



Office of Sponsored Programmes and Research (OSPR)

Research Portfolio

2014-2016



LUMS

Office of Sponsored Programmes and Research (OSPR)

The Office of Sponsored Programmes and Research (OSPR) was established on August 16, 2010 and has the responsibility to manage all sponsored research related activities of academic and research units and act as a bridge between LUMS faculty and national/international donors/sponsors. This includes, but is not limited to externally funded research projects; unrestricted grants; travel grants; sponsored conferences / workshops / seminars; consulting services; memorandum of understanding (MoU), Non-disclosure Agreements (NDA); and contracts/agreements related to externally funded projects. The OSPR was officially approved as the Office of Research, Innovation and Commercialization (ORIC) by the HEC on December 28, 2011.

OSPR has set up a support mechanism to provide help in filing copyright and patent applications. setting up its Technology Transfer Wing (TTW) so that formal support mechanisms are established to provide legal, administrative and financial support required in the patent and commercialization process to LUMS faculty in order to ensure that their focus remains on the research and innovation aspect, leaving the legal and administrative hurdles for the TTW team.



Table of Contents

Message from the Vice Chancellor	5
Message from the Director	6
Research Statistics	7
Submissions & Grants	7
Publications	7
Sponsors:	8
Categories:	9
About LUMS	10
Schools at LUMS	11
Suleman Dawood School of Business (SDSB).....	12
Mushtaq Ahmad Gurmani School of Humanities & Social Sciences (MGSHSS)	13
Syed Babar Ali School of Science and Engineering (SBASSE).....	14
Shaikh Ahmad Hassan School of Law (SAHSOL).....	16
Institutional Bodies	17
Office of Sponsored Programmes and Research (OSPR)	17
Institutional Review Board (IRB).....	17
University Research Council (URC)	17
LUMS Funding Sources.....	19
Faculty Initiative Fund (FIF)	19
Faculty Travel Grant (FTG)	19
Start-up Grants.....	19
National Funding Opportunities	20
Higher Education Commission (HEC).....	20
National ICT R&D Fund.....	20
Pakistan Science Foundation (PSF)	20
Best IT Innovation Awards (BITA).....	20
President's Programme for Care of Highly Qualified Overseas Pakistanis (PPQP)	20
SDSB.....	21
Dr. Atif Saeed Chaudry.....	22
Dr. Choudhry Tanveer Shehzad.....	23
Dr. Farrah Arif	24
Dr. Ferhana Ahmad.....	26
Dr. Hassan Rauf Chaudhry.....	27
Dr. Kamran Ali Chatha.....	28
Dr. Misbah Tanveer Chaudhry	29

Dr. Mohsin Bashir	31
Dr. Muhammad Naiman Jalil.....	32
Dr. Muhammad Shakeel Sadiq Jajja.....	33
Dr. Muhammad Shehryar Shahid.....	34
Dr. Saad Azmat	35
Dr. Samina Quratulain.....	37
Dr. Syed Mubashir Ali.....	38
Dr. Syed Zahoor Hassan.....	39
Dr. Zaghum Umar.....	41
Dr. Zain ul Abdin Khawaja.....	42
Dr. Zehra Waheed	43
MGSHSS.....	45
DEPARTMENT OF ECONOMICS	46
Dr. Abid Aman Burki.....	47
Dr. Hadia Majid	52
Dr. Husnain Fateh Ahmed.....	54
Dr. Imtiaz ul Haq	55
Dr. Kamal Ahmad Munir	56
Dr. Kashif Zaheer Malik.....	57
Mr. Mohammad Usman Khan	59
Dr. Muhammad Farooq Naseer	60
Dr. Rashid Memon	61
Dr. S.M. Turab Hussain.....	63
Dr. Syed Ali Hasanain.....	64
DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES	65
Dr. Ali Khan	66
Dr. Ali Nobil Ahmad	67
Dr. Ali Raza.....	68
Dr. Ali Usman Qasmi	69
Dr. Basit Bilal Koshul	70
Dr. Furrukh A. Khan	71
Dr. Hasan H. Karrar	72
Dr. Nadhra Shahbaz Naeem Khan.....	73
Dr. Nida Yasmeen Kirmani	74
Dr. Rasul Bakhsh Rais.....	75

Dr. Sadaf Ahmad	76
Dr. Waqar Zaidi	77
SBASSE	79
DEPARTMENT OF BIOLOGY	80
Dr. Ahmed Jawaad Afzal	81
Dr. Amir Faisal	82
Dr. Aziz Mithani	84
Dr. Muhammad Tariq	86
Dr. Sadia Ashraf	88
Dr. Sadia Hamera	89
Dr. Safee Ullah Chaudhary	90
Dr. Shaper Mirza	93
Dr. Syeda Kahkeshan Hijazi	94
Dr. Syed Shahzad ul Hussan	95
DEPARTMENT OF CHEMISTRY	97
Dr. Basit Yameen	98
Dr. Falak Sher	99
Dr. Ghayoor Abbas Chotana	100
Dr. Habib Ur Rehman	102
Dr. Irshad Hussain	103
Dr. Muhammad Saeed	105
Dr. Muhammad Zaheer	107
Dr. Rahman Shah Zaib Saleem	109
Dr. Salman Noshear Arshad	110
DEPARTMENT OF COMPUTER SCIENCE	112
Dr. Arif Zaman	113
Dr. Asim Karim	114
Dr. Basit Shafiq	115
Dr. Hamid Abdul Basit	118
Dr. Ihsan Ayyub Qazi	120
Dr. Mian Muhammad Awais	123
Dr. Muhammad Fareed Zaffar	124
Dr. Muhammad Hamad Alizai	127
Dr. Murtaza Taj	129
Dr. Naveed Arshad	131

DEPARTMENT OF ELECTRICAL ENGINEERING	133
Dr. Abubakr Muhammad	134
Dr. Ahmad Kamal Nasir	137
Dr. Farasat Munir	139
Dr. Hassan Abbas Khan	140
Dr. Ijaz Haider Naqvi	142
Dr. Momin Ayub Uppal	144
Dr. Muhammad Adeel Ahmed Pasha	145
Dr. Muhammad Tahir	147
Dr. Nadeem Ahmad Khan	148
Mr. Nauman Ahmad Zaffar	149
Dr. Nauman Zafar Butt	152
Dr. Naveed Ul Hassan	153
Dr. Shahid Masud	155
Dr. Syed Azer Reza	157
Dr. Waqas Majeed	158
Dr. Wasif Tanveer Khan	159
Dr. Zartash Afzal Uzmi	161
DEPARTMENT OF MATHEMATICS	162
Dr. Adnan Khan	163
Dr. Imran Naeem	164
DEPARTMENT OF PHYSICS	165
Dr. Muhammad Sabieh Anwar	166
Dr. Mumtaz Ali Sheikh	169
SAHSOL	171
DEPARTMENT OF LAW & POLICY	171
Dr. Ali Mohsin Qazilbash	172
Mr. Sikander Ahmed Shah	173
Mr. Uzair Kayani	174
Dr. Zubair Abbasi	175
Index	177

Message from the Vice Chancellor

This report presents the significant research achievements of the faculty at LUMS, in terms of external & internal grants won, research work carried out, scholarly papers published, and provision of consultancy services.

The LUMS vision of becoming an “internationally acclaimed research university that serves society through excellence in education and research” underpins the work of students and faculty actively engaged in research to push the boundaries of knowledge and make new discoveries that continue to provide us new insights and understandings of various disciplines.



Research carried out by faculty members at LUMS is both fundamental and applied in nature, with the innovative works having significant commercialization prospects as well as creation of intellectual property that has substantial value in the market place. The entire focus of research work carried out at LUMS is on quality. The faculty aim to collaborate with top institutions and publish in the best journals. It is no wonder then that undergraduate projects are being written up for publication such as “Nature Scientific Reports” as a consequence of which, these students are obtaining fully funded offers for PhD study at many of the premier institutions of the world. LUMS standing in research today is a recognition of the effort over multiple decades put in by the distinguished faculty of LUMS who have always achieved excellence and national and international leadership through groundbreaking research.

It is heartening to see the diversification of research areas at LUMS and growth of research work in management and business studies, economics, humanities and social sciences and law, in addition to the excellent work being carried out in the science and engineering fields. The establishment of different interdisciplinary research centers at LUMS also bodes well for the future. With continued investment in research, LUMS aims to become a regional academic leader in the near future.

Prof. Dr. S. Sohail H. Naqvi
Vice Chancellor



Message from the Director

I am extremely delighted to present to you the LUMS Research Portfolio 2014-2016, a compilation of the funded research endeavours of the faculty at Lahore University of Management Sciences (LUMS) in the past 2 years. With more than 30 years of academic excellence, LUMS has earned a reputation of being an outstanding academic institution, by imparting knowledge to its students to excel in their chosen fields and engage in various research-related activities.

Being dedicated to strengthening its reputation as a centre of excellence, LUMS strives to make research a fundamental part of the university's culture, encouraging faculty and students to reach out and make ground-breaking discoveries in the areas of social sciences, humanities, law, business, natural sciences, technology and engineering and to undertake entrepreneurial ventures to apply the knowledge gained for the betterment of the society and the overall development of Pakistan. The research activities of the faculty have opened many doors for them, giving them the opportunity to present and publish their works nationally as well as internationally while simultaneously allowing the university to establish strong ties with several national and international donor agencies and industries.

Since January 2014 till June 2016, research accomplishments of the faculty have won 186 external grants of PKR 719,203,015. Apart from that, one hundred and twenty three (123) faculty members have won 294 research projects worth PKR 189,125,748 from the LUMS internal funding. The objective of presenting this report is to highlight the pioneering accomplishments and innovative achievements of the LUMS faculty that have made LUMS a regional centre of excellence today, evident from its international rankings, and also to provide an opportunity to further develop research collaboration activities for LUMS.

Looking forward to your feedback.

Dr. Shafay Shamail
Director
Office of Sponsored Programmes and Research (OSPR)

Research Statistics

Submissions & Grants

LUMS is one of the nation's top research universities, not only generating important new knowledge in the fields of medicine, technology, business, science, and beyond, but applying this knowledge to improve the lives of individuals and communities at home and around the world. As a result of constant focus on research support, around 36.2% increase has been observed in the faculty research proposals seeking funding during the last three (3) fiscal years (2013-2014 to 2015-2016). The proposals that were approved during the current year also experienced a 31.6% rise.

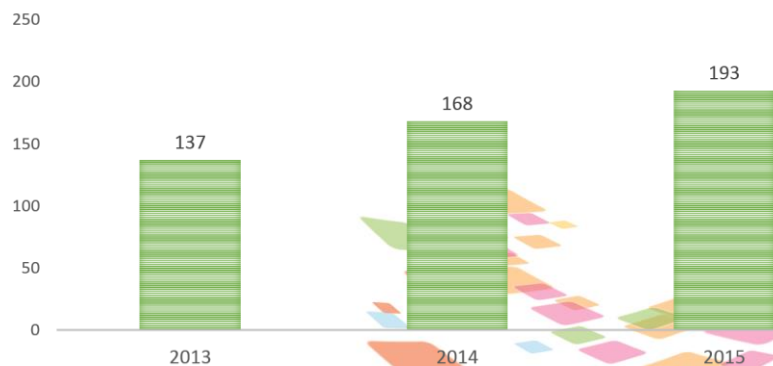
GRANTS SUBMITTED VS APPROVED
(IN A GIVEN YEAR)



Publications

At LUMS, the biggest challenges of the day are being addressed to create a better world. The range of research activities at LUMS is broad and profound. The graph below is a reflection of the increase in the total unique publications authored by LUMS Faculty in last three (3) calendar years (2013 to 2015). The research publications saw a growth of 40.8%, demonstrating a healthy trend which is a reflection of extensive research endeavours by LUMS faculty over the years.

LUMS' PUBLICATIONS



Sponsors:

- 1) Adam Smith International (ASI)
- 2) Aga Khan Cultural Service - Pakistan (AKCS-P)
- 3) American University
- 4) Assessment and Strengthening Program (ASP)
- 5) Association of Management Development Institution in South Asia (AMDISA)
- 6) Barclays Bank, Karachi
- 7) British Council
- 8) Campaign for Quality Education
- 9) Center for Economic Policy Research
- 10) Center for Economic Research in Pakistan (CERP)
- 11) Cleaner Production Institute (CPI)
- 12) Coca Cola Beverages Pakistan Ltd. (CCBPL)
- 13) Comstech-Twas
- 14) Department for International Development (DfID)
- 15) Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
- 16) Disney Research, Pittsburg
- 17) Economic and Social Research Council (ESRC)
- 18) Erasmus Mundus
- 19) German Pakistani Research Cooperation Programme (DAAD)
- 20) Ghulam Ishaq Khan Institute of Engineering Sciences and Technology (GIKI)
- 21) Global Development Network (GDN)
- 22) Global Development Services International (GDSI)
- 23) Google Asia Pacific Pte. Ltd.
- 24) Habib University
- 25) Health and Nutrition Innovation Fund (HANIF)
- 26) Higher Education Commission (HEC)
- 27) HomeNet
- 28) HTSPE International Programme Management
- 29) IGI Insurance Limited
- 30) Indian Council for Research on International Economic Relations (ICRIER)
- 31) Indus Motor Company (IMC)
- 32) Institute of Development and Economic Alternatives (IDEAS)
- 33) Institute of Space Technology (IST)
- 34) International Food Policy Research Institute (IFPRI)
- 35) International Growth Centre (IGC)
- 36) International Water Management Institute (IWMI)
- 37) Japan International Cooperation Agency (JICA)
- 38) K Legal Solicitors
- 39) Kalam Reserach and Media
- 40) Lahore Electric Supply Company (LESCO)
- 41) London School of Economics and Political Science (LSE)
- 42) London School of Economics and Political Sciences (LSE)
- 43) LUMS Faculty Initiative Fund (FIF)
- 44) McGill University
- 45) MicroTech Industries (Private) Ltd.
- 46) Microtech Industries Pvt. Ltd
- 47) National Engineering Services Pakistan (NESPAK)
- 48) National ICT R&D Fund
- 49) National University of Sciences and Technology (NUST)
- 50) Nestle
- 51) Nusrat Jahan College, Rabwah
- 52) Open Society Institute (OSI)
- 53) Oxfam International, Pakistan
- 54) Packages Limited

- 
- 55) Pakistan Centre for Philanthropy (PCP)
 - 56) Pakistan Institute of Corporate Governance (PIGC)
 - 57) Pakistan Microfinance Network (PMN)
 - 58) Pakistan Strategy Support Program (PSSP)
 - 59) PakShine
 - 60) Preston University
 - 61) Punjab Skills Development Fund (PSDF)
 - 62) Qadri Group
 - 63) Re-engineering With Research (RWR) Private Ltd
 - 64) RS Corporate Advisory (Pvt.) Ltd
 - 65) Society for Advancement of Higher Education (SAHE)
 - 66) SONY
 - 67) South Asia Center for Policy Studies (SACEPS)
 - 68) South Asia Network of Economic Research Institutes (SANEI)
 - 69) State Bank of Pakistan (SBP)
 - 70) Techlogix
 - 71) Tetra Pak
 - 72) The Global Fund to End Slavery
 - 73) UET, Peshawar
 - 74) U.S Agency for International Development (USAID)
 - 75) U.S. Agency for International Development (USAID) Ambassador's Fund Program
 - 76) UN Women
 - 77) United Nations International Children's Emergency Fund (UNICEF)
 - 78) United Nations University (UNU)
 - 79) United States Institute of Peace (USIP)
 - 80) University of California, San Diego
 - 81) University of Queensland, Australian Centre for International Agricultural Research (ACIAR)
 - 82) World Bank
 - 83) World Wide Fund (WWF)
 - 84) Zameen Media (Pvt) Ltd.
 - 85) Zarai Taraqiati Bank Limited (ZTBL)

Categories:

1. Agriculture
2. Behavioural Studies
3. Business & Innovation
4. Computer Vision
5. Development Management
6. Economic Development
7. Education
8. Energy
9. Environment
10. GIS
11. Health
12. Law & Policy
13. Operations Management
14. Political Science
15. Robotics
16. Natural Sciences
17. Technology
18. Telecommunications
19. Trade
20. Water
21. History & Art

About LUMS

The Lahore University of Management Sciences was granted University Charter in 1985 and is a leading academic institution with a history of excellence and achievements and a vision of carrying out quality research work and to train its students to excel in their personal and professional lives.

The university initially started off with one school and successfully expanded to four schools: Suleman Dawood School of Business (SDSB), Syed Babar Ali School of Science and Engineering (SBASSE), Mushtaq Ahmad Gurmani School of Humanities & Social Sciences (MGSHSS) and Shaikh Ahmad Hassan School of Law (SAHSOL)

LUMS offers 15 programmes at the undergraduate level, 9 programmes at graduate levels and 7 PhD programmes. It has always endeavoured to provide first-class education to students while encouraging research and intellectual growth concurrently. As a result, it has played a key role in setting high standards of academic excellence and producing high calibre professionals.



Schools at LUMS



Suleman Dawood School of Business (SDSB)

Established in 1986, the **Suleman Dawood School of Business (SDSB)** was the first of the schools at Lahore University of Management Sciences. Its unique pedagogies, such as the case method of teaching and the meticulous personal and professional development of students prepare them to become successful entrepreneurs and global leaders. With more than 2,000 graduates now, SDSB is currently ranked as one of the leading business schools in the region and is recognised for its excellent teaching methods and research-oriented environment.

SDSB offers various programmes at the undergraduate and graduate levels, with BSc (Honours) in Accounting & Finance and Management Science as part of the undergraduate courses as well as MBA Programme, Executive MBA Programme and PhD Management Programme.

Research at SDSB

The school is involved in several research areas related to management. Following research centres are a part of SDSB:

Case Research Centre (CRC)

The Case Research Centre (CRC) plays a coordinating and editorial role in the development of well-researched case studies written by the SDSB faculty. It has a collection of over 450 Pakistan specific cases/industry notes drawn from real life issues in organisations experienced first-hand by the faculty as the result of their research or consultation activities. The CRC disseminates the offers the contextually and academically rich teaching material to business schools and the corporate sector worldwide. Scholarly output of LUMS faculty through its international case research journal "Asian Journal of Management Cases" and also offers the contextually and academically rich teaching material to business schools and the corporate sector worldwide.

Social Enterprise Development Centre (SEDC)

The Social Enterprise Development Centre (SEDC) serves as a scholarship-based research centre working towards the capacity building of the social sector in Pakistan. The centre has successfully developed linkages with more than 500 social sector organisations of Pakistan, which is a unique achievement for any academic institute. To date, SEDC has published more than 170 case studies and notes written by the LUMS faculty for the social sector and has published 6 casebooks.

Strategic Sectors Research Centre (SSRC)

The Strategic Sectors Research Centre (SSRC) is a new initiative in institutionalising research and knowledge generation at SDSB. It focuses on strategic sectors including development (education management, health management, and entrepreneurship) and economic sectors (energy and water management, agribusiness, textiles, food, banking, sports goods and pharmaceuticals).

Raising Executive Development Centre (REDC)

The Raising Executive Development Centre (REDC) imparts executive education with the excellence and rigor that is directed at making every executive's experience a valuable one. It is modelled on the structure of some of the leading executive education centres from around the globe. It offers over 70 programmes every year inclusive of open enrolment and customised programmes backed by in-depth research and a solid grasp on the needs of the modern businesses.

Mushtaq Ahmad Gurmani School of Humanities & Social Sciences (MGSHSS)

The **Mushtaq Ahmad Gurmani School of Humanities & Social Sciences (MGSHSS)** (formerly School of Arts and Sciences) is the largest school at LUMS with a maximum share of the student body. It has made a great contribution towards the country's repertoire of superior multi-disciplinary education in humanities, social sciences and liberal arts.

Exposure to studies at the MGSHSS has led many students to develop a deep interest in the social sciences and several have opted to pursue their PhDs in liberal arts. Some graduates have gone on to serve as faculty members at LUMS and other credible universities in different parts of the world after completing their doctoral degrees.

At present, the school offers several undergraduate programmes such as BSc Economics, BSc (Honours) Economics & Politics, BSc (Honours) Political Science, BSc (Honours) Anthropology & Sociology, BA (Honours) English and BA (Honours) History. The school also offers a competitive MS programme in Economics. The curriculum has been carefully designed and developed over the years by the faculty at LUMS, in conjunction with feedback from distinguished faculty from international universities.

Research at MGSHSS

Following are the research centres at MGSHSS:

Development Policy Research Centre (DPRC)

The Development Policy Research Centre (DPRC) at LUMS is structured around interdisciplinary research in areas including economics, econometrics, sociology, development studies, political science, anthropology, regionalism and globalisation, environmental and natural resources, culture, heritage, policy and democracy, as well as social movements and civil society. It provides a platform to channel expertise in these areas towards sustained, thematic research work and also contributes to evidence based policy making and public discussion.

Gurmani Centre for Languages and Literature (GCLL)

The Gurmani Centre for Languages and Literature (GCLL) at the Lahore University of Management Sciences was initiated by the Gurmani Foundation on Friday April 09, 2010, for the advancement of national and regional languages including Arabic, Persian, Urdu and several other languages. The Centre is part of the Department of Humanities & Social Sciences (HSS) and promotes languages and their literature through teaching, research/publication and its outreach programme.

Syed Babar Ali School of Science and Engineering (SBASSE)

The Syed Babar Ali School of Science and Engineering (SBASSE) is known for its world-class science and engineering students, faculty and high quality and industrially relevant research. Established in 2008, SBASSE is the first private research school for science and engineering in Pakistan.

SBASSE offers a four-year undergraduate programme of Bachelor of Science (BS) degree in Biology, Chemistry, Computer Science, Electrical Engineering, Mathematics and Physics. In addition, it offers MS programmes in Computer Science and Electrical Engineering. The school also offers PhD programmes in Biology, Chemistry, Computer Science, Electrical Engineering, Mathematics and Physics.

Research at SBASSE

In the “no boundaries spirit” of the school, the faculty at the SBASSE is involved in multi-disciplinary research, working on various interfaces between biology, chemistry, physics, mathematics and engineering.

Centre for Water Informatics & Technology (WIT)

The Centre for Water Informatics & Technology (WIT) was established at the Lahore University of Management Sciences (LUMS) in October 2015. WIT aims to serve as a hub with a disciplinary focus on hydro-informatics and systems analysis but touching multidisciplinary research themes in water by engaging faculty and students from all departments of SBASSE; and by forging collaborations among the different schools within LUMS to provide the much needed, interdisciplinary perspective to water issues, under the guidance of a world-class advisory group.

Centre for High Performance Computing (CHPC)

The Centre for High Performance Computing (CHPC) provides scientific computing facilities for the LUMS research community. The goals of the centre are to engender and facilitate science and engineering research efforts; assist researchers with specialised computational needs and provide research and development exposure to our students.

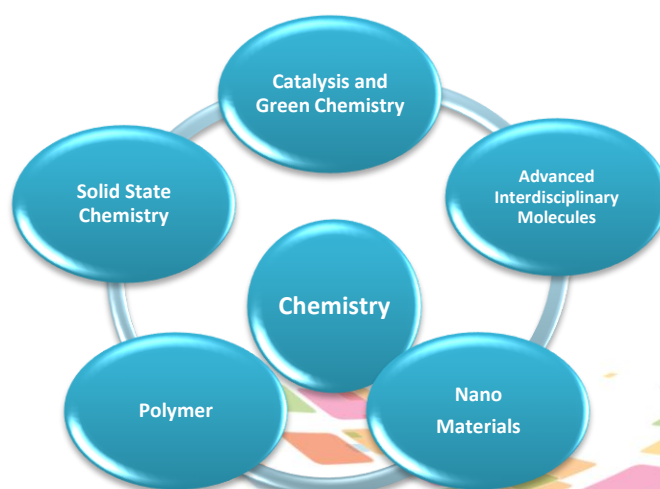
Centre for Advanced Studies in Mathematics (CASM)

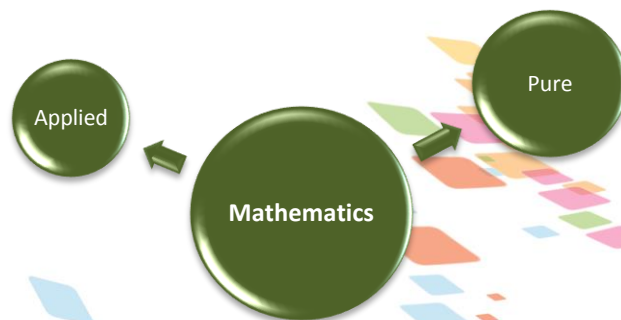
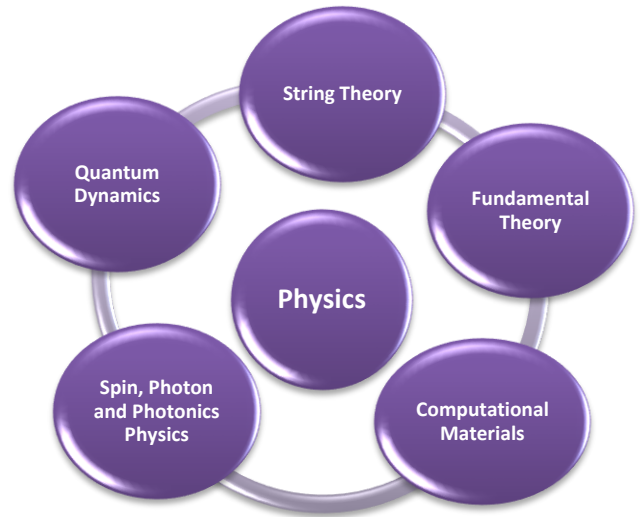
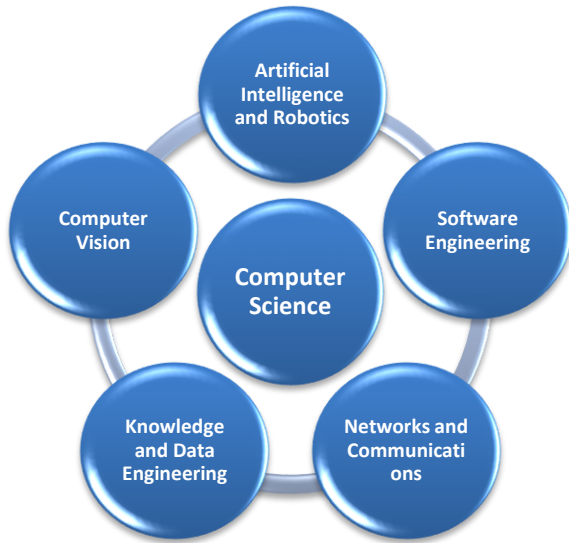
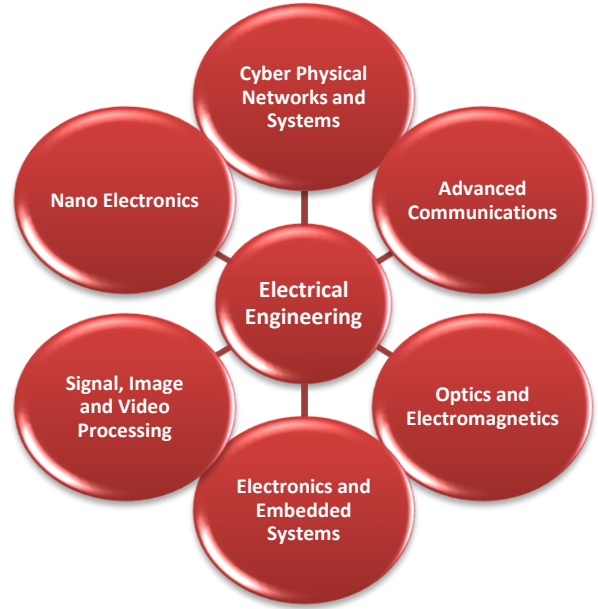
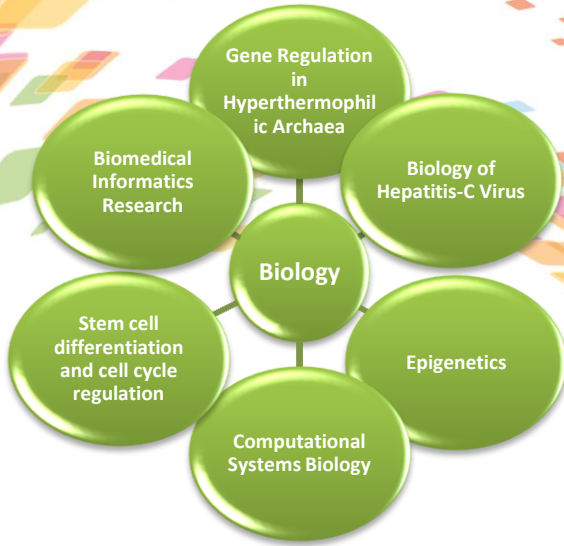
The Centre for Advanced Studies in Mathematics (CASM) runs workshops/conference and seminars on selected topics in Mathematics with applications every year. It also attracts research scholars from Overseas and Pakistan to interact with faculty.

Technology for People Initiative (TPI)

Technology for People Initiative (TPI) is an applied research centre at LUMS. It is focused on designing innovative, low-cost, practical technology solutions for problems in the public sector. Formally founded in April 2012 and housed in the SBASSE at LUMS, TPI brings together a host of talent in inter-disciplinary faculty, fellows and students to work on practical problems having widespread impact.

The school has a number of research clusters, groups and labs in the following areas:





Shaikh Ahmad Hassan School of Law (SAHSOL)

LUMS has launched an independent School of Law, the Shaikh Ahmad Hassan School of Law (SAHSOL), as its fourth School, and a stand-alone building for the School has been established.

The SAHSOL has grown out of the Department of Law & Policy, which had been functioning since 2004, offering a 5-year joint B.A.-LL.B. undergraduate programme, which is accredited by the Pakistan Bar Council. This unique five-year programme provides rigorous interdisciplinary exposure to Law and its related disciplines. The first two pre-LL.B years lay down foundation principles in social sciences. Students undergo extensive academic training in core and specialised subjects in Law over the next three years. Other advanced degrees will be offered as the SAHSOL evolves further.

The school plays a productive and significant role in catalysing reform in the legal system, in promoting both corporate and social responsibility strengthening the legal profession and judicial institutions for the promotion of justice and the rule of law.

The housing of such a law and policy programme at LUMS is a vital step towards the creation of a centre of excellence where academics working in the increasingly inter-related areas of economics, finance, politics and law can collectively take on the challenges being posed by the transformation of the Pakistani economic and legal system.

Research at SAHSOL

Continuous and on-going research is a fundamental value and corner stone of the Law and Policy Programme initiative as apart from other impacts, such research directly translates into better teaching. Law is a dynamic subject with very frequent changes of text, approach and issues. The introduction of the research dimension is, therefore, a vital contribution by the Law and Policy Programme to the broader society.

Institutional Bodies

Office of Sponsored Programmes and Research (OSPR)

The Office of Sponsored Programmes and Research (OSPR) focuses on sponsored research and programmes. It is responsible for managing all sponsored research related activities of academic and research units and act as a bridge between LUMS faculty and national/international donors. This includes, but is not limited to, externally funded research proposals; unrestricted grants; travel grants; sponsored conferences / workshops / seminars; consulting assignments; chair funds; instructional and service activities; contracts; agreements and arrangements related to sponsored and externally funded activities. Moreover, the OSPR also manages internal grants, which are provided by LUMS including Faculty Initiative Fund (FIF), Faculty Travel Grant (FTG) and Start-up Grants. The OSPR has set up a support mechanism to provide help in filing copyright and patent applications through its Technology Transfer Wing (TTW) so that formal support mechanisms are established to provide legal, administrative and financial support required in the patent and commercialization process to LUMS faculty in order to ensure that their focus remains on the research and innovation aspect, leaving the legal and administrative hurdles for the TTW team.

Institutional Review Board (IRB)

Institutional Review Board (IRB) is responsible for overseeing all projects that involve the use of human and animal subjects. All issues related to the bio-safety are also under the review of the IRB. More information can be viewed on the following link:

<http://lums.edu.pk/osp/page.php/institutional-review-board-irb-osp>

University Research Council (URC)

The University Research Council (URC) is a standing committee of the University Faculty Council (FC) that promotes and advocates research environment in LUMS. It is involved in developing policies and acting as an advisory group to the Vice Chancellor and Deans in matters related to research.

URC Charter

The purpose of the Research Council is to identify and recommend those baseline policies that will be applicable to research endeavours of the faculty. Specifically it will be addressing the following:

1. To advocate for and to promote research culture at LUMS.
2. To develop standardised policies and guidelines to promote quality research.
3. To serve as an advisory group to the Vice Chancellor and other members of the administration including Deans.
4. To act as a University Standing Committee in reviewing and recommending new research policies and changes in existing ones.
5. To prepare a brief, written report on the year's activities of the Council at the end of each academic year and to submit copies of the reports to the Vice Chancellor of the University and to the Faculty Council.

Terms of Reference for the Operations of the Research Council

The following are the Terms of Reference for URC:

- Members are decided by the University Faculty Council (FC) in consultation with the convener.
- Faculty is asked for choice of membership and based on the faculty's feedback, the convener selects members and sends recommendation to the Vice Chancellor for final nomination.
- Vice Chancellor finalises the membership of URC based on recommendations of the URC convener.
- Membership for URC is divided in the following manner:
 - 5 Members from SBASSE (including one from Department of Biology)
 - 5 Members from SAHSOL (including one from Department of Law and Policy)
 - 3 Members from SDSB
- 50 percent of the URC members are rotated every year using the same formula.
- URC convener is elected through voting by members
- Convener is re-elected from the house after every 2 years.
- The quorum of URC Meetings consist of a minimum of 60 percent of the members.
- Decisions are based on consensus among all present members. If disagreement persists between members, the issue is moved to the next meeting for debate and efforts are then made to build consensus. Issues that remain unresolved are then decided upon by the Council through a resolution method.
- URC meets at least once a quarter every year and more meetings are scheduled when required.

Research Council Members List 2015-16

The following is the list of the Research Council members for 2015-16. These members were appointed on July 1, 2015 to June 30, 2016.

1. Dr. Abid Aman Burki (Department of Humanities & Social Sciences, MGSHSS) – Convener
2. Dr. Ali Usman Qasmi (Department of Humanities & Social Sciences, MGSHSS)
3. Dr. Atif Saeed Chaudry (Suleman Dawood School of Business, SDSB)
4. Dr. Ayaz Qureshi (Department of Humanities & Social Sciences, MGSHSS)
5. Dr. Syed Azer Reza (Department Of Electrical Engineering, SBASSE)
6. Dr. Choudhry Tanveer Shehzad (Suleman Dawood School of Business, SDSB)
7. Dr. Fahd Rehman (Suleman Dawood School of Business, SDSB)
8. Dr. Husnain Fateh Ahmed (Department of Humanities & Social Sciences, MGSHSS)
9. Dr. Irshad Hussain (Department of Chemistry, SBASSE)
10. Dr. Mian Muhammad Awais (Department Of Computer Science, SBASSE)
11. Dr. Mohammad Waseem (Department of Humanities & Social Sciences, MGSHSS)
12. Dr. Uzair Kayani (Department of Law and Policy, SAHSOL)
13. Dr. Shafay Shamail - Ex-Officio (Department Of Computer Science, SBASSE)- Director OSPR

Research Council Members List 2014-15

The following is the list of the URC members for 2014-15, who were appointed on July 1, 2014 till June 30, 2015:

1. Dr. Abid Aman Burki (Department of Economics, MGSHSS) – Convener
2. Dr. Abubakr Muhammad (Department of Electrical Engineering, SBASSE)
3. Dr. Hasan H. Karrar (Department of Humanities & Social Sciences, MGSHSS)
4. Dr. Irshad Hussain (Department of Chemistry, SBASSE)
5. Dr. Laila Bushra (Department of Humanities & Social Sciences, MGSHSS)
6. Dr. Misbah Tanveer Chaudhry (SDSB)
7. Dr. Syed Muhammad Hussain (Department of Economics, MGSHSS)
8. Dr. Syed Muhammad Azeem (Department of Law and Policy, SAHSOL)
9. Dr. Naveed Arshad (Department of Computer Science, SBASSE)
10. Dr. Muhammad Naiman Jalil (SDSB)
11. Dr. Shafay Shamail – Ex-Officio (Department of Computer Science, SBASSE) – Director OSPR

More information can be viewed on the following link: <http://lums.edu.pk/osp/page.php/research-council-osp>

LUMS Funding Sources

LUMS provides extensive funding opportunities to pursue research at LUMS. These opportunities also help faculty members to prepare for and seek larger international grants.

Faculty Initiative Fund (FIF)

The LUMS Faculty Initiatives Fund (FIF) is an internal funding mechanism that awards competitive grants of between PKR 500,000 to Rs. 1,000,000 to the LUMS faculty. These grants are intended to help faculty members develop innovative projects and benefit from new research initiative opportunities in order to enhance the research endeavours of the university. All full-time and research faculty members at LUMS are eligible to apply for this grant. Proposals are submitted individually or by a group of faculty within or across schools to the Office of Sponsored Programmes and Research (OSPR).

Faculty Travel Grant (FTG)

Faculty Travel Grants (FTG) provided by LUMS assist in the research activities of the university's full-time regular faculty at various stages of their academic careers. The purpose of FTG is to encourage research-related international travels and collaborations by full-time LUMS faculty. Full-time, regular faculty members applying for FTG have their applications reviewed for funding by the FTG review committee.

Start-up Grants

Start-up Grants are the first grants given to full-time regular faculty newly recruited on tenure track or as tenured faculty. These grants are awarded by the Deans of the respective schools. In case the School decides not to award start-up grants to new faculty at the beginning of their stay at the university, the school may institute any scheme for the promotion of research using these funds. Mechanism for award of the start-up grants in such a case may be documented and forwarded to the Vice Chancellor by the Dean.

National Funding Opportunities

Here are some funding opportunities available at National level:

Higher Education Commission (HEC)

The Higher Education Commission of Pakistan (HEC) is an autonomous and constitutionally established institution of primary funding, overseeing, regulating and accrediting the higher education efforts of Pakistan. HEC has, since its establishment, been responsible for formulating higher education policy and has adopted a proactive policy of encouraging the institutions to enhance the quality of education in Pakistan. Grants provided by HEC include National Research Programme for Universities, Travel Grant opportunities, Interim Placement of Fresh PhDs Programme (IPFP), Post Doctoral fellowship, Pakistan Program for Collaborative Research (PPCR), Thematic Research Grant programme as well as HEC Grant to Organise Seminar, Conference and Training Workshop.

National ICT R&D Fund

National ICT R&D Fund was created to assist the phenomenal growth that Pakistan's telecom industry has seen in the recent years. It holds a vision to transform the country's economy into a knowledge-based economy by increasing sustainable and effective ICT initiatives through synergic development of industrial and academic resources. Among its goals is the goal to cultivate industry-academia partnership by funding concrete development and research initiatives and to promote ICT related educational programmes and activities. The National ICT R&D Fund facilitates a large number of projects by providing funds for the successful execution of these projects.

Pakistan Science Foundation (PSF)

Pakistan Science Foundation (PSF) is a body which promotes and funds scientific and technological research as well as science popularisation in the country. With an objective of promoting scientific research and related activities, PSF provides funding in research areas including Agricultural Sciences, Biological Sciences, Bio-technology, Genetic Engineering, Chemical Science, Information Technology as well as Medical Sciences and Physics. Through the provision of grants to universities such as the Pakistan Science Foundation (PSF) Research Support Programme, PSF assists them in undertaking individual and group research activities.

Best IT Innovation Awards (BITA)

Best IT Innovation Awards (BITA) recognises and encourages creativity in the field of IT. It is a platform to identify individuals, organisations and companies whose innovations are valuable to build a knowledge-based economy. The key players of BITA encourage serendipity through the sharing ideas and by building relationships and connections. This platform also serves as a council to discuss the possible applications and likely implications of the latest technologies in the context of the Pakistan's national needs. To assist high quality innovative ideas in the field of IT by Pakistan's brightest mind, BITA provides competitive funding through call for proposals.

President's Programme for Care of Highly Qualified Overseas Pakistanis (PPQP)

President's Programme for Care of Highly Qualified Overseas Pakistanis (PPQP) is a programme which facilitates organisations/ institutions including production units to meet their deficient areas in various fields of specialisation. The purpose is to facilitate high level Pakistani professionals abroad for their placement in Pakistan through short to long term technical assistance to avail benefits of their expertise for specific inputs in their areas of specialisation, for public and private sector within the country. These areas include Engineering Medicine/surgery, Physical sciences, Energy, Nano-Technology, Bio-Science/ Biotechnology, Genetic Engineering, Environment, Agriculture as well as Economics.

SDSB



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Profile: Dr. Atif Saeed Chaudry is an Assistant Professor in the SDSB at LUMS where he teaches in the fields of Economics and Finance. Prior to joining LUMS in 2013, he completed his PhD in Economics from the University of Wisconsin-Madison under the supervision of Prof. Randall Wright. His research interests include Finance, Banking, Monetary Economics and Economic Growth. Currently, Dr. Atif is doing some research work on understanding differences between different modes of financing, bank stability and competition, banks and business cycles, the impact of access to finance to the poor (in initial stages), the impact of foreign aid on transport networks and understanding the microstructure and regulation of energy sector in Pakistan. Before starting his PhD, he completed his MBA from LUMS and worked in Investment Banks in Hong Kong and Karachi. He likes to spend his free time playing golf and racket sports.

Selected Publications:

- Chaudry, Atif Saeed. (2013). Coexistence of Money and Capital as a Medium of Exchange.
- Chaudry, Atif Saeed. Essays on Macroeconomics. Diss. University of Wisconsin–Madison, 2013.



Title: Bank Competition and Business Cycles

PI: Dr. Atif Saeed Chaudry

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2014

Duration: 12 Months

Category: Business & Innovation

Description: This project seeks to answer research questions about bank competition and the financial stability associated with bank competition. There are two opposing forces at play here. Bank competition favours the depositors and the entrepreneurs.

However, too much bank competition may cause banks to indulge in excessive risk taking, resulting in financial stability issues. It seeks to quantify the Welfare associated with different levels of competition and suggest the optimal policy in this regard. Both the US banking environment and the Pakistani banking environment will be studied in this regard.

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Profile: Dr. Choudhry Tanveer Shehzad holds a PhD from University of Groningen, the Netherlands and is a Certified Financial Risk Manager from GARP (USA). He specialises in the area of Banking and Finance. His current research topics include banking and financial crises, empirical analysis of corporate finance theories, market concentration and competition, supervision and regulation of banks, credit ratings and stock market perception of financial reform. He has published in reputed journals like Journal of Banking and finance, Applied Economics and North American Journal of Economics and Finance and has presented his research in a number of international conferences in recent years. Additionally, he is a referee for international journals like Journal of Banking and Finance, Applied Economics and European Journal of Political Economy. Before joining LUMS, he was working at the Central Bank of Pakistan as Deputy Director.

Recent Publications:

- Shehzad, C. T., & De Haan, J. (2015). Supervisory powers and bank risk taking. Journal of International Financial Markets, Institutions and Money.
- Forssbæk, J., & Shehzad, C. T. (2015). The Conditional Effects of Market Power on Bank Risk-Cross-Country Evidence. Review of Finance, 19(5), 1997-2038.

Most Cited Publications:

- Shehzad, Choudhry Tanveer, De Haan, Jakob and Scholtens, Bert (2010) "The Impact of Bank Ownership Concentration on Impaired Loans and Capital Adequacy", Journal of Banking and Finance, Volume 34, Issue 2, February, pp 399-408
- Shehzad, Choudhry Tanveer and De Haan, Jakob (2013) "Is 2007 Financial Crisis Universal?" North American Journal of Economics and Finance, Volume 24, pp 113-124
- Shehzad, Choudhry Tanveer, De Haan, Jakob and Scholtens, Bert (2013) "The Relationship between Size, Growth, and Profitability of Commercial Banks" Applied Economics, Volume 24 Issue 13, pp 1751-1765.



Title: Foreign Speculation and Pakistan's Equity Markets: Innocence at Large

PI: Dr. Choudhry Tanveer Shehzad

Co-PI: Prof. Dr. L.J.R. Scholtens, University of Groningen, Netherlands

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 930,000

Project Initiated in: 2014

Duration: 12 Months

Category: Economic Development

Description: The objective of this study is to gauge the effect of foreign individual and institutional inflows and outflows in Karachi Stock Exchange (KSE) on a daily basis. Another important element is to differentiate local and foreign portfolio investment

(FPI) patterns. A simple advantage of this study is to find out how independent our stock market is from foreign speculation, a pre-condition for flourishing financial markets.

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Profile: Dr. Farrah Arif is the Assistant Professor of Marketing in the Suleman Dawood School of Business at the Lahore University of Management Sciences. As a Commonwealth scholar, she obtained a PhD from the University of Cambridge Judge Business School. She is also a certified Associate Fellow of the Higher Education Academy (AFHEA), UK. Dr. Farrah has been teaching in business schools (Pakistan and abroad) since 1999. Currently, she teaches Consumer Behaviour and Marketing Research to MBA and Marketing Management, Business Strategy, and New Product Development to EMBA. She has also designed and delivered executive programmes for MNCs and local companies including Telenor Pakistan, Packages Limited, Bulleh Shah Packaging Limited and Coffey International Limited.

Recent Publications:

- Shrum, L. J., Wong, N., Arif, F., Chugani, S. K., Gunz, A., Lowrey, T. M., & Sundie, J. (2013). Reconceptualising materialism as identity goal pursuits: Functions, processes, and consequences. *Journal of Business Research*, 66(8), 1179-1185.
- Arif, F. (2012). Impact of social agency on child-brand relationships (Doctoral dissertation, University of Cambridge).

Most Cited Publications:

- Wong, N., Shrum, L. J., Arif, F., Chugani, S., Gunz, A., Lowrey, T. M., & Sundie, J. (2011). Rethinking materialism: A process view and some transformative consumer research implications. *Journal of Research for Consumers*, 19, 1-4.
- Davis, B., Pechmann, C., Grover, A., Kamins, M. A., Martin, I. M., Davis, S., & Pullig, C. (2011). Introduction to the special issue on transformative consumer research for the journal of research for consumers. *Journal of Research for Consumers*, 19.



Title: Evaluating the PICG Brand Position-ing and PICG Train-ing and Education Programs - Consumer Insights Research Project

PI: Dr. Farrah Arif

Sponsor: Pakistan Institute of Corporate Governance (PICG)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 2 Months

Category: Economic Development

Description: The Pakistan Institute of Corporate Gov-ernance (PICG) aims to bring about national economic and social transfor-mations by improving the quality of corpo-rate governance in Pakistan. With this vi-sion, PICG started its services offering, membership,

training programs and other elated services. The research project headed by Dr. Farrah Arif will help PICG in developing and executing its three-year strategic plan, which focuses on increasing the number of members and effectiveness of its services to members and non-members.



Title: Understanding of Financial Inclusion through M-banking in Pakistan – A Perspective of Consumer Innovativeness

PI: Dr. Farrah Arif

Co-PI: Dr. Zartash Afzal Uzmi, Dr. Muhammad Adeel Zaffar

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 756,000

Project Initiated in: 2014

Duration: 12 Months

Category: Economic Development

Description: This research focuses on understanding of innovation diffusion amongst low-income group consumers in a context of m-banking. M-banking has been

considered one of the catalysts for economic growth due to various reasons, including m-banking helps masses to come into the folds of financial inclusion; increases penetration of micro finance as it makes the process of microfinance easy for the borrowers; it helps the government in documenting the unbanked segment (low-income as well as medium income groups); it is a high-growth segment for cellular companies and banks. Currently, a few mobile phone companies and banks are operating their m-banking based services in Pakistan. However, the service did not pick up as anticipated. It is suspected that one of its major reasons is the failure of understanding of the target market (the unbanked segment, mainly the low-income segment.) The aim of the project is to understand the phenomenon so that the positive implications of m-banking could be utilized in Pakistan.

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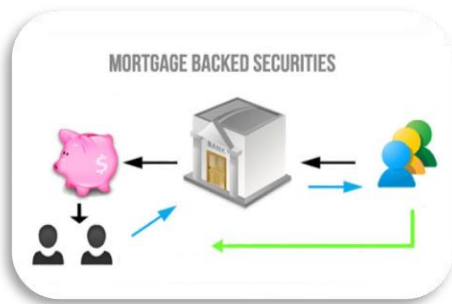
Profile: Dr Ferhana Ahmad is an Assistant Professor at SDSB at LUMS. She holds a PhD degree from University of Oxford in Mathematical and Computational Finance as well as an MSc (Mathematical and Computational Finance) from University of Oxford. Her research interests include Mathematical and Computational Finance, Credit Derivatives, Mortgage backed securities, Numerical simulations.

Recent Publication:

- Ahmad, F. (2012). A stichastic partial differential exquation approach to mortgage backed securities (Doctoral dissertation, University of Oxford).

Most Cited Publications:

- A Stochastic Partial Differential Equation Model For The Pricing Of Mortgage-Backed Securities F Ahmad, Bm Hambly, S Ledge.(2016)
- Ahmad, F. (2008). Market models for inflation (Doctoral dissertation, University of Oxford).
- Ahmad, F., Asghar, S., & Kara, A. H. (2008). Travelling wave and similarity solutions to nonlinear evolution type equations through inverse variational and symmetry methods. Nonlinear Analysis: Theory, Methods & Applications, 69(7), 2223-2229.



Title: Mortgage Backed Securities, Evaluation and Modelling

PI: Dr. Ferhana Ahmad

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 800,000

Project Initiated in: 2014

Duration: 12 Months

Category: Business & Innovation

Description: The market for Mortgage Backed Securities (MBS) was active and fast growing from the issuance of the first MBS in 1981. This enabled financial firms to transform risky individual mortgages into liquid and tradable market instruments. The subprime mortgage crisis of 2007 shows the need for a better understanding and

development of mathematical models for these securities. The aim of this research is to develop models for MBS that are flexible enough to capture both regular and subprime MBS.

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Profile: Dr. Hassan Rauf Chaudhry is an academic, a researcher and a consultant, working in the areas of operations and supply chain management with the leading multinational and national organisations. He attended the National Textile University and Lahore University of Management Sciences (LUMS) in Pakistan. Starting from shop floor production, he gained progressive experience in product development and process improvement. Later, he worked for a leading business house selling fabrics to apparel manufacturers across continents, routing sales via US based brands and retailers. At LUMS, he is involved in research on the competitiveness of apparel industry in Pakistan and documenting of industry best practices. Dr. Hassan Rauf obtained his PhD from North Carolina State University, specialising in Supply Chain Management.

Selected Publications:

- Chaudhry, H. R. (2010). Postponement and Supply Chain Structure. North Carolina State University.
- Rana, A. I., & Chaudhry, H. R. (2007). Leisure Textiles: Salary versus Piece Rate. Asian Journal of Management Cases, 4(2), 95-116.



Title: Operationalisation of stylistic innovation process for short life cycle product

PI: Dr. Hassan Rauf Chaudhry

Co-PI: Dr. Muhammad Shakeel Sadiq Jajja

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 935,000

Project Initiated in: 2015

Category: Business & Innovation

Duration: 12 Months

Category: Operations Management

Description: This research project seeks to capture the branded retail evolution in Pakistani fashion retail market, develop a framework for operationalising the stylistic

innovation process for short life cycle products, and compare/contrast the stylistic innovation process with that of the user centered innovation process whether for tech driven products or for hybrid products. Furthermore, it also seeks to identify whether different categories within the fashion segment require idiosyncratic approaches and ascertain the role of process, people and policies within the process of stylistic innovation.

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Profile: Dr. Kamran Ali Chatha has research interests in the areas of Manufacturing Strategy, and Technology & Innovation Management. He was involved in a multi-country study that aimed at developing an Atlas of Science and Technology based Innovations in the Muslim World sponsored by The Royal Society and Organisation of the Islamic Countries. He has continuing interests in developing techniques for planning, formulating, implementing and evaluating manufacturing strategy in SME sector. Dr. Kamran is the director of the Factory Management Program that aims to develop know-how of contemporary manufacturing management practices among industry executives.

Recent Publications:

- Chatha, K. A., & Butt, I. (2015). Themes of study in manufacturing strategy literature. *International Journal of Operations & Production Management*, 35(4), 604-698.
- Chatha, K. A., Butt, I., & Tariq, A. (2015). Research methodologies and publication trends in manufacturing strategy: a content analysis based literature review. *International Journal of Operations & Production Management*, 35(4), 487-546.
- Omar, A., & Chatha, K. A. (2012). National institute for biotechnology and genetic engineering (nibge): Genetically modified spider cotton. *Asian Journal of Management Cases*, 9(1), 33-58.

Most Cited Publications:

- Worley, J. H., Chatha, K. A., Weston, R. H., Aguirre, O., & Grabot, B. (2005). Implementation and optimisation of ERP systems: A better integration of processes, roles, knowledge and user competencies. *Computers in Industry*, 56(6), 620-638.
- Chatha, K. A., Weston, R. H., & Monfared, R. P. (2003). An approach to modelling dependencies linking engineering processes. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, 217 (5), 669-687.



Title: Internationalisation of Manufacturing: The State of Pakistani Firms

PI: Dr. Kamran Ali Chatha

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 300,000

Project Initiated in: 2013

Duration: 12 Months

Category: Business & Innovation

Description: Increased globalisation of manufacturing indicated by off shoring of manufacturing and innovation to 'low cost' countries has shown increased production activity in the developing countries. Accordingly, the manufacturing capabilities and innovation potential in developing countries has improved. The purpose of this project

is to assess readiness of manufacturing firms in developing countries like Pakistan to internationalise their manufacturing and innovation capabilities and the strategies deployed for this purpose.



Title: Determinants of Internationalization Performance of SMEs: Institutional, Cultural, and Capability Factors

PI: Dr. Kamran Ali Chatha

Sponsor: LUMS Faculty Initiative Fund (FIF)

Co-PI: Dr. Muhammad Shakeel Sadiq Jajja

Funding Amount: PKR 880,000

Project Initiated in: 2015

Duration: 12 Months

Category: Business & Innovation

Description: In this research project, the aim is to understand whether there is a relationship between technology innovation capability and internationalization

performance (e.g. export performance) of SMEs in Pakistan, and if not, what conditions would influence the existence of this relationship. Specifically to prove that organizational culture and institutional pressures (e.g. pressures from competitors, customers, and government) may influence this relationship.

Dr. Misbah Tanveer Chaudhry
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Profile: Dr. Misbah Tanveer Chaudhry holds a PhD in Development Economics. Her research is focused on labour markets and unemployment issues, labour productivity and economic growth, demographic transition, impact of European economic crises on labour markets and gender disparity in labour markets. Her research has been published in high-quality journals like The European Journal of Development Review, International Journal of Manpower and Economic Systems. Before joining the SDSB at LUMS, she worked for State Bank of Pakistan as Deputy Director in Research Department focusing on social sector issues.

Recent Publication:

- Choudhry, Misbah Tanveer, Enrico Marelli, and Marcello Signorelli. "Age dependency and labour productivity divergence." Applied Economics (2016): 1-23.
- Signorelli, M., & Choudhry, M. T. (2015). Symposium: Youth labour market and the "Great Recession". Economic Systems, 39(1), 1-2.
- Bruno, G. S. F., Choudhry, M. T., Marelli, E., & Signorelli, M. (2014). Youth Unemployment: Key Determinants and the Impact of Crises (Vol. 7).

Most Cited Publications:

- Tanveer Choudhry, M., Marelli, E., & Signorelli, M. (2012). Youth unemployment rate and impact of financial crises. International journal of manpower, 33(1), 76-95.
- Choudhry, M. T. (2009). Determinants of labor productivity: an empirical investigation of productivity divergence. The Netherlands: University of Groningen
- Choudhry, M. T., Marelli, E., & Signorelli, M. (2010, March). Financial crises and labour market performance. In International Atlantic Economic Conference, Prague (pp. 24-27).



Title: Women's Economic Empowerment through Entrepreneurship

PI: Dr. Misbah Tanveer Chaudhry

Co-PI: Prof. Marcello Signorelli, University in Perugia, Italy

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 890,000

Project Initiated in: 2014

Duration: 12 Months

Category: Economic Development

Description: This project fundamentally aims to streamline the on-going research on gender-based Labour Force Participation (LFP) across various international platforms by investigating an important component of global labour markets in the context of

Pakistan: women entrepreneurship. It consolidates primary and secondary sources into measurable results, analysing those factors which theoretically and empirically affect women entrepreneurship and the impact of increasing women entrepreneurship on the overall economic development and social well-being of the country. This evidence on growth and labour markets is expected to help in advocating change in labour market policies for Pakistan. In addition, it is intended to provide valuable information to decision makers, researchers, planners and economists to deal with the issue of the dismal status of women entrepreneurship in the country.



Title: Women Entrepreneurship Program Phase 1
PI: Dr. Misbah Tanveer Chaudhry
Co-PI: Dr. Farrah Arif; Asad Alam; Dr. Muhammad Naiman Jalil; Dr. Choudhry Tanveer Shehzad
Sponsor: American University
Funding Amount: PKR 16,595,561
Project Initiated in: 2015
Duration: 18 Months
Category: Economic Development

Description: This project seeks to nurture, support and augment the capacity of women for pursuing entrepreneurial ventures in Pakistan. It is suitable for women who are

either highly educated yet outside the labor pool OR currently operating a small business and have the potential to expand their business. As part of this project, LUMS faculty would conduct a Learning Need Analysis (focus groups, meetings, participation in relevant forums, screening interviews) to understand the development needs and challenges of women entrepreneurs and design an effective learning experience.



Title: Tracing Women in the Informal Sector of Pakistan-Labor Market Dynamics
PI: Dr. Misbah Tanveer Chaudhry
Co-PI: Dr. Enrico Marelli, Professor of Economic Policy, University of Brescia, Italy.
Sponsor: LUMS Faculty Initiative Fund (FIF)
Funding Amount: PKR 870,000
Project Initiated in: 2015
Duration: 12 Months
Category: Economic Development

Description: This project aims to stream line the ongoing research regarding the informal sector by determining the share and importance of women entrepreneurs in the informal economy. It will integrate primary and secondary sources into measurable

results and analyze which factors theoretically and empirically affect women entrepreneurs in the informal economy. Moreover, it will identify the repercussions of augmenting women's share in the informal economy on the overall economic development and social well-being of the country.

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Profile: Dr. Mohsin Bashir is an Assistant Professor at the SDSB, LUMS. His areas of academic interest include Public Private Partnerships, Organisational Power and Politics, and Non-profit Leadership and Management. He holds a PhD in Public Administration and Policy from Arizona State University's School of Public Affairs where he was a Fulbright Scholar. He also holds degrees in Business Administration (LUMS) and Computer Science (FAST). Among his recent publications was a chapter in the Taylor & Francis book "Public Administration in South Asia". He has also published research articles on Public Administration, teaching cases on Non-profit Management and industry reports on Corporate Citizenship. His consulting assignments have been in the areas of Monitoring and Evaluation, Decentralisation/Devolution, Responsible Business Frameworks, Organisational Effectiveness and Information and Communication Technologies; for organisations such as Nike Inc., Engro Corp., Government of the Punjab, USAID, CIDA, GIZ, SDC, various RSPs and other for-profit and non-for-profit organisations.

Selected Publications:

- Bashir, M. & Sethi, A. (2014). Note on Monitoring and Evaluation Frameworks. Teaching Case No. 30-001-2014-2 at the LUMS Case Research Center.
- Bashir, M. & Sethi, A. (2014). Performance Management at Akhuwat. Teaching Case No. 05-762-2014-1 at the LUMS Case Research Center.
- Bashir, M. (2013). Policy process and public participation in Pakistan. In E. Berman, & M. Sabharwal (Eds.), Public Administration in South Asia. Taylor & Francis.



Title: Monitoring and Evaluation framework for Punjab Vocational Training Council, Lahore

PI: Dr. Mohsin Bashir

Sponsor: Assessment and Strengthening Program (ASP)

Funding Amount: PKR 916,034

Project Initiated in: 2015

Duration: 4 Months

Category: Education

Description: This consultancy developed a comprehensive Monitoring, Evaluation and Reporting (MER) manual for the Punjab Vocational Training Council (PVTVC) to design monitoring, evaluation and reporting systems for the organisation. The manual serves as a Performance Management Plan (PMP) as well as a complete guide to conduct M&E data collection, analysis, assessment and reporting. The organisation was also provided multiple instruments and data analysis databases as part of the MER manual.



Title: Public Service in Pakistan: A Post-Colonial Perspective

PI: Dr. Mohsin Bashir

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 413,000

Project Initiated in: 2014

Duration: 12 Months

Category: Development Management

Description: This project aims to understand the history of the civil service structure in Pakistan and analyse the various factors that currently make the civil service a deterrent in achieving democracy in the country. It also plans to study reforms made to the CSP and to suggest further reforms or actions that can help Pakistan progress

in the modern world. This is intended to be carried out by examining the ICS in detail along with the civil service structures of India and Bangladesh to create a civil service framework that draws on both the positive and negative elements of these systems. Finally, using modern theory on the topic, a new kind of civil service structure is expected to be suggested that caters to the needs of Pakistan.

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Profile: Muhammad Naiman Jalil received PhD in Management from Rotterdam School of Management, Erasmus University, and the Netherlands. His professional experiences and academic publications are in supply chain management and management science domains. Endorsing data driven decision making philosophy, he is interested in applying analytical modelling techniques to solve complex supply chain management issues. Such issues often have conflicting objectives of customer service and operational costs. He has also worked and published in environmentally conscious supply chain management and service parts supply chain management domains.

Recent Publications:

- Sheikh, R. A., Jalil, M. N., & Khan, K. A. (2014b). Software Technology Park: Selecting the Contract Type and Contractor. *Asian Journal of Management Cases*, 11(1), 37–58.
- Sheikh, R. A., Jalil, M. N., & Khan, K. A. (2014a). Software Technology Park: Contract Management. *Asian Journal of Management Cases*, 11(1), 59–66.

Most Cited Publications:

- Dekker, R., Pinçe, Ç, Zuidwijk, R., & Jalil, M. N. (2013). On the use of installed base information for spare parts logistics: A review of ideas and industry practice. *International Journal of Production Economics*, 143(2), 536-545.
- Jalil, M. N., Zuidwijk, R. A., Fleischmann, M., & van Nunen, J. A. (2011). Spare parts logistics and installed base information. *Journal of the operational Research Society*, 62(3), 442-457.



Title: Analysis of Real Estate Historical Demand and Price Data to Establish Price Prediction Model and Observe Historical Trends of Real Estate Market Prices

PI: Dr. Muhammad Naiman Jalil

Co-PI: Dr. Saad Azmat

Sponsor: Zameen Media (Pvt) Ltd.

Funding Amount: PKR 600,000

Project Initiated in: 2014

Duration: 1 Month

Category: Development Management

Description: The project involves analysis of real-estate historical demand and price data to establish price prediction model and observe historical trends of real estate

market prices. In addition, ZAMEEN Media (Pvt) Limited approached LUMS to conduct a survey of target respondents at specified cities and locations, analyse results of the interviews using specific methods and software and to give results in shape of reports/presentations of the surveys.

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Profile: Dr Jajja did his PhD research in the area of supply chain and innovation management. He has presented several research papers at globally esteemed research platforms. During his PhD, he won the Best Student Paper Award at 43rd Annual Meeting of the Decision Sciences Institute (DSI) 2012 in San Francisco USA, Emerging Economy Doctoral Student Award at 23rd Annual Conference of Production and Operations Management Society (POMS) in 2012 in Chicago USA, and Best Graduate Student Paper Award at 40th Annual Meeting of Western Decision Sciences Institute in 2011 in Portland, USA. He received Doctoral Fellowship from Association of Management Development Institutions in South Asia (AMDISA). Dr Jajja has taught graduate as well as under-graduate level courses in the area of operations management, supply chain management, problem solving and modelling, and quantitative research methods.

Selected Publications:

- Supply chain strategy and organisational performance: Role of core operational functions
- Chatha, K. A., & Jajja, M. S. S. Innovation capability and internationalisation performance of SMEs: The role of institutional pressures.
- Shakeel Sadiq Jajja, M., Ali Brah, S., Zahoor Hassan, S., & R. Kannan, V. (2014). An examination of product innovation and buyer-supplier relationship in Pakistani firms. *International Journal of Productivity and Performance Management*, 63(8), 1031-1045.



Title: Factors Affecting Adoption of Social and Environmental Compliance Practices in Suppliers of International Brands in the Developing Countries

PI: Dr. Muhammad Shakeel Sadiq Jajja

Co-PI: Dr. Kamran Ali Chatha

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 780,000

Project Initiated in: 2014

Duration: 12 Months

Category: Operations Management

Description: The purpose of this research is to identify factors (internal and external to a firm) and understand their impact on social and environmental compliance

performance of the export firms in manufacturing sector of Pakistan. Review of relevant literature from the areas of organisation theory, buyer-supplier relationship and social and environmental compliance will lead to the development of a research framework and questionnaire. Research data is expected to be collected from exporting firms in the industrial sectors of textile, surgical and sports goods. Also, data is intended to be collected mainly from Pakistan but can be extended to other South Asian countries, contingent upon linkages identified in those countries. Analysis of data is expected to provide a basis to generate insights regarding factors affecting social and environmental compliance in Pakistan.



Title: Family Constitution of Qadri Group

PI: Dr. Muhammad Shakeel Sadiq Jajja

Sponsor: Qadri Group

Funding Amount: PKR 1000,000

Project Initiated in: 2015

Duration: 3 Months

Category: Development Management

Description: The aim of this consultancy is to provide consultancy in the development of the family constitution. In 2015, Qadri Group (QG), which started as a business concern of two brothers in 1896, is a more than hundred years old family business. QG family has expanded to a size of more than eighty family members owning eight

companies dealing with foundry and steel products in the local and international markets. QG's third generation male members who are currently leading the business want to develop a family constitution to manage QG's family, business, and ownership matters. In this context QG has approached Dr. Shakeel Sadiq Jajja to constitute a family constitution.

Dr. Muhammad Shehryar Shahid

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Profile: Dr. Muhammad Shehryar Shahid is an Assistant Professor of Entrepreneurship at SDSB at LUMS and is also a leading member of the Entrepreneurship Working Group at the university. Dr. Shahid received his PhD from University of Sheffield in 2011, his MBA from Lahore University of Management Sciences in 2006, his bachelor's degree from Ghulam Ishaq Khan Institute of Engineering and Technology in 2003, and his intermediate degree from Aitchison College in 1999. Prior to his appointment at LUMS, he served as the Head of Management and Organisation Division and the Director of Centre for Entrepreneurship and SMEs (CESME) at the University of Central Punjab from 2011 to 2013. He has taught courses like Entrepreneurship, Principles of Management, Business Model Development, Lean Launchpad and SME Management at both undergraduate and postgraduate level. He is also an Editorial Board Member of Journal of Small Business & Entrepreneurship (JSBE) and an Editorial Advisory Board Member of The Lahore Journal of Business (LJB). His research interests lie in the areas of informal entrepreneurship, small business growth and entrepreneurial intentions.

Selected Publications:

- Informal entrepreneurship and institutional theory: explaining the varying degrees of (in) formalization of entrepreneurs in Pakistan
CC Williams, MS Shahid Entrepreneurship & Regional Development 28 (1-2), 1-25 2016
- Determinants of the level of informality of informal micro-enterprises: some evidence from the city of Lahore, Pakistan
CC Williams, MS Shahid, A Martínez World Development 84, 312-325 2016
- Shahid, S. (2013). Informal work by Pakistani immigrants: A multifaceted story. Annual Conference of the international Academy of Business and Economics (IABE), Las Vegas, USA.



Title: Cognitive Determinants of Entrepreneurial Behaviour amongst Students

PI: Dr. Muhammad Shehryar Shahid

Co-PI: Dr. Muhammad Azam Roomi

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 483,000

Project Initiated in: 2014

Duration: 12 Months

Category: Behavioural Studies

Description: The goal of this study is to determine the personal and socio-cultural cognitive factors that have the largest impact on the entrepreneurial intentions of students in the three schools at LUMS. It also seeks to potentially maximise

entrepreneurial behaviour amongst the students. Ultimately, besides academic publications, this study offers a very critical input towards designing and optimising the entrepreneurship education and training programmes at LUMS.



Title: Informal Sector Entrepreneurship: Evaluating the Degrees of (in) formalization of Entrepreneurs in the Automotive Sector of Pakistan

PI: Dr. Muhammad Shehryar Shahid

Co-PI: Prof. Colin Williams (University of Sheffield, UK)

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 500,000

Project Initiated in: 2015

Duration: 12 Months

Category: Behavioural Studies

Description: The aim of this project is to transcend the dualistic portrayal of entrepreneurs as either formal or informal and re-conceptualise entrepreneurs as

existing on a continuum from wholly formal to wholly informal. Given that no known studies have evaluated the degree of formalization of entrepreneurs or the factors influencing their degree of (in)formalization, this project will begin to bridge that knowledge gap in an in-depth study of the automotive sector.

Dr. Saad Azmat
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Profile: Dr. Saad Azmat did his BSC. (Hons) from the University of Hull on a full scholarship. From there, he went on to do MA (Economics), from University of British Columbia (Canada). Thereafter, he did a Ph.D in Accounting and Finance from Monash University (Australia). Dr. Azmat also works as an Assistant Professor at Lahore University of Management Sciences (LUMS) and has taught and trained at a number of institutions around the world as well. Dr Azmat is an active researcher and focuses primarily on fixed income securities, commercial banking, credit risk modeling, value investing and Islamic finance. He has a number of published research articles and conference papers to his credit. In 2011, he was invited as an Organisation of the Islamic Conference (OIC) research scholar to deliver Islamic finance seminars and workshops in Malaysia. In 2012, he was awarded a research grant by Institute of Chartered Accountants Australia (ICAA) for conducting Islamic finance research.

Recent Publications:

- Azmat, S., Ghaffar, H., Azad, A. S. M., & Chazi, A. (2015). Islamic Banking and Asset Price Bubbles. Abdelaziz, Islamic Banking and Asset Price Bubbles.
- Azmat, S., Skully, M., & Brown, K. (2015). Can Islamic banking ever become Islamic? Pacific Basin Finance Journal, 34, 253-272. doi: 10.1016/j.pacfin.2015.03.001

Most Cited Publications:

- Azad, A. S., Azmat, S., Fang, V., & Edirisuriya, P. (2014). Unchecked manipulations, price–volume relationship and market efficiency: Evidence from emerging markets. Research in International Business and Finance, 30, 51-71.
- Azmat, S., Skully, M., & Brown, K. (2014). Issuer's choice of Islamic bond type. Pacific-Basin Finance Journal, 28, 122-135.
- Azmat, S. (2009). Applying North's Laws of Motion to the Edge of the West. Economic Affairs, 29(2), 4-9.



Title: Persuasion by Islamic Banks

PI: Dr. Saad Azmat

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 480,000

Project Initiated in: 2015

Duration: 12 Months

Category: Economic Development

Description: The last decade has seen Islamic banks grow at an impressive rate of 15% per annum. At the same time, there are claims that Islamic banks essentially mimic conventional banking products. It is argued that Islamic banks are employing persuasion techniques, such as renaming interest as profit, to convince their customer

about their Shariah compliance. This study focuses on the different persuasion and marketing strategies of Islamic banks to see how a financial product with conventional features is sold as an Islamic instrument. Following Mullainathan, Schwartzstein, and Shleifer (2008) we build a model of co-categorisation that explains the essence of persuasion in finance. Then we extend this model to Islamic banks to analyse what constitutes a persuasive message. Particularly, the use of Arabic language, sale like attributes, and fatwas by Shariah scholars will be analysed and their impact on the customer's categorisation of banking products as Shariah compliant will be evaluated. Using regression analysis, the effectiveness of these persuasion strategies on the profitability of Islamic banks will be tested.



Title: Establishment of Centre for Islamic Finance - Financial Innovation Challenge Fund (FICF)

PI: Dr. Saad Azmat

Co-PI: Dr. Kamran Ali Chatha, Dr. Muhammad Junaid Ashraf, Dr. Ayesha Bhatti, Mr. Abdul Rauf

Sponsor: State Bank of Pakistan (SBP)

Funding Amount: PKR 52,647,000

Project Initiated in: 2015

Duration: 12 Months

Category: Economic Development

Description: State Bank of Pakistan is managing Financial Innovation Challenge Fund (FICF) under UK-aid funded Financial Inclusion Program (FIP). FICF has been designed to help the financial sector reach the financially excluded with use of innovations. The core objective of the Challenge Round 3 is to promote Islamic Finance to meet the unmet demand for Shariah compliant financial services in Pakistan. This round aims to establish Islamic finance education and research infrastructure in partnership with Lahore University of Management Sciences to serve the Islamic finance industry by meeting its growing human resource and knowledge requirements through quality and value added services and knowledge products.

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Profile: Dr. Samina Quratulain is an Assistant Professor of Organisational Behaviour at LUMS. She received her PhD in 2010 from Aix-Marseille University France. Prior to her appointment at LUMS, she was on the business studies faculty of Lahore College Women University (2001-2005) and University of Central Punjab (2011-2012). Her research interests include social exchange theory, public service motivation, individual cultural orientations, organisational citizenship behaviours and career oriented self-efficacy. Her work has been published in various academic journals including Journal of Organisational Behaviour, Journal of Business and Psychology, Review of Public Personnel Administration and Public Personnel Management. Dr. Quratulain is actively involved in several professional organisations including the Academy of Management and American Society of Public Administration.

Recent Publications:

- Khan, Abdul Karim, Samina Quratulain, and Jonathan R. Crawshaw. "Double Jeopardy: Subordinates' Worldviews and Poor Performance as Predictors of Abusive Supervision." *Journal of Business and Psychology* (2016): 1-14.
- Quratulain, Samina, and Abdul Karim Khan. "Red Tape, Resigned Satisfaction, Public Service Motivation, and Negative Employee Attitudes and Behaviors Testing a Model of Moderated Mediation." *Review of Public Personnel Administration* 35.4 (2015): 307-332.
- Khan, A. K., Quratulain, S., & Bell, C. M. (2014). Episodic envy and counterproductive work behaviors: Is more justice always good? *Journal of Organizational Behavior*, 35(1), 128–144.

Most Cited Publications:

- Khan, A. K., Quratulain, S., & Crawshaw, J. R. (2013). The mediating role of discrete emotions in the relationship between injustice and counterproductive work behaviors: A study in Pakistan. *Journal of business and psychology*, 28(1), 49-61
- Quratulain, S., & Khan, A. K. (2013). Red tape, resigned satisfaction, public service motivation, and negative employee attitudes and behaviors: Testing a model of moderated mediation. *Review of Public Personnel Administration*.



Title: Cultural Frames for Negotiation

PI: Dr. Samina Quratulain

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 520,000

Project Initiated in: 2013

Duration: 12 Months

Category: Behavioural Studies

Description: The research addresses cultural differences by exploring the role of relationship domains and negotiation frames of members of an individualist culture, Canada, and a collectivist culture, Pakistan, in determining negotiation behaviour, preference for outcomes and performance. Specifically, this research explores the

question of whether and under what circumstances members of collectivist cultures negotiate more competitively, prefer to maximise their own gains and even minimise the gains of others and ultimately achieve lower joint gains as compared to the members of individualist cultures.

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Profile: Dr. Ali's research interests include corporate finance, privatisation policy and regulation of utilities. He was working as a Teaching Assistant and a researcher for the International Banking Centre in Manchester. Case studies developed by him have been used at LUMS, Judge Institute of Management, University of Cambridge, and the Manchester Business School. He has published in the Journal of Economics and Business (1993), Financial Director (1993), and Research Newsletter (1995) and has also presented a paper at the EDAMBA Conference at Luven, Belgium, 1994. As part of the LUMS-Essex research collaboration, Dr Ali has worked on financial sector and new financial instrument development in Pakistan. He is also the co-editor of Corporate Finance in Pakistan: Case Studies from an Emerging Market, published by OUP.

Selected Publications:

- Ali, S. M., & Jaffer, S. M. (2005). Fashion Knits Ali's Vision. Asian Journal of Management Cases, 2(1), 69-86.
- Energy Policy in Pakistan: An Investigation of the Tariff Structure of Petroleum Products. CMER Working Paper No. 00-22
- Ali, S. M., Rehabilitation of Women Prisoners in Peshawar Central Jail. LUMS Case Research Centre.
- Ali, S. M., Pakistan at the Millennium: Macro Economic Performance and Prospects. Pakistan 2000. West View Publishers.



Title: Learning Need Assessment of Punjab Skills Development Fund (PSDF)

PI: Dr. Syed Mubashir Ali

Co-PI: Dr. Zehra Waheed

Sponsor: Punjab Skills Development Fund (PSDF)

Funding Amount: PKR 468,000

Project Initiated in: 2014

Duration: 2 Months

Category: Development Management

Description: The purpose is to identify performance requirement, knowledge, skills and abilities needed by PSDF's workforce, both in Bahawalpur and Lahore offices in order to achieve organisational goals. This includes development and administration of

survey questionnaire for training needs assessment; conduct meetings; focus group discussions; interviews and assess gaps in capacity for PSDF employees.

Dr. Syed Zahoor Hassan
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Profile: Dr. Hassan has more than two decades of extensive experience in the higher education sector. At LUMS, he has served in many capacities besides teaching and research, including Associate Dean, Dean, Pro-Vice Chancellor and Vice chancellor (VC) (2002-8). During his six year tenure as VC, LUMS expanded in all dimensions (academic programmes, faculty, schools and infrastructure) and formulated its vision to become a broad-based research university. Launch of the National Outreach Programme (NOP), through which bright students from the under privileged sections of our society are groomed and developed to join LUMS on full financial support, is a key highlight of Dr Hassan's term as VC. Now almost 20% of students at joining BSc at LUMS are from NOP. Dr. Hassan's current research interests include management of technology, innovation and entrepreneurship in the global world. Besides consulting for many leading local companies and international organisations, like UNDP and World Bank, he has also served on the boards of organisations like PTCL and NTDC. He is also actively involved in helping a number of Pakistani and Indian educational institutions improve their systems and processes as a mentor and accreditation peer reviewer.

Recent Publication:

- Saleem, A., & Hassan, S. Z. (2015). US Denim Mills: Quest for Alternative Fuel Sources in the Wake of Energy Crisis (A). Asian Journal of Management Cases, 12(1), 84-101
- Jajja, M. S. S., Brah, S. A., Hassan, S. Z., & Kannan, V. R. (2014). An examination of product innovation and buyer-supplier relationship in Pakistani firms. International Journal of Productivity and Performance Management, 63(8), 1031-1045
- Pakistan: Facing the challenge of science and technology driven entrepreneurial take-off
- Supply Chain Strategy and Organizational Performance: Role of Core Operational Functions. Jajja, M.S.S., Brah, S.A., Hassan, S.Z. International Journal of Services and Operations Management. 03/2014; 1(3):330-349.



Title: Understanding Technology Based Innovation Ecosystem of Pakistan and Impact of Innovation on Performance of Pakistani Organizations

PI: Dr. Syed Zahoor Hassan

Co-PI: Dr. Kamran Ali Chatha

Sponsor: Higher Education Commission (HEC)

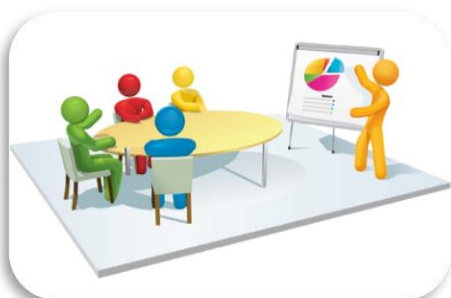
Funding Amount: PKR 3,497,187

Project Initiated in: 2015

Duration: 24 months

Category: Business & Innovation

Description: The first phase of this proposed research will focus on developing case studies of innovative organisations within the five industrial sectors (Engineering, Agriculture, Textile, Chemicals & Pharma as well as IT and Telecom) without constrained by business areas. The second phase of the proposed research will investigate the role of innovations in supply chain management on organizational performance within five industrial sectors. The outcomes of the proposed research will act as a stepping stone to propose future research studies in order to better understand the role of innovation in various other business areas (such as product development and business development) on organizational performance.



Title: Facilitation of the Strategic Plan formulation process at IGI

PI: Dr. Syed Zahoor Hassan

Sponsor: IGI Insurance Limited

Funding Amount: PKR 1,029,569

Project Initiated in: 2015

Duration: 2 Months

Category: Development Management

Description: This consultancy assignment took place in the following stages: all the related documents and reported prepared by IGI was analysed to prepare for the strategic planning sessions and interactions were carried out with the related staff of IGI. Moreover, analysis was carried out to develop preliminary ideas about possible

discussion points during the strategic plan formulation meetings. Lastly, detailed assessment for the strategic plan was prepared by top management of IGI.



Title: Post Session Review and Preparation of short report on new strategic thrust areas for Zarai Taraqati Bank Limited (ZTBL)

PI: Dr. Syed Zahoor Hassan

Sponsor: Zarai Taraqati Bank Limited (ZTBL)

Funding Amount: PKR 1,482,000

Project Initiated in: 2015

Category: Development Management

Description: This consultancy assignment took place in the following stages:

Moderation of the discussions, articulation of the key discussion points, decisions and their implications on the strategic plan of ZTBL, analysis of the overall situation will be carried out to develop preliminary ideas about the possible discussion points

during the strategy sessions and synthesis of the main ideas presented during the strategy sessions to identify revised or new strategic thrust areas and the related implementation implications. Consequently Review and comment on the plan formulated as a result of the strategic planning meetings and detailed analysis of the strategic plan and related implementation approach prepared by the top management of ZTBL in light of the ideas and decisions generated during the strategy sessions.

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Profile: Dr. Zaghun Umar is currently working as an Assistant Professor (Finance) at SDSB, Lahore University of Management Sciences, Pakistan. In addition, he is on the panel of HEC approved PhD supervisors and associated with Network for studies on Pension, Ageing and Retirement (Netspar), The Netherlands, as a research fellow. He received a Phd from School of Management (SOM), University of Groningen, The Netherlands and M.Sc from University of Twente, The Netherlands, with specialization in "Financial Engineering and Management". His broad research interests include Financial Modeling, Empirical analysis, Project Finance, Corporate Finance, Infrastructure Financing, Public Finance, Public Private Partnership, Risk Management, Emerging markets and Strategic Asset Allocation.

Selected Publications:

- "Islamic vs conventional equities in a strategic asset allocation framework". Pacific-Basin Finance Journal.
- "Financing constraints on the size distribution of industrial firms: The Chinese experience" with Qigang Yuan, Yanping Zhao, Hui Shang, Wei Zhang. Applied Economics. March 2016
- "Stocks for the long run? Evidence from emerging markets". Journal of International Money and Finance (JIMF). 47 (2014), Pages 217-238, DOI: 10.1016/j.jimonfin.2014.06.003 with Laura Spierdijk
- "Stocks, Bonds, T-bills and Inflation Hedging: From Great Moderation to Great Recession." Journal of Economics and Business. (2015) 79, 1-37 with Laura Spierdijk
- "Are commodities a good hedge against inflation?" Journal of Investment Strategies. 3.2 – 2014 with Laura Spierdijk
- "How appreciable is the policy of appreciating local currency: The case of Pak Rupee" Journal of International Finance and Economics. (2015) 15, 67-80.



Title: Real Asset and Real returns: The case of Islamic vs conventional equities

PI: Dr. Zaghun Umar

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 580,000

Project Initiated in: 2015

Duration: 12 Months

Category:

Description: The objective of this project is to extend the existing literature by analyzing the portfolio choice problem of an emerging market investor. In particular, the implication of return predictability on the long run and short run asset demand will be

documented.

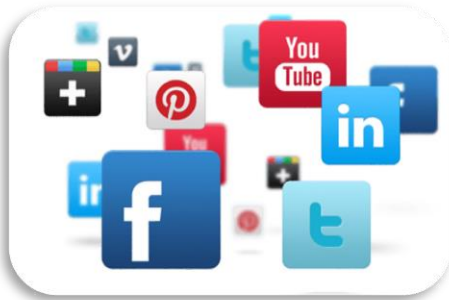
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Profile: Dr. Zain ul Abdin Khawaja is an Assistant Professor at the SDSB at LUMS. He holds a PhD in Media and Communication Studies (2013) and an MA from the FSU School of Communication (2009), attaining Fulbright scholarships for both degrees. He also completed his MBA in Marketing from the Lahore School of Economics in 2007. Dr. Khawaja's research interests include the effects of social media marketing in the development sector in Pakistan.

Selected Publications:

- Zain-ul-abdin, K., & Vahe, M. (2011). Misuse of Media Regulation: The case of the PEMRA ordinance in Pakistan. In IAMCR 2011- Istanbul
- Zain-ul-abdin, K., & Vahe, M. (2011). Effectiveness of Observational Learning as an Alternate to Traditional Instruction in the Online Medium. In World Conference on Educational Multimedia, Hypermedia and Telecommunications (Vol. 2011, No. 1, pp. 1283-1288).
- Zain-Ul-Abdin, K., & Adams, J. (2010, March). The acceptability of online degrees in teacher training and hiring. In Society for Information Technology & Teacher Education International Conference (Vol. 2010, No. 1, pp. 995-1000).
- Zain-Ul-Abdin, K. (2013). Use Of Observational Learning Enhanced Instruction In Low Language Competency Audiences.
- Vahe, M., Zain-Ul-Abdin, K., & Türel, Y. K. (2012). Social Media as a Learning Tool in Medical Education: A Situation Analysis. Virtual Professional Development and Informal Learning via Social Networks, 168



Title: Investigating the Effectiveness of Facebook as a Delivery Channel for Social Marketing Campaigns on Women's Health in Pakistan

PI: Dr. Zain ul Abdin Khawaja

Co-PI: Dr. Mariliis Vahe, Florida State University, United States

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 958,360

Project Initiated in: 2014

Duration: 12 Months

Category: Telecommunications

Description: This project seeks to determine whether or not Facebook is an effective and persuasive channel for delivering social marketing campaigns on women's health

issues in Pakistan and also aims at investigating whether the social pressures that intervene the success of traditional mass media social marketing campaigns continue to do so in the online realm.

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Profile: Dr. Zehra Waheed is the co-ordinator of the BSc Management Science Program at SDSB. Prior to SDSB, Zehra has worked at Heriot-Watt University in Scotland; in Corporate and Institutional Banking and Textile sector in Pakistan; and Retail Banking in the UK. Dr. Zehra's teaching experience spans undergraduate and postgraduate teaching in the areas of Construction Project Management, Facilities and Asset Management, Value and Risk Management and Construction Financial Management at Heriot-Watt University, Scotland. She has taught executive, undergraduate and postgraduate students at SDSB. Her primary teaching areas at SDSB and the Rausing Executive Development Centre (REDC) are Project Management and Public Procurement.

Recent Publications:

- Case Studies in Project, Program and Organisational Project Management Z Waheed, Z Waheed - Facilities, 2016
- Capture and Reuse of Project Knowledge in Construction Z Waheed - Facilities, 2016
- Understanding Project Management: Skills and Insights for Successful Project Delivery Z Waheed, Z Waheed - Facilities, 2016

Most-Cited Publications:

- Building Methodological Bridges Waheed, Z Facilities, Volume 31, Number 3/4
- Facilities Change Management Waheed, Z 2013, Facilities, Volume 31, Number 3/4
- How to Write a Historic Structure Report Waheed, Z 2013, Facilities, Volume 31, Number 1/2
- Managing Complex Projects, Waheed, Z 2012, Facilities, Volume 30, Number 13/14



Title: Building Inclusive and Sustainable Urban Waste Management Systems in Large Urban Centers of the Developing World: A Case of the City of Lahore

PI: Dr. Zehra Waheed

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 675,000

Project Initiated in: 2015

Category: Environment

Description: This study is intended to be an exploratory case study of the city's waste landscape: a lens through which the evolution of desired systems, governance processes and organizational development (in this case, the Lahore Waste Management Company) will be viewed. It is also meant to be a vehicle of culturally

interpreting the city's need for waste, its historical handling of its excrement and the various narratives that define the city's inhabitants', including the industry's, approach towards waste. Whilst the results will map current waste management practice in the city, the development of its infrastructure and identify future challenges of solid waste management in Lahore, they will also unveil the implications of current practice on the sustainable development of the second largest city of the country and the role that local industry can play in waste reduction and disposal.



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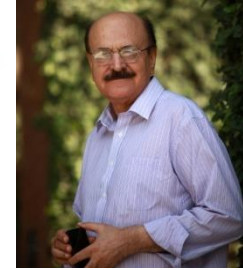




DEPARTMENT OF ECONOMICS

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Profile: Dr. Abid Aman Burki is a Professor of Economics at the Lahore University of Management Sciences (LUMS). He was also the Director of the Centre for Management and Economic Research of LUMS from 2003 to 2010. Dr. Burki received his PhD in Economics from Kansas State University. Prior to his appointment at LUMS, he was on the economics faculty of Quaid-i-Azam University (1985-2002) and most recently as Professor and Head of the Economics Department. He serves on several high-level committees and taskforces of the government. His research interests lie in the areas of applied microeconomics; development economics; and production economics. He has also taught courses at Kansas State University and is a referee for numerous academic journals. He has authored or co-authored more than 70 articles, book chapters and professional reports and has supervised three PhD, 18 MPhil and 28 Master's theses. In recognition of his services he was conferred the President of Pakistan's academic distinction award Izaz-i-Fazeelat in 2001.

Recent Publications:

- Ahmad, Shabbir, and Abid A. Burki. "Banking deregulation and allocative efficiency in Pakistan." *Applied Economics* 48.13 (2016): 1182-1196.
- Burki, A. A., Memon, R., & MIR, K. (2015). Multiple Inequalities and Policies to mitigate inequality traps in Pakistan. *Oxfam Research Report*.
- Burki, Abid A., Mushtaq A. Khan, and Sobia Malik. "From chronic disease to food poverty: evidence from Pakistan." *Pakistan Development Review* 54.1 (2015): 17.
- Burki, A. A., & Khan, M. A. (2011). Formal participation in a milk supply chain and technical inefficiency of smallholder dairy farms in Pakistan. *Pakistan Development Review*, 50(1), 63-81.

Most Cited Publications:

- Burki, A. A., & Terrell, D. (1998). Measuring production efficiency of small firms in Pakistan. *World Development*, 26(1), 155-169.
- Burki, A. A., & Niazi, G. S. K. (2003). The Effects of Privatisation, Competition and Regulation on Banking Efficiency in Pakistan, 1991–2000. In *Regulatory Impact Assessment: Strengthening Regulation Policy and Practice*, Chancellors Conference Centre, University of Manchester, Manchester, UK.



Title: Impact Assessment of Microfinance in Pakistan

PI: Dr. Abid Aman Burki

Co-PI: Dr. Syed Muhammad Hussain, Dr. Rashid Memon and Dr. Ghazal Mir Zulfiqar

Sponsor: Pakistan Microfinance Network (PMN)

Funding Amount: PKR 36,052,500

Project Initiated in: 2015

Duration: 36 Months

Category: Economic Development

Description: Microfinance in Pakistan has come of age as a financial industry, with three million active microcredit clients, nearly six million savers and more than three million micro insurance policy holders. This study on microfinance seeks to estimate

the impact of microcredit on (1) consumption expenditure; (2) asset creation; (3) employment generation or number of jobs created; (4) schooling of children and (5) gender empowerment.



Title: Economics of Milk Production in Pakistan & the Role of UHT Milk Processing Industry

PI: Dr. Abid Aman Burki

Co-PI: Dr. Mushtaq Ahmad Khan

Sponsor: Tetra Pak

Funding Amount: PKR 9,545,000

Project Initiated in: 2014

Duration: 22 Months

Category: Economic Development

Description: In this project, Dr. Abid Aman Burki examines the statement of the problem method of analysis, data sources and structure of the report. The analysis in the study

is based on published data, e.g. livestock census, Pakistan Economic Survey and Agricultural Statistics of Pakistan. Dr. Abid Aman Burki addresses various subjects in the study including Economics of Agriculture related to Dairy farming, Economics of Nutrition: Calcium and Milk, Milk Processing Industry and Productivity Growth in Non-Corporate Farms and Economics of Modern Dairy Farming. Conclusions and recommendations are provided for the future.



Title: Multiple Inequalities & Exclusion by Challenging Existing Development Paradigm

PI: Dr. Abid Aman Burki

Co-PI: Dr. Khalid Mir and Dr. Rashid Memon

Sponsor: Oxfam International, Pakistan

Funding Amount: PKR 2,000,000

Project Initiated in: 2014

Duration: 8 Months

Category: Law & Policy

Description: Oxfam Pakistan approached LUMS to prepare Pakistan country report on multiple inequalities and exclusion by challenging "existing development paradigm."

The main objective of this study is to highlight the nature and dimensions of inequality in Pakistan, to identify inequality traps that tend to exacerbate multi-dimensional inequality and to suggest policies that can help mitigate multidimensional inequality.



Title: Out of School-Children (OOSC) Survey and Study in Gilgit Baltistan (GB) and Azad Jammu Kashmir (AJK)

PI: Dr. Abid Aman Burki

Co-PI: Prof. Mohammad Usman Khan

Sponsor: United Nations International Children's Emergency Fund (UNICEF)

Funding Amount: PKR 19,229,100

Project Initiated in: 2014

External Collaboration: Pakistan Bureau of Statistic

Duration: 22 Months

Category: Education

Description: The purpose of this assignment is to conduct OOSC study on AJK and GB,

in partnership with the concerned education ministries/departments. The objectives of the survey include gathering relevant data on OOSC in GB and AJK. The survey also identifies pockets of OOSC at district level aimed at developing powerful and focused policy tools to address the issues.



Title: Pakistan Database & Productivity Measurement at the Industry Level

PI: Dr. Abid Aman Burki

Co-PI: Dr. Mushtaq Ahmad Khan and Dr. Syed Muhammad Hussain

Sponsor: International Growth Centre (IGC)

Funding Amount: PKR 3,386,422

Project Initiated in: 2014

Duration: 12 Months

Category: Economic Development

Description: The World KLEMS initiative promotes a gradual build-up of industry level database on outputs, inputs and productivity across countries. Based on a growth accounting framework, this new database is comparable across countries due to its

consistent definitions, methodology, classifications and standards. This study has the objective of creating Pakistan KLEMS data at the national and industry level on the pattern of EU KLEMS database. It includes growth in output, growth in input and derived measures of total factor productivity.



Title: Pakistan KLEMS Database & Productivity Measurement at the Industry Level

PI: Dr. Abid Aman Burki

Co-PI: Dr. Mushtaq Ahmad Khan and Dr. Syed Muhammad Hussain

Sponsor: International Food Policy Research Institute (IFPRI)

Funding Amount: PKR 2,457,000

Project Initiated in: 2014

Duration: 20 Months

Category: Economic Development

Description: The study aims at creating an internationally comparable Pakistan KLEMS data at the national and industry level on the pattern of EU KLEMS database. It will include growth in output, growth in inputs and derived measures of total factor

productivity. The data will be generated for 31 industries from 1980 to 2010. Also, combining this data with other sources will help in evaluating various policies such as tax policy, monetary policy, industrial policy, trade liberalisation policy and many more. The data will be useful to federal and provincial governments, the State Bank of Pakistan, Pakistan Statistical Bureau and the academic community in general.



Title: Tax Compliance and Measures to Counter Tax Evasion in Pakistan: Sector Analysis for Cement, Sugar, Steel, Paper and Paper Board

PI: Dr. Abid Aman Burki

Co-PI: Dr. Mushtaq Ahmad Khan and Dr. Syed Muhammad Hussain

Sponsor: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Funding Amount: 6,289,000

Project Initiated in: 2014

Duration: 5 Months

Category: Law & Policy

Description: The analysis helps in benchmarking ratios relevant for tax audit purposes, identification of loopholes in an intra-sector wise comparison and fine tuning of audit

activities in this regard. Furthermore, the sector analysis helps in identifying the relative contributions of sectors to tax revenues compared to their share in Gross Domestic Product (GDP). This assignment is contributed to capacity development of FBR officer (for each sector) dedicated for this task.



Title: Consumer Preferences for Sales and Service Operations

PI: Dr. Abid Aman Burki

Sponsor: Indus Motor Company (IMC)

Funding Amount: PKR 5,200,000

Project Initiated in: 2013 - 2014 - 2015

Duration: 6 Months

Category: Operations Management

Description: The Indus Motor Company (IMC) is the assembler, manufacturer and marketer of Toyota vehicles in all over Pakistan. Dr. Abid Aman Burki has been serving Indus Motor Company with his consultancy services in different phases from last four years. The objective of the initiative is to generate a primary data resource that could

be used to analyse consumer behaviour for automobile demand in Pakistan and to construct a comprehensive ranking of its 3S dealership based on their sales and service operations. As IMC wanted to commission a customer satisfaction study based on the feedback and survey of new car buyers and owners, it approached LUMS to conduct the survey of target respondents at specified cities and locations and analyse the results of interviews using specific methods and software, giving results in the shape of reports/presentations of two surveys.



Title: Farmer's capabilities, productivity, and profitability: A case study of smallholders in selected agro zones in Pakistan

PI: Dr. Abid Aman Burki

Co-PI: Prof. Shabbir Ahmad - University of Queensland

Sponsor: University of Queensland, Australian Centre for International Agricultural Research (ACIAR)

Funding Amount: PKR 1,047,150

Project Initiated in: 2015

Duration: 6 Months

Category: Economic Development

Description: The improvement in farmer's capabilities to enhance farm productivity is

part of a national priority to raise the living standard of the population and reduce poverty. This research project aims to influence policy by identifying intervention strategies that policy makers could use to support small farmers and create wealth in the agricultural sector.



Title: Access to Education and Social Cohesion in Conflict-Ridden Areas (SCR): End-line Study and Review of Outcome 4 Activities

PI: Dr. Abid Aman Burki

Co-PI: Syed Muhammad Hussain, Rashid Memon

Sponsor: United Nations International Children's Emergency Fund (UNICEF)

Funding Amount: PKR 8,415,700

Project Initiated in: 2015

Duration: 6 Months

Category: Economic Development

Description: UNICEF Pakistan launched the four-year SCR Programme in 2012 in conflict-affected districts within the provinces of Balochistan, Punjab, Khyber

Pakhtunkhwa (KP), and Sindh. SCR is a four-year initiative that aims to strengthen social cohesion and resilience through education in vulnerable contexts, including contexts at risk of or experiencing and recovering from # instability. Towards this end, the programme will strengthen policies and practices in education for social cohesion and resilience. The programme builds on the theory of change that when delivered equitably and effectively, education can strengthen the resilience of children and communities, reduce risk of recruitment and indoctrination by armed actors, and limit the loss of human capital while sustaining longer-term opportunities for children and youth for civic engagement and entering the labour market. The UNICEF SCR program aims to contribute towards individual and community capacity building which is being achieved through helping students, parents, teachers and other community members to cope with instability and promoting social cohesion among them.



Title: Boosting FDI Inflows to Pakistan: What Can Policy Makers Do?

PI: Dr. Abid Aman Burki

Co-PI: Dr. Syed Muhammad Hussain

Sponsor: Japan International Cooperation Agency (JICA)

Funding Amount: PKR 2,835,000

Project Initiated in: 2015

Duration: 6 Months

Category: Economic Development

Description: The aim of this Project is to conduct a rigorous quantitative exercise to find out the most effective methodology to attract FDIs in Pakistan and will attempt to find out the optimal balance between investment incentives and tax revenue. We will

explore the relationship between changes in corporate tax structure, FDI inflows, and corporate tax revenues in Pakistan. In the process, we will identify the key factors that influence these practices and will identify the barriers to implement them. Finally, we will also provide recommendations on how to implement these policies.

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Profile: Hadia Majid joined LUMS as an Assistant Professor in August 2012. A Fulbright Scholar, she holds a PhD in Development Economics from The Ohio State University, an MA in Economics from The Ohio State University, an MSc in Economics from the University of Warwick, and a BSc in Economics from Lahore University of Management Sciences. Her research interests include aspects that relate to the economic characteristics of the household, including parental decision-making and human capital acquisition. Her previous work has looked at CCT evaluations at the intra-household level, factors that affect parental investment in child education, female bargaining power in rural Pakistan, and agricultural taxation in Pakistan. On-going research includes impact evaluation of climate change on health industry.

Recent Publications:

- Majid, H., & Mukhtar, N. (2015). Pakistan-India Trade: An Analysis of the Health Sector. In India-Pakistan Trade (pp. 273-309). Springer India.
- Cluster Based Industrialization and its Effect on Firm Productivity in Pakistan MA Khan, H Majid, A Riaz, MS Awan
- Hassan, F. S., Javaid, K., & Majid, H. (2015). Pakistan-India bilateral trade in sports goods sector India-Pakistan Trade: Strengthening Economic Relations (pp. 245-272).
- Drought and Farm Output: An Analysis of Common-Pool Water and the Role of Ethnic Fractionalization in Rural Pakistan H Majid



Title: Female labour supply and the escape from poverty: new evidence from household data

PI: Hadia Majid

Co-PI: Professor Andy McKay -University of Sussex

Sponsor: Economic and Social Research Council (ESRC)

Funding Amount: PKR 6,048,384

Project Initiated in: 2015

Duration: 24 Months

External Collaborator: University of Sussex

Category: Development Management

Description: The focus of this project is on different aspects of labour supply and how their evolution over a 20-30 year time period; This research study by Dr. Hadia Majid will consider participation, hours, nature of work (wage or self-employment, within or outside the household, sector, occupation etc.), and adoption of productivity enhancing measures. The project will disaggregate by household type according to many criteria (geographic, socioeconomic status, household size and composition etc.). The survey data will be examined in detail, using a cohort approach, the associations between increased or changing female labour supply and poverty reduction, which has taken place in all countries, controlling for many other correlates. The focus is on examining the transition of female work from a buffering role to a longer term income generating role. This can shed light on the institutional and policy factors that facilitate the transition.



Title: Electricity and Rural Development: Insights from a Natural Experiment in Punjab, Pakistan

PI: Dr. Hadia Majid

Co-PI: Dr. Lauge Skovgaard Poulsen, University College London and Dr. Mahvish Shami, London School of Economics and Political Science

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 780,963

Project Initiated in: 2015

Duration: 12 Months

Category: Economic Development

Description: The paper starts from the fact that load-shedding has made many farmers who were previously dependent on groundwater for their water supply shift to much more expensive diesel-powered tube wells. The analysis in this paper will assess the implications of this increase in input costs for agricultural production caused by the electricity crisis. For the dependent variables, the paper will focus not only on agricultural output, as earlier studies, but also crop- choice, where it is expected that electricity shortages have reduced cultivation of water-intensive crops such as rice, sugarcane, and cotton - resulting in inefficient crop decisions.



Title: Urban Transportation, Labour Markets and Access to Economic Opportunity: Evidence from Lahore's Bus Rapid Transit System

PI: Dr. Hadia Majid

Co-PI: Dr. Ammar Anees Malik

Sponsor: International Food Policy Research Institute (IFPRI)

Funding Amount: PKR 2,949,000

Project Initiated in: 2014

Duration: 20 Months

Category: Development Management

Description: This project assesses the impact of the Lahore Rapid Bus Transit system on labour market outcomes in Lahore metropolitan area. By using primary data-

sources that detail the current Metrobus use based upon a quasi-experimental design as well as secondary data sources that detail public transport usage before the inauguration of the Metrobus, the researcher plans to use econometric techniques to isolate the causal impact of the Metrobus on labour market outcomes.



Title: Urban Transportation, Labour Markets and Access to Economic Opportunity: Evidence from Lahore's Bus Rapid Transit System

PI: Dr. Hadia Majid

Co-PI: Dr. Ammar Anees Malik and Dr. Katherine Vyborny

Sponsor: International Growth Centre (IGC)

Funding Amount: PKR 11,731,198

Project Initiated in: 2014

Duration: 25 Months

External Collaboration: Gallup PakistanDuke University

Category: Development Management

Description: This research seeks to quantify the causal impact of a reduction in transit

cost and time due to an investment in public transport infrastructure on labour market outcomes and human capital acquisition. The study also identifies a more comparable control group than used in previous literature: areas which were slated for potential routes but have not yet received them yet. Using quasi-experimental difference-in-difference approach, in which the treatment group will be areas within a short distance of Metrobus stations, while the control group will be identified on the basis of lines which have been planned but have not yet been built. Answers to these questions will provide evidence-based insights for policymaking in Pakistan's high priority policy area of urban transportation infrastructure.



Title: Study on Individual Indigenous Philanthropy in Pakistan

PI: Dr. Hadia Majid

Co-PI: Dr. Husnain Fateh Ahmed

Sponsor: Pakistan Centre for Philanthropy (PCP)

Funding Amount: PKR 1,500,000

Project Initiated in: 2015

Duration: 4 Months

Category: Development Management

Description: PCP works with a vision to increase the volume and effectiveness of indigenous philanthropy for social development in Pakistan. Instead of getting into direct service delivery mode or receiving grants, PCP seeks to promote altruistic efforts

of national and international philanthropists by establishing effective linkages between the grant maker and non-profit organizations.

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Profile: Husnain Fateh Ahmed is an Assistant Professor of Economics at the Lahore University of Management Sciences. His research interests fall under the umbrella of microeconomic theory and industrial organisation. Ahmad has applied behavioural game theory to study the phenomenon of over bidding in since joining LUMS, his interests have expanded, and he has been conducting exploratory work the areas of maternal health and the interaction of identity and economic behaviour. The common theme to his research, is his interest in identifying and rationalising seemingly irrational behaviour. Other than research and teaching, he is an amateur photographer and an avid badminton and table tennis player.

Recent Publications:

- Endogenous price expectations as reference points in auctions HF Ahmad Journal of Economic Behavior & Organization 112, 46-63 2015
- Essays on auctions and Bayesian games with endogenous expectations HF Ahmad University of Iowa 2014
- Ahmad, H. F. (2015). Endogenous price expectations as reference points in auctions. Journal of Economic Behavior and Organization, 112, 46-63.



Title: Urban Informal Livelihood Study

PI: Dr. Husnain Fateh Ahmed

Primary Sponsor: HomeNet

Secondary Sponsor: Oxfam International, Pakistan

Funding Amount: PKR 201,960

Project Initiated in: 2015

Duration: 2 Months

Category: Development Management

Description: The overall purpose of conducting this study is to support Oxfam Pakistan and the Urban Institute in accessing available baseline information (both quantitative and qualitative) on the nature of challenges and conditions that informal wage workers

in the domestic work sector face in urban Pakistan. Dr. Husnain was required to provide support for designing and finalising the focus group instrument, conducting the focus groups, and analysing the response of focus group members.

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Profile: Dr. Imtiaz ul haq is an Assistant Professor of Economics at the Lahore University of Management Sciences. He completed his PhD in Finance from the Manchester Business School, University of Manchester (UK). He also holds an MSc in Finance from the Manchester Business School and a BSc (Hons) in Economics from LUMS. His research interests are Corporate Finance, Financial Intermediaries, Private Equity Investments and Capital Markets. His doctoral research focused on investor behaviour in the mutual fund industry in the U.S. and U.K, particularly on investor fund-selection ability, investor behaviour over economic cycles and investor reactions to mutual fund name changes. More recently, Dr. Imtiaz has looked at herding in venture capital investments and their effect on economic productivity.

Research Interests:

His research interests are Corporate Finance, Financial Intermediaries, Private Equity Investments and Capital Markets. His doctoral research focused on investor behavior in the mutual fund industry in the U.S. and U.K, particularly on investor fund-selection ability, investor behavior over economic cycles and investor reactions to mutual fund name changes. More recently, Imtiaz has looked at herding in venture capital investments and their effect on economic productivity.



Title: Coordinated Development of Manufacturing Industry with Particular Reference to Building Production Network in South Asia

PI: Dr. Imtiaz ul Haq

Co-PI: Dr. Farah Shahid Hassan

Sponsor: South Asia Center for Policy Studies (SACEPS)

Funding Amount: PKR 786,400

External Collaboration: Syed Babar Ali Foundation

Project Initiated in: 2014

Duration: 6 Months

Category: Development Management

Description: This report explores the potential of coordinated production in manufacturing industries across South Asia. It seeks to identify the factors restricting the formation of such regional production networks despite the 1995 SAARC trading agreements. The need for such a report arises from the fact that this region has lagged behind other trade blocs in moving towards true economic integration. Such coordination can open not only an access to wider markets, but also facilitate the distribution of the production process across countries to take the advantage of varying competitive advantages.

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Profile: Dr. Munir has a PhD in Strategy and Policy from McGill University, Canada. Most recently Dr. Munir was a Professor of Strategy and Policy at Cambridge Judge Business School and Director of the Centre of Markets, Organizations and Society. He has also been the Professor of Strategy at the Suleman Dawood School of Business. Dr. Munir's research focuses on economic sociology, social change and stability as well as innovation and technological shifts in society. His research also spans economic policy and the competitive advantage of nations. Dr. Munir has published several articles in leading organizational and technology journals, including the Academy of Management Journal, Journal of Management Studies, Organization Studies and Research Policy and presented his work at numerous international conferences.

Selected Publications:

- Networking and innovation: a systematic review of the evidence L Pittaway, M Robertson, K Munir, D Denyer, A Neely International Journal of Management Reviews 5 (3-4), 137-168
- The birth of the 'Kodak Moment': Institutional entrepreneurship and the adoption of new technologies KA Munir, N Phillips Organization studies 26 (11), 1665-1687 2005
- A dark side of institutional entrepreneurship: Soccer balls, child labour and postcolonial impoverishment FR Khan, KA Munir, H Willmott Organization Studies 28 (7), 1055-1077 2007
- The social construction of events: A study of institutional change in the photographic field KA Munir Organization Studies 26 (1), 93-112 2005



Title: Saida Waheed Gender Studies Initiative

PI: Dr. Kamal Ahmad Munir

Sponsor: Descendants of Late Begum Saida Waheed

Funding Amount: PKR 20,000,000

Project Initiated in: 2015

Duration: 60 Months

Category: Education

Description: The Fund is established for funding research and practical initiatives relating to Gender Studies at LUMS. The income derived from the investment of the Fund can be applied to support research, training and education, and preferably interdisciplinary projects which are related to the area of Gender Studies and to maintain a

focal person for the Initiative, to support deserving and high achieving students in undergraduate programs of LUMS who might be interested in working on projects related to Gender Studies, Engage in practical initiatives related to Gender Studies and Engage with civil society organizations to generate and disseminate insights into Gender relations and associated subjects.

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Profile: Dr. Kashif Zaheer Malik is an Assistant Professor of Economics at LUMS. He is a Fulbright Scholar and has a Masters and PhD degree in Economics from Florida State University. His area of research ranges from empirical macroeconomics, theoretical macroeconomics and Industrial Organisation. Dr. Malik has conducted various quantitative researches in multiple areas: Trade, Industry and Microfinance. He has consulted for Barclays Bank and Coca-Cola Beverages Pakistan Limited and has also been involved with the International Growth Centre (IGC). He is currently working on a Randomised Evaluation of Micro-Venture Capital. The project aims to study the impact of introducing Sharia compliant micro financing in collaboration with Akhuwat. Dr. Kashif has recently concluded a project that measures the Economic Impact of Coca-Cola Beverages Pakistan Limited (CCBPL). The study employs input-output model and Social Accounting Matrix to measure income and employment effects of CCBPL on the economy. Previously, Kashif has conducted two research studies for IGC, one focusing on the industrial clusters in Punjab and the other focusing on the garment sector. Both projects involved extensive field work and data analysis. His research articles are published in Economic Modelling and Lahore journal of Economics.

Recent Publications:

- Malik, K. Z., Ali, S. Z., & Khalid, A. M. (2014). Intangible capital in a real business cycle model. *Economic Modelling*, 39, 32-48.
- Hussain, S. T., Khan, U., Malik, K. Z., & Faheem, A. (2012). Constraints faced by industry in Punjab, Pakistan (No. id: 5090).
- Malik, K. Z. (2011). Essays on Productivity, Labor Allocations and Intangible Capital. *Electronic Theses, Treatises and Dissertations*. Paper 5012.



Title: Encouraging Entrepreneurship: A Randomised Evaluation of Micro-Venture Capital - An Initial Assessment

PI: Dr. Kashif Zaheer Malik

Co-PI: Dr. Faisal Bari, Dr. Hammad Siddiqui and Dr. Imtiaz ul Haq

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 780,000

Project Initiated in: 2014

Duration: 12 Months

Category: Business & Innovation

Description: The main contribution of this study is to conduct initial assessment to introduce equity based micro-financing (micro-venture capital or Sharia compliant

micro financing) at a much lower level. The long-run objective is to conduct field experiments based on Randomized Controlled Trails (RCT) by offering Modarba micro-finance of up to Rs. 300,000/- to existing clients of Akhuwat (Akhuwat is a microfinance institution operating in Pakistan. It gives out small interest free loans). Since Akhuwat brings together different models, as compared to conventional micro-finance, the spirit of volunteerism and the tradition of giving, which is a cardinal principle of all religions as well as having better knowledge about clients greatly enhances the commitment of clients to abide by the rules of business. The findings of this innovative field experiment may have far reaching consequences and are likely to be of significant interest to policy makers, academia and microfinance professionals.



Title: Equity-based Financing for Microenterprise in Pakistan

PI: Dr. Kashif Zaheer Malik

Sponsor: LUMS Faculty Initiative Fund (FIF)

Co-PI: Dr. Faisal Bari, Prof. Simon Quinn, Prof. Muhammad Meki

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Category: Business & Innovation

Description: The main objectives of this research are to design a new equity-based microfinance product and to test its impact on growth of small enterprises, using a field experiment, To test the understanding of and demand for this new equity-based contract by local male and female entrepreneurs; and To test for heterogeneous effects

by key characteristics of the participants namely their gender, the type of enterprise, their business and managerial skills, as well as behavioural characteristics (such as time and risk preferences).



Title: An analysis of economic and social impacts of mechanization of brick-kiln in Punjab.

PI: Dr. Kashif Zaheer Malik

Sponsor: The Global Fund to End Slavery

Co-PI: Dr. Syed M. Hassan

Funding Amount: PKR 1,392,858

Project Initiated in: 2015

Duration: 4 Months

Category: Economic Development

Description: The overall objective of this project is to assess the economic benefits and the economic and social impacts of targeted brick kiln mechanization in Punjab. In

addition, one of the objectives of the study is to investigate the impact of targeted mechanization on the bonded labor. Furthermore, the study will also compare economic structure and labour arrangements of representative, traditionally operated brick-kiln in Punjab with partly-mechanized brick-kiln to explore a case for adopting new technologies.



Title: Creating and Utilizing Comic Books to Bridge Knowledge Gaps in Child Health in Rural Okara, Punjab

PI: Dr. Kashif Zaheer Malik

Primary Sponsor: Health and Nutrition Innovation Fund (HANIF)

Secondary Sponsor: Department for International Development (DfID)

Co-PI: Dr. Spenta Kaklia

Funding Amount: PKR 5,017,166

Project Initiated in: 2015

Duration: 10 Months

Category: Nutrition

Description: The proposed project will address the four areas of childhood illness that

contribute to mortality in children under the age of 5 years in Pakistan. The under-five mortality rate in Pakistan is 87 per 1000 live births, one of the highest in the world. Dr Zaheer's suggested innovation is to create comic books addressing the gaps in maternal knowledge in these four areas of children's health. The comics will be designed with graphics and wording that is culturally appropriate to a rural Punjabi setting. Printing half the comics with only graphics, and no written script will appeal to most of the women in the area, especially to those with limited reading ability. The overall goal of the project is to improve maternal knowledge, especially amongst women of child bearing age, addressing the main causes of childhood mortality in Pakistan amongst children less than five years of age.

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Profile: Dr. Muhammad Usman Khan started his professional career in banking and investment consulting in London, UK. In the UK, he advised large institutional clients on financial matters including financial strategy, asset allocation, manager selection and corporate governance. After spending 6 years in investment industry in the UK, he moved to Pakistan where he joined Lahore University of Management Sciences (LUMS) as a faculty in the Economics Department. He has been lecturing at LUMS since 2006 and has headed the Development Policy Research Centre (DPRC) at LUMS for two years. He won research studies over US\$1,000,000 in the inception stage of the centre. His work in Bangladesh comprised of trade analysis within the SAARC region while his work in Nigeria involved working with the State Government of Kano to design a development strategy aiming improvement in key sector value chains mainly agriculture and enhance the role of the private sector. He has also worked with Indian Council for Research and International Economic Relations (ICRIER) on normalising Pakistan India trade. Dr. Khan's research interests include policy and strategy in development sector.

Recent Publications:

- Situation Analysis of Women & Children in Pakistan
- Global Initiative on Out of School Children, Pakistan Report
- SME Credit Policy: Case Study of Fan Cluster
- Constraints to Industrial Sector in the Punjab
- Nazish Afraz, Syed Turab Hussain, Usman Khan (2013), "Barriers to Growth of Small Firms In Pakistan: A Qualitative Assessment of Selected Light Engineering Industries", IGC Working Paper.



Title: Advocacy to Strengthen Demand for Economic Reforms

PI: Mr. Mohammad Usman Khan

Co-PI: Dr. Abid Aman Burki

Sponsor: Adam Smith International (ASI)

Funding Amount: PKR 6,253,200

Project Initiated in: 2015

Duration: 8 Months

Category: Economic Development

Description: This project involves estimation of OOSC table and statistics based on the 5D methodology developed by UNICEF. Various data sets and templates were developed to engage in active dialogue with UIS to obtain accuracy of calculations and to conduct various meetings and presentations to develop the OOSC report for Pakistan and provincial level.



Title: Punjab Economic Report (2014-15): A Comprehensive Profile on Socioeconomic Development

PI: Mr. Mohammad Usman Khan

Co-PI: Dr. Abid Aman Burki

Sponsor: UN Women

Funding Amount: PKR 8,100,000

Project Initiated in: 2015

Duration: 12 months

Category: Economic Development

Description: This project is divided into key chapters covering overall economy, its performance and reflection on various strata of society and providing a compendium of economic profiling of the Punjab; socio economic and poverty profiling; sectoral profiling, issues and key public sector programmes; public sector financial management issues, policies and reforms; mega projects and their assessment and a host of policy options.

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Profile: Dr. Farooq Naseer joined the Department of Economics at LUMS in September 2006. His research interests lie in the field of development economics and political economy including microeconomic analysis of institutions and their role in the face of information problems. His dissertation work has looked at community-based organisations in the Philippines as well as the pricing structure in the sugarcane markets in Pakistan. In the current academic year, Farooq is teaching econometrics in the undergraduate program along with an econometric theory course for the Masters students. A former LUMS graduate, he continues to enjoy the work environment here.

Selected Publications:

- Naseer, M. F., M. Patnam & R. Raza. (2010). transforming public schools: impact of the CRI programme on child learning in Pakistan. *Economics of Education Review*. 29, 669-683.
- Cheema, A., & Naseer, F. (2010). Poverty, Mobility and Institutions in Rural Sargodha: Evidence for Social Protection Reform. Report submitted to the Planning and Development Department (P&DD) of the Government of Punjab.
- Cheema, A., Naqvi, A. A., Naseer, F., & Siddiqi, B. (2012). Land Rights and Long-Run Development: Evidence from Pakistan.
- Cheema, A., Khwaja, A. I., Naseer, F., & Shapiro, J. N. (2014). Center for International Development.



Title: Partnerships for Management: A study of the Adopt-a-School program in Sindh and Punjab

PI: Muhammad Farooq Naseer

Sponsor: Institute of Development and Economic Alternatives (IDEAS)

Funding Amount: PKR 621,600

Project Initiated in: 2014

Duration: 5 months

Category: Education

Description: Dr. Farooq Naseer provided consultancy services to the IDEAS for this project which was related to partnerships for management in Sindh and Punjab.

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Profile: Dr. Rashid's work focuses on the causes and consequences of ethnic and gender inequality in economic outcomes. He is also interested in the economic history of the Indian sub-continent with a particular focus on land tenure arrangements and peasant rebellions.

Selected Publication:

- Memon, R. (2005). Determinants and Trends of Internal Migration in Pakistan. Internal Labour Migration in Pakistan. Institute of Developing Economies, Japan External Trade Organisation, Chiba, Japan.
- Determinants and Trends of Internal Migration in Pakistan Rashid Memon 2005



Title: Ethnic Violence and Labour Unrest in Pakistan

PI: Dr. Rashid Memon

Co-PI: Dr. Mushtaq Ahmad Khan

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 269,000

Project Initiated in: 2014

Duration: 12 Months

Category: Behavioural Studies

Description: This research is intended to construct a data set that documents the incidence of different kinds of violence in a given district in a given year. Existing data on violence, collected by Dr. Shapiro of Princeton and Dr. Rasul Bakhsh Rais of LUMS

appears to underestimate the incidence of violence because it focuses on a national newspaper (DAWN), which might not report incidences in small towns and villages. Under this research, a hypothesis that local newspapers carry more information by focusing on 4 districts, two in Sindh and two in Punjab, is expected to be tested. Research Assistants are expected to be hired to search through these newspapers and create a data base of incidents. After that, a comparison is intended to be made with the Shapiro-Rais data set to see if the approach is indeed useful.



Title: Urbanisation/Migration Nexus project (UM-Np) in South Asia

PI: Dr. Rashid Memon

Sponsor: London School of Economics and Political Science (LSE)

Funding Amount: PKR 2,681,059

Project Initiated in: 2014

Duration: 16 Months

Category: Economic Development

Description: The main research question of this study is: How exactly is investment in urban construction (in the five south Asian countries) and its concurrent demand for labour giving rise to new and varied temporal forms of migration? The mapping exercise is designed to give us a better understanding of the construction

industry/sector in Pakistan and to narrow down the fieldwork sites for the project. The findings from the mapping exercise helps to identify the precise sites where fieldwork takes place.



Title: UNU-WIDER Project on Disadvantaged Groups and Social Mobility

PI: Dr. Rashid Memon

Sponsor: United Nations University (UNU)

Co-PI: Dr. Hadia Majid

Funding Amount: PKR 627,930

Project Initiated in: 2015

Duration: 8 Months

Category: Economic Development

Description: This research initiative, supported under UNU-WIDER's 2014-2018 research programme, addresses the measurement of horizontal inequalities in developing countries². It focuses on inequalities among ethnic, racial, religious, and

communal groups³. This work is an integral part of a larger research effort on the politics of group-based inequalities, which considers causes, correlates, and possibilities for change. The project aims to build a comprehensive picture of variation in such group-based inequalities across countries at the national level, as well sub-nationally and diachronically for a selected set of developing countries.

Dr. S.M. Turab Hussain
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Profile: Dr. Turab Hussain's research interests have ranged from migration theory and policy, poverty and rural development to trade and development. His recently published research is based on industrial policy, migration and remittances, prospects of trade with India and on Pakistan's experience at dispute settlement within the WTO. His teaching interests include Development Theory, International Trade, Macroeconomics and Trade and Development.

Selected Publications:

- Burki, A. A., & Hussain, S. T. (2007). Opportunities and Risks of Liberalising Trade in Services in Pakistan, ICTSD.
- Industrial Policy, its Spatial Aspects and Cluster development in Pakistan, Vol I and II, policy and report prepared for the Ministry of Industries and Production, Government of Pakistan. Hussain. S.M. Turab, A. Burki, K. Munir, M. Khan, U. Khan, A. Faheem and A. Khalid. Dec. 2010
- Hussain, S. T., & Ishfaq, M. (1998). Dynamics of agricultural productivity and poverty in Pakistan. The Lahore Journal of Economics. 3(1).



Title: Pakistan-India Trade in Agriculture

PI: Dr. S.M. Turab Hussain

Co-PI: Mr. Mohammad Usman Khan

Sponsor: South Asia Network of Economic Research Institutes (SANEI)

Funding Amount: PKR 987,900

Project Initiated in: 2014

Duration: 4 Months

Category: Trade

Description: The Key objective of the study is to deepen the understanding of issues revolving around agriculture trade between Pakistan and India. These are expected to be assessed in the light of Pakistan's intent of granting Non-Discriminatory Access

(NDA) to India in the near future. Based on the analysis and findings, the paper is expected to put forward policy recommendations which would inform both the agricultural sector and the government in formulating a strategy for trade in agriculture with India.

Dr. Syed Ali Hasanain
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Profile: Dr. Ali Hasanain is a 2014-2016 Oxford-Princeton Global Leaders Fellow, and an Assistant Professor of Economics at LUMS, as well as a member of EGAP. His recent research has studied how Information and Communications Technology (ICT) can be applied in underdeveloped countries to improve governance and market outcomes. He has also studied how individuals' personal characteristics mediate the success of this process. Ali also serves on the Government of Punjab's Economic Advisory Committee. He received his PhD in Economics from George Mason University in 2010.

Recent Publications:

- The political economy of public employee absence: Experimental evidence from Pakistan MJ Callen, S Gulzar, SA Hasanain, MY Khan
- Callen, M., Gulzar, S., Hasanain, A., Khan, Y., & Rezaee, A. (2015). Personalities and Public Sector Performance: Evidence from a Health Experiment in Pakistan (No. w21180). National Bureau of Economic Research.

Most Cited Publications:

- Callen, M. J., Gulzar, S., Hasanain, A., & Khan, M. Y. (2013). The political economy of public employee absence: Experimental evidence from Pakistan. Available at SSRN 2316245.
- Callen, M., & Hasanain, A. (2011). The Punjab model of proactive governance: empowering citizens through information communication technology. University of California, San Diego.



Title: Quality Testing to Address a Market for Lemons in Pakistan

PI: Dr. Syed Ali Hasanain

Co-PI: Dr. Arman Rezaee-University of California, San Diego and Dr. Yasir Khan-International Growth Center

Sponsor: Center for Economic Policy Research

Funding Amount: PKR 1,483,622

Project Initiated in: 2015

Duration: 18 months

Category: Behavioural Studies

Description: In this project, the plan is to first document that there is a lemons market for untreated milk in Lahore, Pakistan, due to informal, self-employed milkmen having

asymmetric information about their milk's quality. Secondly, the study will outline the partial and general equilibrium impacts on milkmen, consumers, and the market as a whole of a simple and cost-effective policy intervention that will provide consumers with credible, real-time milk quality information. Third, it will examine whether milk quality information along one dimension might be supplanted by quality information along a different one (i.e., the watering down of milk versus the addition of harmful adulterants).



Title: Coordinating Farmers with Cell phones: Technology Innovation in Livestock Extension Services in Pakistan

PI: Dr. Syed Ali Hasanain

Sponsor: University of California, San Diego

Funding Amount: PKR 2,910,663

Project Initiated in: 2014

Duration: 6 Months

Collaborator: University of California

Category: Agriculture

Description: The aim of the study is to understand whether farmers adopt the use of information about better veterinary quality. These programs seek to reduce corruption

and improve service delivery using cellular technologies. Dr. Ali Hasanain specialises in the study of service delivery and corruption in underdeveloped countries and agriculture policy.



DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

Dr. Ali Khan
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Profile: Dr. Ali Khan is an Associate Professor of Anthropology and Department Chair at the Department of Humanities & Social Sciences at LUMS. He has an MPhil and a PhD in Social Anthropology from the University of Cambridge in England. Dr. Khan's research interests vary from labour issues, particularly child and bonded labour to popular culture in Pakistan focusing mainly on cinema and sports. Ali Khan's book 'Representing Children: Power, Policy and the Discourse on Child Labour in the Football Manufacturing Industry of Pakistan' was published in October 2007 by Oxford University Press. He is also the General Editor for a series of books on Sociology and Anthropology in Pakistan.

Selected Publications:

- Khan, A. (2014). Pakistani Film Poster Art. Bioscope: South Asian Screen Studies, 5(2), 183-190
- Khan, A. Discourses on Childhood: Policy-making with regard to Child Labor in the Context of Competing Cultural and Economic Perceptions in History and Anthropology. 21(2), Taylor and Francis.
- Khan, A. (2010). Peshgi without bondage: Reconsidering the links between debt and bonded labour. Cultural Dynamics, 22(3), 247-266.



Title: Growth of Islamic Religiosity in Pakistan: Manifestations and Impact

PI: Dr. Ali Khan

Co-PI: Dr. Laila Bushra

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 838,000

Project Initiated in: 2014

Duration: 12 Months

Category: Behavioural Studies

Description: The rising influence of Islam in the Pakistani state and in wider society has been the topic of much academic and journalistic debate, especially in the last decade.

The project aims to contribute to this debate by taking an approach that is both focused and holistic regarding the role of Islam in Pakistan. The project investigates the growth of Islamic religiosity in Pakistan in four specific sectors or arenas of activity: the influence of religious affiliation and practice on the dynamics of the national cricket team over the last decade; the political and electoral trajectory of Islamist political parties since the 1950s; the rise of an Islamist media and civic organisations structure since the 1970s; and the rise of mob violence or targeted attacks by radical Islamist organisations against minority communities (Christians and Shias) over the last three decades.

Dr. Ali Nobil Ahmad
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Profile: Ali Nobil Ahmad is teaching courses in modern comparative history, historiography, cinema and world history at LUMS. His current research interests include journalism, cinema and the media in Pakistan. He has worked as a Research Officer at the Migration Research Unit at University College London, and published articles and chapters on gender, sexuality and migrant labour; his monograph, 'Masculinity, Sexuality and Illegal migration' was published by Ashgate in October 2011. He received his PhD, an inter-disciplinary comparative study of gender and human smuggling from Pakistan to Europe, from the Department of History at the European University Institute in Florence in 2008. He trained as a historian at UCL where he did his BA and MA. In 2009 he was awarded the Scott Trust bursary for journalism and received training at The Guardian and Goldsmiths College in London, where he completed a Masters in Journalism and contributed to various journalistic publications including The Guardian. A former editorial board member of the journal Third Text, in 2010 he edited a special issue on Cinema and the Muslim World. He was co-curator of 'Winds of Change: Cinema from Muslim Societies', a festival of films and talks at the Institute of Contemporary Arts in 2011.

Recent Publications:

- Ahmad, A. N. (2014). Film and Cinephilia in Pakistan: Beyond Life and Death. BioScope: South Asian Screen Studies, 5(2), 81-98. doi: 10.1177/0974927614548646
- Ahmad, A. N., & Anjum, S. (2014). Independent Filmmaking in Pakistan: An Interview with Sabiha Sumar. BioScope: South Asian Screen Studies, 5(2), 153-162. doi: 10.1177/0974927614550756.
- Askari, M. H., & Ahmad, A. N. (2014). Color in Film: Why and to What End? BioScope: South Asian Screen Studies, 5(2), 167-173. doi: 10.1177/0974927614547988
- Pakistan en Italia: Los escencantos del vivir transaccional Ahmad, Ali Nobil Revista CIDOB Afers, Issue 92 Barcelona: CIDOB



Title: The Politics of Resources in Pakistan's Peripheries

PI: Dr. Ali Nobil Ahmad

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 827,000

Project Initiated in: 2015

Duration: 12 Months

Category: Development Management

Description: The objective of this project is to generate a large data set of qualitative research; an absolute minimum of 20 interviews in three separate field sites of study within Pakistan that will serve as the basis of three academic articles relating to the politics of natural resources. Given the input of diverse perspectives such as policy

makers, state officials, business interests and civil society, the data set will include diverse perspectives and serve as a useful basis for developing a new research and teaching field for the study of Pakistan. More broadly, the objective is to deepen and diversify discussions on Pakistani politics beyond the narrow confines of Islam/secularism, democracy and dictatorship and civil-military relations (as understood by Washington and Islamabad-based security analysts).

Dr. Ali Raza

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Profile: Dr. Ali Raza is an Assistant Professor of Economics at LUMS. He obtained a DPhil in Modern South Asian History from St. Antony's College, University of Oxford, England. His Thesis was based on Interrogating Provincial Politics: The Leftist Movement in Punjab. Prior to that, he graduated with a distinction in Masters in African/Asian History from the School of Oriental and African Studies, University of London, England and Bachelors of Science (Honors) with a major in Computer Science; minor in Social Sciences from Lahore University of Management Sciences. Prior to joining LUMS, he worked as a postdoctoral researcher at the Zentrum Moderner Orient in Berlin. His research interests include the histories of leftist internationalism and fascism in South Asia. He teaches courses related to colonialism, decolonization, and modern South Asia.

Selected Publications:

- Raza, A., & Roy, F. (2015). Paramilitary Organisations in Interwar India. *South Asia: Journal of South Asian Studies*, 38(4), 671-689.
- 'Separating the Wheat from the Chaff: Meerut and the Creation of Official Communism in India.' *Comparative Studies of South Asia, Africa, and the Middle East* (December 2014)
- 'An Unfulfilled Dream: The Left in Pakistan ca. 1917-50,' *South Asian History and Culture*, Vol.4 No. 4 (October 2013)
- 'Looking towards Moscow: The Ghadar Party's Engagement with Communism,' in J.S. Grewal, Harish K. Puri and Indu Banga (eds.), *Ghadar Movement: Background, Ideology, Action and Legacies* (University of Punjab Press, June 2013)



Title: Bards, Minstrels, and Outcastes: Oral Narratives and Subordinate Histories

PI: Dr. Ali Raza

Co-PI: Prof. Ishtiaq Ahmed

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Education

Description: This project is an attempt in archiving the narratives of subordinate and marginalised groups who have, by and large, been neglected in dominant historiography. The eventual aim is to establish a repository of digitised archival

materials at LUMS. Aside from being an invaluable resource to researchers, this archive will also be an important first step in working towards a 'people's history' of Pakistan, the historiography of which has largely tended to privilege the narratives of elite groups.

Dr. Ali Usman Qasmi
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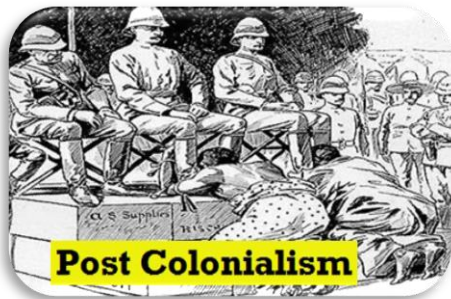
Profile: Dr. Ali Usman Qasmi is Assistant Professor (History) at the School of Humanities, Social Sciences and Law since January 2012. He received his PhD from the South Asia Institute of Heidelberg University in 2009. Before joining LUMS, he was a Newton Fellow for Post Doctoral research at Royal Holloway College, University of London. He has published extensively in reputed academic journals such as Modern Asian Studies, The Muslim World and The Oxford Journal of Islamic Studies. He is the author of Questioning the Authority of the Past: The Ahl al-Qur'an Movements in the Punjab (Karachi: Oxford University Press, 2011) and The Ahmadis and the Politics of Religious Exclusion in Pakistan (London/New York: Anthem Press, 2014). Besides these, he is the co-editor of Revisioning Iqbal as a Poet and Muslim Political Thinker (Heidelberg: Draupadi, 2010; Karachi: Oxford University Press, 2011) and The Shi'a in Modern South Asia: Religion, History and Politics (New Delhi: Cambridge University Press, 2015). Dr. Qasmi was recently awarded the Karachi Literary Festival Peace Prize for his book on Ahmadis.

Recent Publications:

- Jones, J., & Qasmi, A. U. (Eds.). (2015). The Shi 'a in Modern South Asia: Religion, History and Politics. Cambridge University Press.
- Qasmi, A. U. (2015). The Ahmadis and the Politics of Religious Exclusion in Pakistan. Anthem Press.
- Ansari, S., Jones, J., & Qasmi, A. U. (2014). Special issue isna 'ashari and isma'ili shi'ism: From south Asia to the indian ocean. Journal of the Royal Asiatic Society, 24(3), 351. doi: 10.1017/s1356186314000340

Most Cited Publications:

- Qasmi, A. U. (2010). God's Kingdom on Earth? Politics of Islam in Pakistan, 1947–1969. Modern Asian Studies, 44(06), 1197-1253.



Title: Problematising Citizenship in a Postcolonial Nation-State: A Case Study of Pakistan

PI: Dr. Ali Usman Qasmi

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2014

Duration: 12 Months

Category: Development Management

Description: This research aims to de-centre the concept of citizenship from its European settings and argue for a more nuanced understanding that is cognizant of regional political, social, economic and cultural variations in which it emerged and is practiced in the non-Western world. Thus, the project proposes an

interdisciplinary/multi-cultural investigation of the notion of citizenship across time and space. It draws upon theoretical insights from diverse fields such as history, political theory, religious studies, sociology, and postcolonial theory. Apart from its conceptual contributions towards an alternative understanding of the concept of citizenship, the project also explores the contestations of Islam with the idea of nation-state in a postcolonial setting. This requires a study of the interaction between the state and civil society, exploration of debates on nation and nationalism, and influences from transnational religious organisations and ideologues in shaping the contours of debate on such issues in Muslim societies.

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Profile: Basit Koshul received his first PhD in 2003 from Drew University, specialising in the sociology of religion. He joined the School of Humanities, Social Sciences and Law at LUMS in 2006. His areas of interests include the relationship between religion and modernity, philosophy of science, philosophy of religion, the sociology of culture and the contemporary Islam-West encounter. He is especially interested in integrating the ideas of Muhammad Iqbal, Charles Peirce and Max Weber. He completed his second PhD in 2011 from the University of Virginia. The title of his dissertation was Max Weber, Charles Peirce and the Integration of the Natur and Geisteswissenschaften. The dissertation begins with an integration of Max Weber's methodology of the social sciences and the philosophy of Charles Sanders Peirce. It goes on to show that the conversation between Weber and Peirce opens up the possibility of the conceptual integration of science, philosophy and religion.

He has a number of publications to his credit, including a book titled *The Postmodern Significance of Max Weber's Legacy: Disenchanted Disenchantment* (Palgrave, 2005). He has co-edited a collection of essays titled *Scripture, Reason and the Contemporary Islam-West Encounter: Studying the Other, Understanding the Self* (Palgrave, 2007). He has also co-edited a collection of essays titled *Muhammad Iqbal: A Contemporary* (Iqbal Academy, 2010).

Selected Publications:

- Akhtar, J., Awais, M. M., & Koshul, B. B. (2013). Putting Peirce's theory to the test: Peircean evolutionary algorithms. *Transactions of the Charles S Peirce Society*, 49(2), 203-237
- Akhtar, J., Awais, M. M., & Koshul, B. B. (2013). An evolutionary algorithm derived from Charles Sanders Peirce's theory of universal evolution. Paper presented at the GECCO 2013 - Proceedings of the 2013 Genetic and Evolutionary Computation Conference Companion.
- Akhtar, J., Koshul, B. B., & Awais, M. M. (2013). A framework for evolutionary algorithms based on Charles Sanders Peirce's evolutionary semiotics. *Information Sciences*, 236, 93-108.
- Khan, F. R., & Koshul, B. B. (2011). Lenin in Allah's court: Iqbal's critique of Western capitalism and the opening up of the postcolonial imagination in critical management studies. *Organization*, 18(3), 303-322



Title: Dr. Islamic Analytic Theology Project Phase 1: Building Foundational Analytic Resources

PI: Basit Bilal Koshul

Sponsor: Kalam Reserach and Media

Funding Amount: PKR 1,054,250

Project Initiated in: 2015

Duration: 2 Months

Category: Development Management

Description: Kalam, mantiq, philosophy, and jurisprudence have been important elements in the classical Muslim intellectual traditions. This conference will explore the contribution that modern Pakistani thinkers have made in these areas. The conference will especially focus on the attempts of kalamists, logicians, philosophers and legal

thinkers to maintain links with the classical tradition as they internet with and respond to modern developments. Another important aspect of the inquiry will be to explore the relevance (or perhaps irrelevance) that the ideas of these thinkers in the 21st century.

Dr. Furrukh A. Khan
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Profile: Dr. Furrukh Khan has been with LUMS since 2001. He has a PhD in Postcolonial Studies from University of Kent at Canterbury, where he taught for two years prior to coming to LUMS. He has also taught English as a Foreign Language in the UK during the summers. His research interests include the Partition of India, Postcolonial Literature, Shakespeare and Oral History. His publications have appeared among others in Index on Censorship, AngloFiles and The International Journal of Punjab Studies as well as a chapter in The Novels of Bapsi Sidhwa and in Gender, Conflict and Migration. He was hosted by The Center for the Study of Developing Societies in Delhi as the ASIA Fellow, funded by a grant from the Asian Scholarship Foundation in 2006. He was selected as the British Academy/ESRC Visiting Fellow from South Asia and the Middle East and affiliated with University of Manchester in 2007. Dr. Furrukh has also directed Stories of the Broken Self, a documentary on the Pakistani women's narratives of the 1947 Partition.

Selected Publications:

- Khan, F. A. (2006). Speaking violence: Pakistani women's narratives of partition. Gender, conflict and migration, 97-115.
- Khan, F. A. (2006). Empowerment through Representation: Aurat Foundation's Initiative in Local Governance. Managing NGOs in Developing Countries Vol. III: Gender Challenges. Karachi: Oxford University Press, 33-53.
- Khan, F. A. (1997). Of Victims and Villains: Representation of Muslims in Khushwant Singh's Train to Pakistan and Chaman Nahal's Azadi. The International Journal of Punjab Studies. 4(2), 181-200.
- Khan, F. A. (1996). Crossing Imaginary Boundaries: Partition And Temporal Post-Colonial Identities in Bapsi Sidhwa's Ice-Candy-Man. 99, 21-33.



Title: The Walton Refugee Camp Project
PI: Dr. Furrukh A. Khan
Co-PI: Dr. Anne Christine Hubbard
Sponsor: LUMS Faculty Initiative Fund (FIF)
Funding Amount: PKR 340,500
Project Initiated in: 2015
Duration: 12 Months
Category: Development Management

Description: The Walton Refugee Camp Project aims at studying, documenting and analysing the impact and legacy of the Walton Camp. It is done in active collaboration with the University of St. Andrews, UK. Walton Camp was set up in Lahore in 1947 to

cater for the refugees arriving from India. It became an extraordinarily important place, the lieu de passage and main entry point into Pakistan for hundreds of thousands of newcomers and hence the project aims to identify the key agencies concerned with immediate relief granting and to determine the lifespan of their activities in relation to the Camp. Moreover, it also seeks to identify the key agencies involved in facilitating and resettling the refugees and to analyse the refugees' itineraries to and from the Camp.



Title: Training for Capacity Building under USAID
PI: Dr. Furrukh A. Khan
Sponsor: Zeus Consulting
Funding Amount: PKR 160,000
Project Initiated in: 2016
Duration: 4 Months
Category: Development Management

Description: Zeus Consulting' has been tasked with developing two Research Centers for U.S Agency for International Development USAID Projects at HBPRC and CAPRIL, for which Dr. Furrukh A. Khan, has been appointed as one of the consultants. Under this consultancy, Dr. Furrukh A. Khan, is responsible for assisting in delivering research

materials prepared to the Research Center at both HBPRC and CAPRIL, contribution in guiding and answering questions of center members and officials in research methods over the period of 4 face to face engagements, as scheduled by Zeus Consulting.

Dr. Hasan H. Karrar
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Profile: Dr. Hasan is an assistant professor of History, specialising in modern Chinese, Central Asian history and political economy. His current research is focused on informal connections across the greater Central Asian region (inclusive of western China and northern Pakistan) since the 1980s. More broadly, his work engages with globalisation and transnationalism in Eurasia, transformations in Central Asian borderlands, foreign relations, twentieth century international history, and war and society. His earlier research, on the development of Sino-Central Asian relations, appeared as *The New Silk Road Diplomacy: China's Central Asian Foreign Policy since the Cold War* (Vancouver: University of British Columbia Press, 2009). At LUMS, he has been teaching East Asian and Central Asian history and politics, the Cold War, world history, and ecology.

Selected Publications:

- Nabil Ahmad, A., & Karrar, H. H. (2015). Capitalism, Nature, and Socialism in South Asia: Perspectives on Ecology from India and Pakistan. *Capitalism, Nature, Socialism*, 26(3), 48-63. doi: 10.1080/10455752.2015.1067633
- Karrar, H. H., & Ahmad, A. N. (2015). Capitalism Nature Socialism: Introduction. *Capitalism, Nature, Socialism*, 26(3), 44-47. doi: 10.1080/10455752.2015.1067632
- Karrar, H. H. (2015). Return of the Dragon: Rising China and Regional Security. *Pacific Affairs*, 88(1), 171-173.
- Karrar, H. H. (2013). Merchants, Markets, and the State. *Critical Asian Studies*, 45(3), 459-480.



Title: Markets, Merchants and the State: An Exploration of the Informal Mechanism between Sino-Central Asian and Sino-Pakistan Trade

PI: Dr. Hasan H. Karrar

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2014

Duration: 12 Months

Category: Trade

Description: This research is part of an ongoing inquiry into how, since the Cold War state-led development of market mechanisms in China's Xinjiang Uighur Autonomous Region (XUAR) has transformed societal and market structures in the countries on its

western periphery. This research seeks to understand formal and informal trade, the relationship between them (does informal trade always require Formal trade?) and how this commerce is changing societal structures (increased mobility, new occupational opportunities, decline in traditional vocations, negotiating the state) and market structures (entrepreneurship and agency, wholesale markets for import and re-export; the emergence of Asia's largest bazaars in a post-Soviet space).

Dr. Nadhra Shahbaz Naeem Khan
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Profile: Dr. Nadhra Khan's primary area of research and interest is 19th Century Sikh Art and Architectural Ornament in the Punjab, but she also focuses on Mughal Art and Architecture (16th to 18th century). Her work emphasizes the significance of the Sikh period as the last episode of centuries old indigenous art and architectural tradition before annexation of the Punjab by the British in 1849 that changed, among other things, the visual culture of the Punjab forever. A research project that started with one Sikh funerary monument or samadhi built to honor Maharaja Ranjit Singh has led her to study almost all major monuments dateable to this period, including the Golden Temple Amritsar, Sikh period havelis and various other samadhis. Her current research includes the impact of Sikh architectural vocabulary on subsequent British Raj architecture in the Punjab and the deep impact of British art and craft education on traditional art and craft practices.

Selected Publications:

- "Posthumous Homage Paid to Maharaja Ranjit Singh," in *Jamal: A Journal of Aesthetics*, Vol. 1, No. 1 (2012): 65-74. Shahbaz Naeem Khan, Nadhra 2012
- "Carved Doors of the Gateway to Maharaja Ranjit Singh's Samadhi" Published in *Sikh Arts & Heritage*, Sikh Arts Forum, August 4, 2011 Shahbaz Naeem Khan, Nadhra 2011
- Frescoes at Maharaja Ranjit Singh's Samadhi Shahbaz Naeem Khan, *Nadhra MARG* Vol. 61, No. 4 (June 2010): 72-85.
- The Secular Sikh Maharaja and his Muslim Wife: Rani Gul Bahar Begum in *Indian Painting: Themes, Histories, Interpretations (Essays in Honour of B. N. Goswamy)*, eds. Mahesh Sharma and Padma Kaimal (Ahmedabad: Mapin, 2013): 247-254. Shahbaz Naeem Khan, Nadhra, Ahmedabad: Mapin, 2013



Title: Documentation, Presentation and Promotion of Picture Wall, Lahore Fort

PI: Dr. Nadhra Shahbaz Naeem Khan

Sponsor: Aga Khan Cultural Service - Pakistan (AKCS-P)

Funding Amount: PKR 700,000

Project Initiated in: 2016

Duration: 2 Months

Category: History & Art

Description: The consultancy services shall meet the following requirements; Photographic documentation of the northern part of the picture wall not included in AKCSP's current documentation work, Inventorying of all panels and, if necessary, establishing a panel nomenclature system which will supplement AKTC identifiers of

each panel in its respective section of the picture wall. For this purpose, Dr. Nadhra will establish a Classification of decorative elements and themes assigning a title to each individual motif and theme Building up an archive of published and other data on the Picture Wall and translate any epigraphy on the picture wall and its associate architectural elements such as the Hati Pol gate, and of other relevant texts into English, relating them with other epigraphic material and historic references from the Lahore Fort and elsewhere.

Dr. Nida Yasmeen Kirmani
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Profile: Dr. Nida Kirmani completed her PhD in Sociology in 2007 from the University of Manchester. Since then, she has been working as a Research Fellow with the Religions and Development Research Programme at the University of Birmingham. Dr. Nida has been an Assistant Professor of Sociology at LUMS since January 2011.

Selected Publications:

- Kirmani, N. (2015). Fear and the City. *Journal of the Economic and Social History of the Orient*, 58(5), 732-755.
- Kirmani, N. (2013). Treading a dangerous path? The use of Islam in women's rights advocacy *Alternative Islamic Discourses and Religious Authority* (pp. 179-198).
- Kirmani, N. (2013). Contentious encounters: A comparison of developments in the contemporary Indian and Pakistani women's movements' relationships with Islam. *Religion, Gender, and the Public Sphere*: 197-207.
- Kirmani, N. (2013). Claiming their space: Muslim women-led networks and the women's movement in India. *Journal of International Women's Studies*, 11(1), 72-85.



Title: Understanding the Impact of Urban Conflict on Everyday Lives: Narratives of Insecurity and Marginalisation in Lyari

PI: Dr. Nida Yasmeen Kirmani

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 500,000

Project Initiated in: 2014

Duration: 12 Months

Category: Behavioural Studies

Description: This research project explores the multiple discourses of marginalisation narrated by Lyari's residents, focusing in particular on those neighbourhoods that are populated largely by Baloch communities and in which the 'gangsters' affiliated with the

banned People's Aman Committee (PAC) maintain their hold. The research highlights the diverse ways in which this process of marginalisation is framed, narrated and experienced by residents depending on their age, class, and ethnic background. Furthermore, it places these narratives within the wider socio-political context of Karachi, where the fear of violence increasingly permeates all areas of the city, although this ubiquitous sentiment of insecurity takes different shapes from one residential community to another.



Title: Understanding the Causes and Consequences of Urban Conflict in Lyari, Karachi

PI: Dr. Nida Yasmeen Kirmani

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 605,000

Project Initiated in: 2015

Duration: 12 Months

Category: Behavioural Studies

Description: The current proposal builds on previous research, which explores the multiple discourses of marginalization and insecurity narrated by Lyari's residents, focusing in particular on those neighbourhoods that are populated largely by Baloch communities. The research highlights the diverse ways in which this process of

marginalisation is framed, explained and experienced by residents depending on their age, class, and ethnic background. Furthermore, it places these narratives within the wider socio-political context of Karachi, where the fear of violence increasingly permeates all areas of the city.

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Profile: Dr. Rasul Bakhsh Rais is Professor of Political Science in the Department of Humanities and Social Sciences, LUMS, Lahore since 2002. He took time off from LUMS and served at the Institute of Strategic Studies, Islamabad from August 2013 to December 2014. Dr. Rais has Ph.D. in Political Science from University of California, Santa Barbara. Before joining LUMS, he remained associated with the Quaid-i-Azam University, Islamabad for nearly 22 years as Professor/Director, Area Study Centre and prior to that as Associate Professor in the Department of International Relations. He was Quaid-i-Azam Distinguished Professor of Pakistan Studies at Columbia University, New York for 3 years, 1991-94. He took Fulbright fellowship at Wake Forest University, Winston-SaleF, 1997-98, Social Science Research Fellowship at Harvard, 1989-90, Rockefeller Foundation fellowship in International Relations at the University of California, Berkeley, in 1985-85. He is author of Recovering the Frontier State: War, Ethnicity and State in Afghanistan (Lanham: Lexington Books, 2008), War Without Winners: Afghanistan's Uncertain Transition after the Cold War (Karachi: Oxford University Press, 1996), Indian Ocean and the Superpowers: Economic, Political and Strategic Perspectives (London: Croom Helm, 1986), editor of State, Society and Democratic Change in Pakistan (Karachi: Oxford University Press, 1997) and with Charles H. Kennedy, Pakistan 1995 (Boulder: Westview Press, 1996) He has published widely in professional journals on political and security issues pertaining to South Asia, Indian Ocean and Afghanistan. His current research interests are: "Modernism, State and Challenge of Radical Islam in Pakistan".

Recent Publication:

- Rais, R. B. (2015). Pakistan's Strategic Culture and Deterrence Stability on the Subcontinent. Deterrence Instability, 95.

Most Cited Publications:

- Rais, Rasul Bakhsh. (1993). Afghanistan and the regional powers. Asian Survey, 905-922.
- Rais, R. B. (1994). War without winners: Afghanistan's Uncertain Transition after the Cold war. Oxford University Press, USA.



Title: HEC Distinguished National Professor program - Dr. Rasul Bakhsh Rais

PI: Dr. Rasul Bakhsh Rais

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 1,200,000

Project Initiated in: 2015

Duration: 24 months

Category: Education

Description: Dr. Rasul Bakhsh Rais has been selected as a Distinguished National Professor, a programme launched by The Higher Education Commission known as "HEC Distinguished National Professors" programme in order to use the services of outstanding senior Professors and Scientists in Universities and R&D Organisations

with the objective of acknowledging their services.



Title: Junior Fellowship in Peace and Conflict Studies

PI: Dr. Rasul Bakhsh Rais

Sponsor: United States Institute of Peace (USIP)

Funding Amount: PKR 4,310,188

Project Initiated in: 2016

Duration: 12 months

Category: Education

Description: The aim of the fellowship is to groom and train young scholars in the field of Peace and Conflict Studies and promote innovative, empirical research and fresh approaches to the study of conflicts and peace building. The Department of Humanities and Social Sciences at LUMS will invite research proposals in the fields of new

approaches to Peace and Conflict in Pakistan, Contemporary Conflicts in furrukPakistan and Contemporary Conflicts in Pakistan, Peace Building and Conflict Resolution.

Dr. Sadaf Ahmad
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Profile: Sadaf Ahmad completed her Ph.D in Cultural Anthropology from Syracuse University in the United States in 2006, and has Masters Degrees in Gender, Anthropology and Development from Goldsmiths College, the University of London (2001), and in Psychology, from the National Institute of Psychology, Quaid-e-Azam University (2000). Gender has been a cross cutting theme in all of her research to date - whether it has been exploring the extent to which university students believe in rape myths and understanding the awkward relationship development organizations have had with the issue of gender based violence in her M.A. dissertations, or understanding how its techniques of expansion and pedagogies of persuasion have allowed Al-Huda, an Islamic school for women established in Islamabad in the early 1990s, to turn into a social movement in her doctoral dissertation. Her book, Transforming Faith, is based on her doctoral research, and was published by the Syracuse University Press in the fall of 2009. Her edited book Pakistani Women: Multiple Locations and Competing Narratives, a collection of works done on women in Pakistan was published by the Oxford University Press in 2010. She spent a year teaching at the Hobart and William Smith Colleges in upstate New York in 2005-06, and covered courses such as Gender and Islam, Women and Fundamentalism, and Introduction to Islam, while the courses she has taught at LUMS include Introduction to Cultural Anthropology, Anthropology of Islam, Gender and Power, Food and Culture, and Qualitative Research Methods.

Recent Publication:

- Al-Huda and Womenâ€™s Religious Authority in Urban Pakistan. The Muslim World, Vol 103(3):363-74. Ahmad, Sadaf 2013
- Identity Matters, Culture Wars: An Account of Al-Huda (re)-defining Identity and Reconfiguring Culture in Pakistan Ahmad, Sadaf Religion and Culture, 9(1): 63-80. 2008.
- AASHAs Approach to Institute Sexual Harassment Legislation in Pakistan. In New South Asian Feminisms: Paradoxes and Possibilities. Srila Roy (ed.) Ahmad, Sadaf London: Zed Books. 2012



Title: Pakistani Police Women-An Ethnography

PI: Dr. Sadaf Ahmad

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 691,500

Project Initiated in: 2015

Duration: 12 months

Category: Behavioural Studies

Description: This ethnographic research project aims to use interviews and participant observation to understand women's experience of working in the police force and the meaning doing so has for them. More specifically, it aims to explore and understand the diverse ways in which women's experiences (e.g. working with colleagues, the

public) may be influenced by a combination of factors that may include gender, age, rank, geographical location, class, caste, ethnicity, etc. As such, it will situate and understand women's experiences—as understood through direct observation and their personal narratives—in the larger context of the socio-political structures and ideologies which permeate both their specific locality and the larger region. This research also aims to understand what impact working in an occupation that has been traditionally associated with men and 'manly' characteristics' (but which may also be associated with other themes) has had on police women along a range of axes that include but are not limited to their personal life, policing style, identity, etc.

Dr. Waqar Zaidi
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Profile: Dr. Waqar Zaidi is an Assistant Professor of History at the Department of Humanities & Social Sciences at LUMS. He has an MSc and PhD in the History of Science, Technology and Medicine from Imperial College London. Dr. Waqar's current research interests include early Cold War discourses on atomic energy and the atomic bomb, and internationalist movements in the early Cold War period. More broadly, he is interested in the relationship(s) between technology and international relations in the twentieth century.

Selected Publications:

- Zaidi, W. H. (2011). Aviation Will either Destroy or Save Our Civilisation. Proposals for the International Control of Aviation, 1920-45. *Journal of Contemporary History*. 46(1), 150-178.
- Zaidi, W. (2011). A Blessing in Disguise: Reconstructing International Relations through Atomic Energy. 1945-1948. *Past & Present*. 210(suppl 6), 309-331.
- Zaidi, S. W. H. (2008). The Janus-face of Techno-nationalism: Barnes Willis and the "Strength of England". *Technology and Culture*, 49(1), 62-88.
- Zaidi, S.W.H. (2014). Wings for Peace versus Airopia: Contested Visions of Post-war European Aviation in World War Two Britain, in Martin Schiefelbusch and Hans-Liudger Dienel (eds.), *Integration of Infrastructures Comparative Analysis*.
- Zaidi, S.W.H. (2011). Liberal Internationalist Approaches to Science and Technology in Interwar Britain and the U.S., in D. Laqua (ed.), *Internationalism Reconfigured: Transnational Ideas and Movements Between the World Wars*, 17-43.



Title: Discourses and Ideologies of the 'Atomic Age': A Cultural Approach to the Atomic Bomb in International Affairs, 1945 - 1960

PI: Dr. Waqar Zaidi

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 300,000

Project Initiated in: 2014

Duration: 12 Months

Category: Development Management

Description: This project aims to investigate and understand the concepts about and discourses around the 'Atomic Age' prevalent in international affairs between 1945 and 1960. Although this was a crucial early period in the development of atomic weapons, there has been no historical research on how policymakers, strategists and

intellectuals thought about atomic weapons at this time. By looking at how these people envisaged the new 'Atomic Age' they lived in, this project allows us to understand, for the very first time, the historical intellectual and cultural context in which atomic weapons were actually developed. Further, this project allows us to understand how and why atomic weapons spread so rapidly in this time period: from the US, USSR and Britain (which had pre-existing nuclear weapons programs) to France, China, and myriad of other countries which began their atomic weapons programs in this time period.



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SBASSE



SCHOOL OF SCIENCE & ENGINEERING



DEPARTMENT OF BIOLOGY

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Profile: Dr. Ahmed Jawaad is an Associate Professor at the Department of Biology in SBASSE. Plants employ multiple layers of immunity to guard against infection. The first layer responds to structures within conserved microbial molecules. The second layer responds to effector proteins, which are pathogen-encoded virulence factors. These two “branches” of the immune system synergize to provide robust host defense that halts most infections. My current work focuses on understanding the role of the multifunctional protein RIN4, which regulates both branches of the plant immune system. His current work focuses on understanding the role of the multifunctional protein RIN4, which regulates both branches of the plant immune system.

Selected Publications:

- Ahmad, M., Chaudhary, S. U., Afzal, A. J., & Tariq, M. (2015). Starvation-Induced Dietary Behaviour in *Drosophila melanogaster* Larvae and Adults. *Scientific Reports*, 5. doi: 10.1038/srep14285
- Afzal, A. J., Kim, J. H., & Mackey, D. (2013). The role of NOI-domain containing proteins in plant immune signaling. *BMC genomics*, 14(1), 327.
- Afzal, A. J., Srour, A., Goil, A., Vasudaven, S., Liu, T., Samudrala, R., & Lightfoot, D. A. (2013). Homo-dimerization and ligand binding by the leucine-rich repeat domain at RHG1/RFS2 underlying resistance to two soybean pathogens. *BMC plant biology*, 13(1), 43.
- Srour, A., Afzal, A. J., Blahut-Beatty, L., Hemmati, N., Simmonds, D. H., Li, W., & Lightfoot, D. A. (2012). The receptor like kinase at Rhg1-a/Rfs2 caused pleiotropic resistance to sudden death syndrome and soybean cyst nematode as a transgene by altering signaling responses. *BMC genomics*, 13(1), 368.



Title: Analysis of the RIN4 Proteins in Important Crop Plants using The Nicotiana Benthamiana Heterologous System

PI: Dr. Ahmed Jawaad Afzal

Co-PI: Dr. Aziz Mithani

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2014

Duration: 12 Months

Category: Natural Sciences

Description: This study focuses on a multifunctional protein called RIN4 that regulates both branches of the immune system of the model plant *Arabidopsis*. The preliminary data indicate that the sub-cellular localisation of RIN4 is correlated with dramatic and distinct effects on its regulation of both branches of plant immunity. These findings lead us to hypothesise that the sub-cellular localization of RIN4 plays a key role in controlling plant immunity.



Title: Identifying the role of the RIN4- NOI domains in plant disease resistance and developmental regulation

PI: Dr. Ahmed Jawaad Afzal

Co-PI: Dr. Jibrán Tahir

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Natural Sciences

Description: In this project the aim is to understand the evolution of the interaction of a classical component of plant immune system RIN4. With multifunctional properties,

RIN4 regulates immunity at multiple levels and this is surprisingly achieved by the two domains, referred as NOI (Nitrate induced), anchored at both the N and C terminus of this protein. Dr. Jawaad is interested to explore how these domains are regulating molecular interactions with other seemingly crucial components of the bi-layer immune system and hence trying to understand the molecular switches that regulate plant immune responses.

Dr. Amir Faisal
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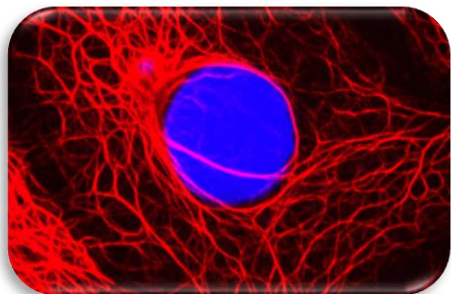
Profile: Dr. Amir Faisal received his PhD in Cell Biology from Friedrich Miescher Institute for Biomedical Research/University of Basel, Switzerland in 2004. During his PhD he identified novel roles for Shc protein, an important adaptor downstream of tyrosine kinases, in insulin signalling and cytoskeletal reorganization. He received his first postdoctoral training (2004-2008) in Protein Phosphorylation Laboratory at London Research Institute where he discovered that another adaptor protein, MyD88, couples Protein Kinase C epsilon to Toll like receptors during innate immunity. From 2008 to 2014, he worked at Cancer Therapeutics Unit of Institute of Cancer Research in Sutton first as postdoctoral fellow and later as senior scientist. He played an important role in progression of several drug discovery projects, one of which resulted in discovery of a pre-clinical development candidate that will undergo phase I clinical trials in 2016. After joining LUMS in August 2014, he has been establishing a cancer therapeutics lab at SBASSE.

Recent Publications:

- Bavetsias, Vassilios, Faisal, Amir, McIntyre, Patrick J. Atrash, Butrus, Kosmopoulou, Magda N. 7-(Pyrazol-4-yl)-3H-imidazo[4,5-b]pyridine-based derivatives for kinase inhibition: Co-crystallisation studies with Aurora-A reveal distinct differences in the orientation of the pyrazole N1-substituent: *Bioorganic and Medicinal Chemistry Letters*, 10.1016/j.bmcl.2015.08.003
- Cheeseman, M. D., Faisal, A., Rayter, S., Barbeau, O. R., Kalusa, A., Westlake, M., & Jones, K. (2014). Targeting the PPM1D phenotype; 2, 4-bisarylthiazoles cause highly selective apoptosis in PPM1D amplified cell-lines. *Bioorganic & medicinal chemistry letters*, 24(15), 3469-3474.
- Naud, S., Westwood, I. M., Faisal, A., Sheldrake, P., Bavetsias, V., Atrash, B., & Blagg, J. (2013). Structure-based design of orally bioavailable 1 H-pyrrolo [3, 2-c] pyridine inhibitors of mitotic kinase monopolar spindle 1 (MPS1). *Journal of medicinal chemistry*, 56(24), 10045-10065.

Most Cited Publications:

- Bavetsias, V., Faisal, A., Crumpler, S., Brown, N., Kosmopoulou, M., Joshi, A., & Blagg, J. (2013). Aurora Isoform Selectivity: Design and synthesis of imidazo [4, 5-b] pyridine derivatives as highly selective inhibitors of Aurora-A kinase in cells. *Journal of medicinal chemistry*, 56(22), 9122-9135.
- Saurin, A. T., Durgan, J., Cameron, A. J., Faisal, A., Marber, M. S., & Parker, P. J. (2008). The regulated assembly of a PKCε complex controls the completion of cytokinesis. *Nature cell biology*, 10(8), 891-901.



Title: Development of PTEN knockout isogenic breast cancer cell lines to study the mechanism of resistance to PI3 kinase/Akt inhibitors

PI: Dr. Amir Faisal

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

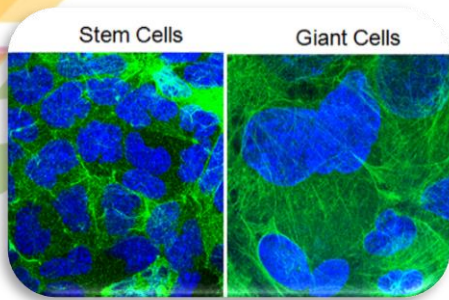
Project Initiated in: 2015

Duration: 12 Months

Category: Health

Description: The research focuses on studying the role of PTEN tumour suppressor in sensitivity of isogenic breast cancer cell lines towards PI3 kinase pathway inhibitors and in development of resistance in these cell lines to the inhibitors. The aim is to mimic

tumour heterogeneity by creating an in vitro cell line based system, where we will knockout PTEN tumour suppressor in breast cancer cell lines, MDA-MB-361 and MDA-MB-231 to generate two isogenic sets of cell lines with and without PTEN protein expression. This will allow to study the sensitivity of these cell lines to different inhibitors of PI3 Kinase pathway and to develop resistance against these inhibitors in the presence or absence of PTEN. Understanding the mechanism of any differential resistance of PTEN isogenic cell lines to these inhibitors will identify specific role PTEN plays in development of resistance. The findings will help devise better treatment strategies for such tumours.



Title: Role of Caspases in the Differentiation of Trophoblast Stem Cells into Polyloid Giant Cells

PI: Dr. Amir Faisal

Co-PI: Dr. Muhammad Tariq

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 7,134,638

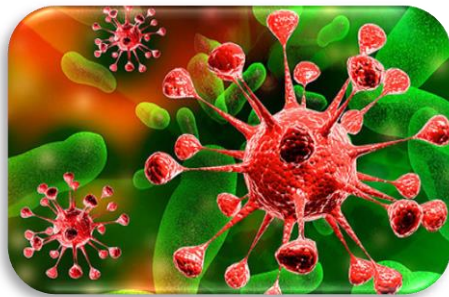
Project Initiated in: 2013

Duration: 36 Months

Category: Natural Sciences

Description: This project is aimed to investigate the role of Caspases family of proteases in the resistant response of 83olyploidy cells. This area of biology remained largely

unexplored. Successful use of TS/TO cells as model systems not only answers specific biological questions about differentiated 83olyploidy cells, but also helpful in understanding diseases like, Alzheimer's disease and cancer where the regulation of apoptosis plays an essential role. In addition, the goal is to determine what makes 83olyploidy cells resistant to apoptosis. This information is expected to help better understand a fundamental process in human development and diseases like cancer.



Title: Cellular characterization of Aurora A kinase inhibitors for cancer therapeutics and identification of resistance mechanisms

PI: Dr. Amir Faisal

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Natural Sciences

Description: The project aims to characterize Aurora A kinase selective inhibitors (co-discovered by PI at the Institute of Cancer Research, UK) in cancer cell lines. This will include studying the effect of inhibitors on activation of Aurora A kinase and its

substrate(s) in the cells and consequences of this inhibition in the form of Aurora A specific phenotypes. This research project will also screen a number of cancer cell lines for their "sensitivity" towards these inhibitors in order to determine whether these inhibitors can potentially kill or stop the growth of cancer cell lines derived from different tissues.

Dr. Aziz Mithani
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Profile: Dr Aziz Mithani started as a computer scientist and received his Masters in Computer Sciences from FAST-NU, Karachi before going to the University of Cambridge, UK where he did MPhil in Computational Biology. In summer 2006, he went to Harvard Medical School for a research internship in Paulsson Lab at Department of Systems Biology. Dr Mithani received his DPhil in Statistics (Computational Biology) from University of Oxford, UK in November 2009 under the supervision of Prof Jotun Hein and Dr Gail Preston. His dissertation focused on modelling the evolution and analysis of the properties of metabolic networks. Subsequently, Dr Mithani joined Harberd Lab at the Department of Plant Sciences, University of Oxford, UK as a postdoctoral research associate where he worked for two years on the evolution of bread wheat. His research interests include the application of computational and mathematical methods in the area of modern biology. Specifically, he is interested in the development of computational tools and techniques to model and analyse biological systems and to investigate how different organisms evolve over time.

Selected Publications:

- Jiang, C., Mithani, A., Belfield, E. J., Mott, R., Hurst, L. D., & Harberd, N. P. (2014). Environmentally responsive genome-wide accumulation of de novo *Arabidopsis thaliana* mutations and epimutations. *Genome research*, 24(11), 1821-1829.
- Belfield, E. J., Brown, C., Gan, X., Jiang, C., Baban, D., Mithani, A., Harberd, N. P. (2014). Microarray-based optimization to detect genomic deletion mutations. *Genomics Data*, 2, 53-54.
- Belfield, E. J., Brown, C., Gan, X., Jiang, C., Baban, D., Mithani, A., & Harberd, N. P. (2014). Microarray-based ultra-high resolution discovery of genomic deletion mutations. *BMC genomics*, 15(1), 224.
- Mithani, A., Belfield, E. J., Brown, C., Jiang, C., Leach, L. J., & Harberd, N. P. (2013). HANDS: a tool for genome-wide discovery of subgenome-specific base-identity in polyploids. *BMC genomics*, 14(1), 653.
- Leach, L. J., Belfield, E. J., Jiang, C., Brown, C., Mithani, A., & Harberd, N. P. (2014). Patterns of homoeologous gene expression shown by RNA sequencing in hexaploid bread wheat. *BMC Genomics*, 15(1).



Title: Mango ripening in the post-genomic era

PI: Dr. Aziz Mithani

Co-PI: Dr. Muhammad Tariq and Dr. Ahmed Jawaad Afzal

Sponsor: Confidential

Funding Amount: PKR 37,234,470

Project Initiated in: 2014

Duration: 60 Months

External Collaboration: University of Agriculture Faisalabad (UAF), Bahauddin Zakariya University

Category: Natural Sciences

Description: Mango is one of the world's major fruit crop. In Pakistan, mango is the most abundant fruit crop with 1.9 million tons of mangoes produced in 2011. This proposal takes a multidisciplinary approach involving genomics, systems biology and bioinformatics to understand the genomic architecture of mango (*Mangifera indica*). It proposes to exploit the recent advances in genomic science, particularly high-throughput DNA sequencing, to identify the genes involved in the ripening of mango fruit.



Title: Rahnuma: a Hypergraph Based Tool for Comparative and Evolutionary Analysis of Metabolic Networks

PI: Dr. Aziz Mithani

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 2,971,600

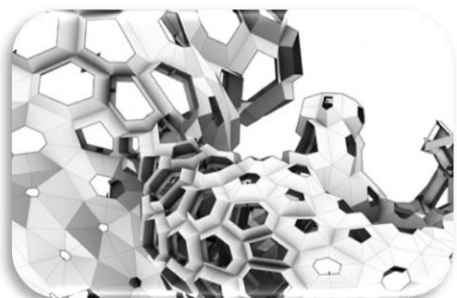
Project Initiated in: 2014

Duration: 36 Months

Category: Natural Sciences

Description: Comparative and evolutionary analyses of metabolic networks have a wide range of applications, ranging from research into metabolic evolution through to practical applications in drug development, synthetic biology and biodegradation. This

project aims to develop a software tool called Rahnuma that will contain a variety of tools that can be used to study the evolution and function of metabolic networks. Rahnuma will provide a unique and powerful web-based tool for comparative and evolutionary analysis of metabolic networks, which can be used to address a wide variety of biological questions. This project will open doors for further research in comparative and evolutionary analyses of metabolic networks ranging from research into metabolic evolution through to practical applications in drug development, synthetic biology and biodegradation.



Title: Understanding the genetic architecture of wheat using next-generation sequencing analysis

PI: Dr. Aziz Mithani

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 2,116,000

Project Initiated in: 2015

Duration: 36 months

Category: Natural Sciences

Description: This project aims to use a multidisciplinary approach consisting of the latest genomic science including high-throughput sequencing analysis, comparative genomics and associated computational analyses to understand of the complex

genome architecture of wheat and to determine the precise nature and extent of the genetic variation that confers additional salt-tolerance in these wild relatives thus providing insights into the pressures of domestication on cultivated wheat during the last 10,000-15,000. Results obtained from this project will help in the long run in the development of strains of wheat that have increased resistance to salt stress through the incorporation of natural genetic variance into wheat lines.

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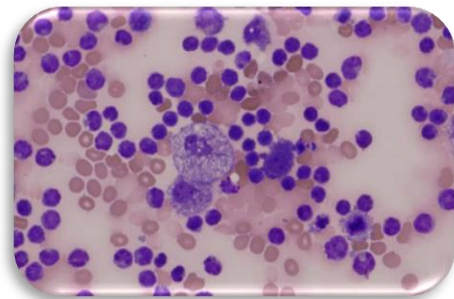
Profile: Dr. Muhammad Tariq received his PhD in Molecular Cell Biology from Friedrich Miescher Institute for Biomedical Research, Switzerland. During his PhD, he worked in Jerzy Paszkowski's lab specializing in epigenetic gene silencing in Arabidopsis. In 2003, he joined Renato Paro's lab as a postdoctoral fellow at Zentrum für Molekulare Biologie Heidelberg (ZMBH). He was awarded EMBO long term fellowship for his postdoctoral studies elucidating a link between molecular chaperones, in particular Hsp90 (Heat shock protein 90), and epigenetics in Drosophila. He joined ETH Zurich as an Oberassistent (Senior Researcher) in 2006 where he continued his work on Hsp90 and Epigenetics in Department of Biosystems Science and Engineering (D-BSSE), Basel. In 2009, he joined the Department of Biology at the Syed Babar Ali School of Science and Engineering (SSE) in LUMS as an Associate Professor where he is actively involved in developing biology research and teaching programs at undergraduate and graduate levels. He has developed the first epigenetic research lab in Pakistan which uses Drosophila to teach basic concepts of genetics, epigenetics and development. His research interests include molecular link between epigenetic cell memory and cell signalling during development and the epigenetic basis of diseases. To pursue his research interests, he primarily focuses on a paradigm based on Polycomb group (PcG) and Trithorax group (TrxG) proteins using the Drosophila and mammalian cultured cells.

Recent Publications:

- Abbas, W., Tariq, M., Iqbal, M., Kumar, A., & Herbein, G. (2015). Eradication of HIV-1 from the Macrophage Reservoir: An Uncertain Goal. *Viruses*, 7(4), 1578-1598.
- Tariq, M., Wegrzyn, R., Anwar, S., Bukau, B., & Paro, R. (2013). Drosophila GAGA factor polyglutamine domains exhibit prion-like behavior. *BMC Genomics*, 14(1).

Most Cited Publications:

- Tariq, M., Saze, H., Probst, A. V., Lichota, J., Habu, Y., & Paszkowski, J. (2003). Erasure of CpG methylation in Arabidopsis alters patterns of histone H3 methylation in heterochromatin. *Proceedings of the National Academy of Sciences*, 100(15), 8823-8827.
- Tariq, M., & Paszkowski, J. (2004). DNA and histone methylation in plants. *TRENDS in Genetics*, 20(6), 244-251.
- Bowler, C., Benvenuto, G., Laflamme, P., Molino, D., Probst, A. V., Tariq, M., & Paszkowski, J. (2004). Chromatin techniques for plant cells. *The Plant Journal*, 39(5), 776-789.



40% sequence similarity to human MLL5.

Title: Molecular Characterisation of Mixed Lineage Leukemia 5 (MLL5) Gene in Drosophila

PI: Dr. Muhammad Tariq

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 6,754,333

Project Initiated in: 2014

Duration: 36 Months

Category: Health

Description: The study aims to characterise Drosophila melanogaster (fruit fly) MLL5 homologue, the functionally uncharacterised gene CG9007 (hereafter referred to as DmMLL5), encoding a predicted protein with virtually identical domain structure and



Title: Quest for Identification of Novel Epigenetic Cell Memory Factors: Establishing a Cell based Reporter Assay in Flies

PI: Dr. Muhammad Tariq

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 2,000,000

Project Initiated in: 2014

Duration: 12 Months

Category: Natural Sciences

Description: This particular proposal aims to construct the PRE based reporter which involves cloning of a well characterised PRE with GFP and LUC in specific DNA based plasmids which are engineered to have antibiotic resistance gene along with PRE-

GFP or LUC reporter. GFP and luciferase reporters under PRE are expected to mimic regulation by PcG/TrxG proteins which are intended to be validated by generating fly cells transiently expressing member of PcG proteins and monitoring expression of GFP/LUC. Cell-based studies performs either by over-expression or knockdown of PcG and TrxG proteins in fly S2 cells to validate PcG/TrxG mediated behaviour of reporter system.



Title: Aberrant DNA methylation as signature for breast cancer patients in Pakistani population

PI: Dr. Muhammad Tariq

Co-PI: Dr. Sohail Asif Qureshi, Dr. Shafaat Rabani (Professor, Department of Medicine, Physiology and Oncology McGill University (Health Centre, Canada)

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Natural Sciences

Description: The goal of this proposal is to develop innovative, non-invasive blood

based diagnostic markers that will allow early prediction and monitor prognosis with high accuracy and specificity. Dr. Tariq in this project has proposed that the coating of genes by chemical marks termed "DNA methylation" is disrupted in cancer which correlates with clinical factors. Due to the important role of immune system in cancer our proposal is to focus on mapping "DNA methylation" T cells rather than breast cancer cells. He aims to isolate T cells from blood of a prospective cohort of different stages of breast cancer patients. Using these samples the "DNA methylation signature" will be customized as non-invasive exquisite biomarkers of breast cancer that will, potentially, diagnose, stratify for therapy and follow up the progression of the disease. These studies will help in understanding the involvement of the immune system in breast cancer leading to new therapeutic concepts targeting the immune system.

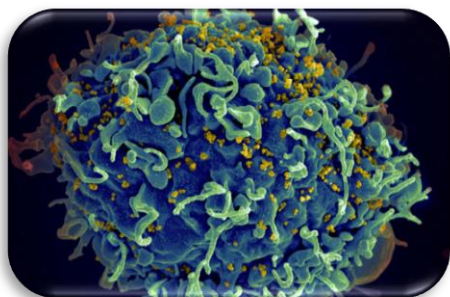
Dr. Sadia Ashraf
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Profile: Dr. Sadia Ashraf completed her MSc with distinction, in microbiology and molecular genetics from University of Punjab in 2006. After that, she completed a one year research degree course on the subject of nucleotide transporters in *C. trachomatis*, from the University of Leeds, UK. Later, she joined University of Padua, Italy in 2011 to complete her PhD. Dr. Sadia's PhD work mainly focused on molecular mechanism of bacterial and scorpion neurotoxins and its action in various models. She is now an Assistant Professor at the SBASSE at LUMS.

Selected Publications:

- Ahmad, A., Ashraf, S., & Komai, S. (2015). Optogenetics applications for treating spinal cord injury. *Asian spine journal*, 9(2), 299-305. : 10.4184/asj.2015.9.2.299
- Ahmad, A., Ashraf, S. and Komai, S. (2014). Are developing countries ready to face Ebola like outbreaks? *Virologica Sinica*, 30 (3), 234-237
- Ashraf, S., Zornetta, I., Montecucco, C., Grishin, E., Lima, M. E., and Rossetto, O. SNARE cleavage inside cultured neurons by scorpion venoms.
- Ashraf, S. Different botulinum serotypes translocate at different rates in primary neuronal cell cultures.



Title: Production of soluble CCR5 receptor protein and identification of new CCR5 antagonists from natural sources as potential anti-HIV and anti-cancer agents.

PI: Dr. Sadia Ashraf

Co-PI: Dr. Syed Shahzad ul Hussan

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 442,750

Project Initiated in: 2015

Duration: 9 months

Category: Natural Sciences

Description: This study is highly significant in order to identify new CCR5 antagonists from natural sources which will present new potential anti-HIV and anti-cancer agents

to devise novel therapies. Furthermore it seeks to facilitate other future projects such as solving the solution structure of the V3 domain of HIV gp120 in CCR5 bound conformation that will in turn provide a lead for rational design of HIV entry inhibitors. Development of protocols to produce soluble CCR5 will facilitate such associated future studies in the laboratory. The objectives of this research include the following: To produce biologically active water-soluble CCR5 by expressing only its extracellular domains connected through flexible linkers in prokaryotic system as well as in mammalian system; To produce biologically active full length CCR5 with few mutations and solubilizing it with detergents after expressing the full-length gene according to the method described by Tan et al.(7); To develop a CCR5 probe by covalently linking the CCR5 protein to agarose resin and constructing an affinity chromatographic column; To identify new CCR5 binding molecules by screening algal extracts through the designed affinity column (CCR5 probe); To test the anti-HIV and anti-cancer activities of the identified molecules in a single round HIV infectivity assay and cancer cell lines based cell culture assays, respectively.

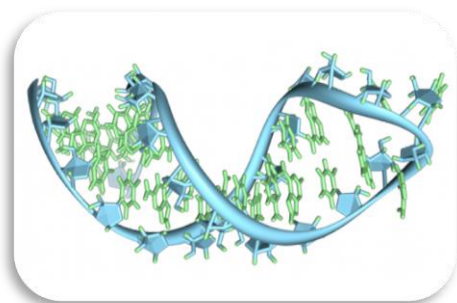
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Profile: Dr. Sadia Hamera completed her BSc in Agriculture (Food technology), MPhil in Microbiology from Quaid-e-Azam University and PhD in Genetics from Institute of Microbiology at Chinese Academy of Sciences, Beijing, China. After her PhD, she acquired a postdoc opportunity at Institute of Genetics Chinese Academy of Sciences Beijing, and another postdoc research opportunity funded by US Govt. NSF project at Univ. of Arkansas Little Rock. She is an Assistant Professor at the SBASSE at LUMS.

Selected Publications:

- Wang, H., Jiao, X., Kong, X., Humaira, S., Wu, Y., Chen, X., ... & Yan, Y. (2016). A signaling cascade from miR444 to RDR1 in rice antiviral RNA silencing pathway. *Plant physiology*, pp-01283.
- Yan, Y., Wang, H., Hamera, S., Chen, X., & Fang, R. (2014). MiR444a has multiple functions in the rice nitrate-signaling pathway. *The Plant Journal*, 78(1), 44-55.
- Mural, R. V., Liu, Y., Rosebrock, T. R., Brady, J. J., Hamera, S., Connor, R. A., & Zeng, L. (2013). The Tomato Fni3 Lysine-63-Specific Ubiquitin-Conjugating Enzyme and Suv Ubiquitin E2 Variant Positively Regulate Plant Immunity. *The Plant Cell*, 25(9), 3615-3631.
- Hamera, S., Mural, R. M., Liu, Y., & Zeng, L. (2014). The tomato ubiquitin-conjugating enzyme variant Suv, but not SIUev1C and SIUev1D regulates Fen-mediated programmed cell death in *Nicotiana benthamiana*. *Plant signaling & behavior*, 9(10), e973814.



Title: Deciphering the potential intervention of RNA virus Cucurbit Mosaic suppressor protein 2b in plant immunity and epigenetic signal

PI: Dr. Sadia Hamera

Co-PI: Dr. Muhammad Tariq

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 353,940

Project Initiated in: 2015

Duration: 9 months

Category: Natural Sciences

Description: The research is aiming at the functional analysis of pathogenicity determinants of plant viruses and their interaction with host defense systems with the

focus on functional perspectives of virus-encoded protein, especially the pathogenicity determinant, and virus-plant host interactions. Cucurbit Mosaic Virus is a sense RNA virus with the widest host range among known plant RNA viruses. It spreads both through vectors and mechanically. Hence, the major aim is to get insights and control the damages spread through RNA viruses.



Title: Dissecting the role of tomato AGO4 in plant innate immunity

PI: Dr. Sadia Hamera

Co-PI: Dr. Muhammad Tariq

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Natural Sciences

Description: In both plants and animals, a multi-protein complex known as RISC is responsible to do silencing of gene expression through methylation. AGO4 protein is a major component of this RISC complex. It binds with small interfering RNAs and causes

silencing of cognate sequences through methylation. Methylation is crucial for genome defense from foreign pathogens as well as from endogenous repeat loci like transposons. This study proposes to use the Virus induced gene silencing (VIGS) system to dissect the AGO4 resistance against PST and its key effectors then exploit them to further decipher the mechanism of resistance. AGO4d will be used to explore its role in methylation and small RNA binding too. The next goal of this study will be to investigate the AGO4 interacting partners and their potential contributions in host immunity in coordination with AGO4.

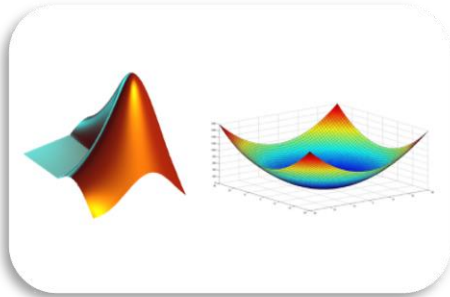
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Profile: Safee Ullah Chaudhary received his Ph.D. in 2013 from the Department of Bio. & Brain Engineering, Korea Advanced Institute of Science and Technology (KAIST), South Korea. His research was focussed on the computational modelling of multiscale cancer systems biology. He took an agents-based (multi-agent) approach to model tumorigenesis as described in the Warburg Effect. His work also led to the development of Electronic Cancer System (ELECANS), which is a next-generation modelling platform for applications in cancer systems biology. In 2014, he joined the Department of Biology at LUMS where he is involved in the development of a GPU-based cancer modelling and simulation pipeline by leveraging the CUDA Toolkit. He is also keenly interested in investigating the oncological manifestations of the Warburg Effect during cell death.

Selected Publications:

- Abubakar, M. B., A Hussain, R Bibi, Z.Gul, A Bashir, Z Arshad, S.N Uppal, M.A Chaudhary, S.U. (23 February 2016). Towards providing full spectrum antenatal health care in low and middle income countries. HEALTHINF 2016 - 9th International Conference on Health Informatics, Proceedings; Part of 9th International Joint Conference on Biomedical Engineering Systems and Technologies, BIOSTEC 2016, 2016, Pages 2478-2483.
- Ahmad, M., Chaudhary, S. U., Afzal, A. J., & Tariq, M. (2015). Starvation-Induced Dietary Behaviour in *Drosophila melanogaster* Larvae and Adults. *Scientific Reports*, 5. doi: 10.1038/srep14285
- Chaudhary, S. U., Shin, S. Y., Lee, D., Song, J. H., & Cho, K. H. (2013). ELECANS—An Integrated Model Development Environment for Multiscale Cancer Systems Biology. *Bioinformatics*, btt063.
- Hussain, S. A., Saeed, A., & Chaudhary, S. U. (2013). A Dynamically Controlled Broadcasting Scheme for VANETs in Dense Traffic Environments. *SmartCR*, 3(6), 405-415.



Title: LUMSPROT 2.0 – A High Performance MATLAB Toolbox for Searching Protein Mass Spectra using NVIDIA's Graphical Processing Unit Arrays

PI: Dr. Safee Ullah Chaudhary

Co-PI: Dr. Sadia Hamera

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Technology

Description: In this project, the aim is to develop such a high-performance version of this toolbox 'LUMSPROT 2.0', by using the popular and affordable NVIDIA GPU clusters.

The proposed toolbox aims to provide a high performance computing (HPC) environment for searching and identifying proteins from dense proteomics data obtained by using high resolution mass spectrometers. Upon implementation, this toolbox will act as an open and scalable platform for further development, optimization, testing and benchmarking of high throughput top down proteomics algorithms. The project will act to seed and stir high performance proteomics research in Pakistan. It is envisaged that this project will create several collaboration avenues for academia and industry, where by industrial partners can leverage the software to quickly analyze their MS data and provide valuable feedback towards an improved protein identification.



Title: Development of a MATLAB-based High Performance Computing Toolbox for Top-down Proteomics

PI: Dr. Saffee Ullah Chaudhary

Sponsor: Comstech-Twas

Funding Amount: PKR 203,590

Project Initiated in: 2015

Duration: 12 Months

Category: Technology

Description: In this project, the aim is to develop a top-down proteomics toolbox using a popular mathematical computing platform MATLAB. The toolbox aims to provide a richly featured environment for searching and identifying proteins from top down

proteomics data obtained by using high resolution mass spectrometers. Upon implementation, this toolbox will act as an open and scalable platform for further development, testing and benchmarking of novel top down proteomics algorithms. Additionally, the proposed toolbox will be very useful for proteomics instructors in their educational and training endeavors. The project will act to seed and stir computational proteomics research in Pakistan. It is envisaged that this project will also create collaboration avenues for academia and industry, where by industrial partners can leverage the software to analyze their MS data and provide valuable feedback towards developing newer algorithms for an improved protein identification.



Title: Design and development of the mesh partitioning algorithm for a distributed numerical estimation of partial differential equation models of extra cellular environments using CUDA graphical processing unit arrays

PI: Dr. Saffee Ullah Chaudhary

Co-PI: Aziz Mithani

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 480,125

Project Initiated in: 2015

Duration: 9 Months

Category: Technology

Description: Cancer is a complex pathological disorder involving biological elements

spanning across multiple spatiotemporal scales (e.g. genetic, metabolic, cellular and tissue level). In order to systematically investigate the initiation, development and metastasis of cancer, the aforementioned multiscale biological components need to be integrated into a systematic and unified model. To that effect, Dr. Saffee Ullah in his project has designed and developed a multiscale modeling platform, termed 'ELECANS', which aims to couple and model the multiple biological components underlying oncogenesis.



Title: Design and Development of a Multi-User Web Platform for Integrative Modelling and Simulation of Cancer Systems Biology

PI: Dr. Saffee Ullah Chaudhary

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2016

Duration: 12 Months

Category: Technology

Description: The proposed multiscale cancer modelling platform will be the state of the art software in cancer modelling which will stand to deliver major advantages to the cancer patients, researchers and the pharmaceutical industry. The patients will be

benefited by the personalized medicines and therapeutics developed by modelling and analysis of their pathological data using the proposed platform. The cancer researchers stand to gain by obtaining a computational modelling framework using which they can save precious wet-lab materials and resources. The pharmaceutical industry can use this platform to investigate novel drug targets from personalized patient data and design newer drugs for treatment of cancer.



Title: Design and Development of a Top-down Protein Sequence Search Engine for High Resolution Mass Spectra

PI: Dr. Saeef Ullah Chaudhary

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 5,662,600

Project Initiated in: 2016

Duration: 36 Months

Category: Technology

Description: In this project, the objective is to develop a next generation protein sequence search engine and the associated algorithms that can optimally leverage this high resolution spectral data and act as a platform to seed and stir computational top-

down (whole protein) and bottom-up (peptides) proteomics research in Pakistan. We propose to design and develop a web-based software architecture that will make this search engine available, free of cost, to the experimental and in silico biologists across the country. Moreover, this project will act as a collaboration avenue between academia and industry, where in industrial partners can also leverage the software to analyze their data and provide valuable feedback towards developing intelligent algorithms geared towards an improved biomolecular identification and characterization.



Title: Design and Development of a Next-Generation Modelling and Simulation Platform for Cancer Systems Biology

PI: Dr. Saeef Ullah Chaudhary

Co-PI: Dr. Sameer Ahmad

Sponsor: National ICT R&D Fund

Funding Amount: PKR 14,987,180

Project Initiated in: 2016

Duration: 36 Months

Category: Technology

Description: The proposed project outlines the design and development of a next generation multiscale modelling platform for applications in cancer systems biology.

This modelling platform envisages a seamless integration of next generation sequencing and quantitation data from the wet labs and its onward usage for investigating the roles of known oncological factors. A powerful HPC enabled simulation engine will be developed and coupled with an intuitive and customizable GUI. To facilitate in the modelling of complex oncological phenomenon, a programmable interface to the engine and GUI will also be developed. The resulting software and case study model will be made available to the laboratories, research centers, universities as well as the pharmaceutical companies which are aiming to develop or evaluate therapeutic targets as well as drugs for treatment of cancer patients.

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Profile: Dr. Shaper Mirza holds a BSc (Hon) degree from University of Karachi and a doctorate from The University of Alabama at Birmingham (UAB). Her PhD studies involved understanding mechanisms of nasal colonisation by a Gram-positive pathogen *Streptococcus pneumoniae*. More specifically the work was focused on understanding the interaction of a human mucosal protein lactoferrin with pneumococcal surface proteins and its downstream effects on colonisation by *Streptococcus pneumoniae*. Dr. Mirza received several awards and honours during her PhD which included a student travel grant award for Gordon Conference on Structure and Functions of Lactoferrin, held in Hawaii 2005; Gail Castle award for best poster presentation as PhD student and Gail Castel Award for best post-doctoral presentation. Prior to joining LUMS in 2015, Dr. Mirza served as an Assistant Professor since 2008, at The University of Texas – Houston Health Science Center in the Division of Epidemiology Human Genetics and Environmental Health. While working at the Brownsville (Texas) regional campus Dr. Mirza started elucidating the relationship between immune impairments in type-2 diabetes and their impact on pneumococcal infections in individuals with type-2 diabetes. Her studies are the first to demonstrate impairments in immune mechanisms in type-2 diabetes that are critical for protection against pneumococcal infections. Dr. Mirza joined LUMS as an Associate Professor in the Department of Biology at Syed Babar Ali School of Science and Engineering. Dr. Mirza's specialised areas of teaching at LUMS include immunology and bacterial pathogenesis, where she continues to develop her studies on association of immune impairments in diabetes with pneumococcal infections.

Selected Publications:

- Combined effects of lactoferrin and lysozyme on *Streptococcus pneumoniae* killing GO André, WR Politano, S Mirza, TR Converso, LFC Ferraz, LCC Leite, *Microbial pathogenesis* 89, 7-17
- Seckel Syndrome: In a Two and a Half Months Old Male Presenting at Tertiary Care Hospital in Karachi. M Kazmi, S Aslam, S Mirza, S Aziz *ANNALS ABBASI SHAHEED HOSPITAL & KARACHI MEDICAL & DENTAL COLLEGE* 21 (1), 54-57
- Meeting physical activity guidelines is associated with lower allostatic load and inflammation in Mexican Americans JL Gay, JJ Salinas, DM Buchner, S Mirza, HW Kohl III, SP Fisher-Hoch, *Journal of Immigrant and Minority Health* 17 (2), 574-581 7 2015
- Impaired CD4+ and T-helper 17 cell memory response to *Streptococcus pneumoniae* is associated with elevated glucose and percent glycated hemoglobin A1c in Mexican Americans with type 2 diabetes mellitus PJ Martinez, C Mathews, JK Actor, SA Hwang, EL Brown, HK De Santiago, *Translational Research* 163 (1), 53-63



Title: Off-site Quality Assurance Test for Products from Packages Limited

PI: Dr. Shaper Mirza

Co-PI: Dr. Muhammad Tariq

Sponsor: Packages Limited

Funding Amount: PKR 2,920,000

Project Initiated in: 2016

Duration: 12 Months

Category: Health

Description: The main purpose of this proposed collaboration is to provide consultancy for setting up quality control standards for paper products from Packages limited. The products include Facial tissues, Toilet rolls and party tissues. Although paper products

have lower risk of human infections than for example meat, dairy, fruits or vegetables, nonetheless they can still become contaminated with potentially hazardous materials that can cause anything from mild skin irritation to severe skin infections. For quality assurance, the activities which will be performed in the collaborative project include Identifying the potential hazard to assess the level of risk, designing and implementing procedures for, monitoring and controlling hazard and Suggesting corrective actions.

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Profile: Dr. Kahkeshan Hijazi received her Bachelor's degree in Bioinformatics from Mohammad Ali Jinnah University, Islamabad, Pakistan in 2006. In 2009, she was awarded the J. William Fulbright Doctoral Award from the United States Educational Foundation (USEFP), Pakistan. She received her Master's degree and a PhD in Bioinformatics from Boston University, Massachusetts, USA in 2014. Her research during her PhD was focused on developing predictors of tobacco-induced airway epithelial cell damage and the risk for having or developing tobacco-associated lung disease in humans at the Boston University Medical Center (BUMC) under the supervision of Dr. Avrum Spira. Prior to joining LUMS she served at the Research Center for Modeling and Simulation, National University of Sciences and Technology (NUST), Islamabad as Assistant Professor of Bioinformatics.

Dr. Hijazi's expertise in Bioinformatics gives her great experience in the application of techniques from computer science and statistics to identify and understand patterns in the ever-more complex datasets produced by genome-wide profiling technologies. Her long terms goals are to apply post-genomic technologies and computational tools for translational research into human disease and to train graduate students who can apply these tools in a clinical setting.

Research Interests

- Transcriptomics, Genomics
- Translational Bioinformatics



Title: Identifying Nasal Epithelial MicroRNA Regulators of the Gene-expression Response to Smoking Cessation

PI: Dr. Syeda Kahkeshan Hijazi

Co-PI: Dr. Aziz Mithani

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 308,000

Project Initiated in: 2016

Duration: 9 Months

Category: Natural Sciences

Description: The goal in this project is to identify the physiological response to smoking-cessation using microRNA sequencing on specimens collected longitudinally

from the nasal epithelium. The results will provide insights into the regulation of smoking-associated processes.

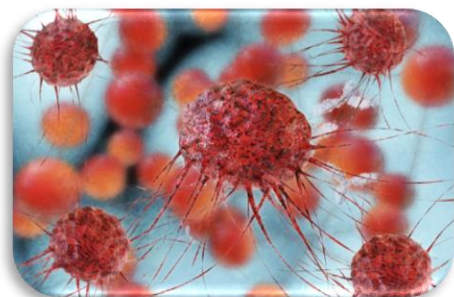
Dr. Syed Shahzad ul Hussan
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Profile: Dr. Shahzad ul Hussan joined the Department of Biology at Syed Babar Ali School of Science and Engineering (SSE) in LUMS in December 2013 as an Associate Professor. He earned his PhD. in Bioorganic Chemistry from the University of Luebeck, Germany in 2005. In 2005, he obtained the Postdoctoral Visiting Fellowship Award from the National Institutes of Health (NIH), USA and joined the Laboratory of Bioorganic Chemistry at NIDDK, NIH. During the postdoctoral training his research was focused on NMR structural studies of anti-HIV lectins and understanding the sub-molecular level basis of HIV entry inhibition by those lectins. In 2010, Dr. Hussan Joined the Vaccine Research Center of NIAID at NIH as a research fellow where the focus of his research was to study the atomic level details of HIV-surface-displayed-glycan recognition by HIV-1 neutralising antibodies using methodologies such as NMR, surface plasmon resonance (Biacore), isothermal calorimetry (ITC) and HIV neutralisation assays. His research during last 10 years has resulted in several publications in high-ranking journals namely, Nature, Science, Nature Structural and Molecular Biology, Journal of the American Chemical Society, Journal of Biological Chemistry, Chembiochem and Journal of Virology. His research interests, in general, include understanding the structural properties of ligands in their macromolecular-bound state, the solution structure of proteins and biophysical characterisation of recognition phenomenon involving glycans.

Selected Publications:

- Miana, G. A., Riaz, M., Shahzad-Ul-Hussan, S., Paracha, R. Z., & Paracha, U. Z. (2015) Prostratin: An overview. *Mini-Reviews in Medicinal Chemistry*, 15(13), 1122-1130
- McLellan, J. S., Pancera, M., Carrico, C., Gorman, J., Julien, J. P., Khayat, R., & Kwong, P. D. (2011). Structure of HIV-1 gp120 V1/V2 domain with broadly neutralising antibody PG9. *Nature*, 480(7377), 336-343.
- Pancera, M., Shahzad-ul-Hussan, S., Doria-Rose, N. A., McLellan, J. S., Bailer, R. T., Dai, K., & Kwong, P. D. (2013). Structural basis for diverse N-glycan recognition by HIV-1-neutralising V1-V2-directed antibody PG16. *Nature structural & molecular biology*, 20(7), 804-813.
- Hansman, G. S., Shahzad-ul-Hussan, S., McLellan, J. S., Chuang, G. Y., Georgiev, I., Shimoike, T., & Kwong, P. D. (2012). Structural basis for norovirus inhibition and fucose mimicry by citrate. *Journal of virology*, 86(1), 284-292.



Title: Solution structure of the V3 domain of HIV-1 gp120 in CCR5 co-receptor bound conformation to better understand the viral entry process

PI: Dr. Syed Shahzad ul Hussan

Co-PI: Dr. Thomas Peters

Sponsor: German Pakistani Research Cooperation Programme (DAAD)

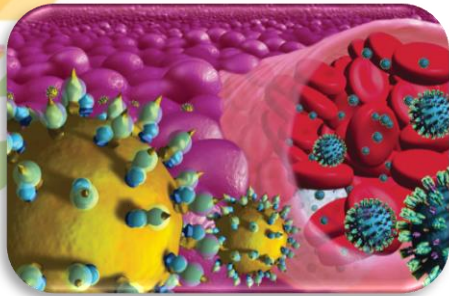
Funding Amount: PKR 10,654,782

Project Initiated in: 2014

Duration: 12 Months

Category: Health

Description: The aim of this study is to understand the atomic level details of CCR5 recognition by the V3 domain of HIV-1 gp120, to understand the HIV-1 cellular entry process, by solving the NMR based solution structure of V3 in CCR5 bound conformation and by investigating the kinetic and thermodynamic aspects of the recognition.



Title: Development of Hepatitis C Viral and Human Immunodeficiency Viral Cellular Infectivity Assays to Identify New Potential Therapeutics

PI: Dr. Syed Shahzad ul Hussan

Co-PI: Dr. Zakir Ullah

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

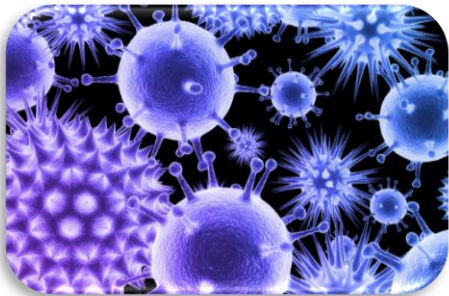
Project Initiated in: 2014

Duration: 12 Months

Category: Health

Description: This project aims to develop HCV and HIV cellular infectivity assays using viral constructs that are not infectious to humans and are routinely used for such

assays. A fluorescence activated cell sorting (FACS) based quantitative assay is also expected to be developed to evaluate viral neutralisation by potential therapeutic molecules. Once the assays are established, researcher is expected to identify new entry inhibitors in extracts from different Algae which are known to contain carbohydrate binding proteins (lectins) that can inhibit viral entry into human cells. To facilitate these experiments researchers have started growing liver-derived Huh-7.5 cells that are used to test HCV infection in experimental systems and TZMbl cells having HIV receptors to study the viral neutralisation by the potential viral entry inhibitors.



Title: Discovery of New HCV Entry Inhibitor Lectins and Design of an Anti-HIV Lectin as a Better Potential Therapeutic

PI: Dr. Syed Shahzad ul Hussan

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 5,987,705

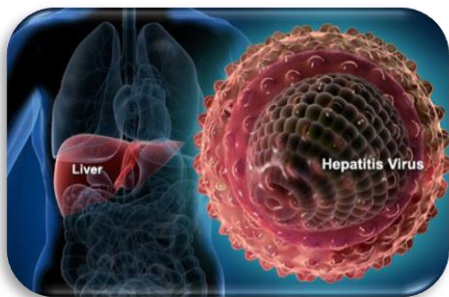
Project Initiated in: 2015

Duration: 36 months

Category: Health

Description: This study has two main aims. To begin with, it aims to identify new HIV and HCV cellular-entry inhibitor lectins from different algal strains. Based on the observation that most of the antiviral lectins have been identified from different algal

strains, it has been hypothesised that by using specific probes consisting of envelope glycoproteins of HIV and HCV new anti-HIV and anti-HCV lectins can be identified from algal extracts. Envelope glycoprotein, gp120 of HIV and E2 of HCV have already been produced in the laboratory. In this project, these glycoproteins will be covalently linked to an appropriate resin to develop a specific affinity column to identify new anti-HIV and anti-HCV lectins by screening extracts of various algal strains and characterise their atomic level details of viral entry inhibition by using NMR, viral neutralisation assays, isothermal calorimetry titrations (ITC) and surface plasmon resonance (SPR). Secondly, the study also aims to construct a smaller sized MVN lectin to make it better drug like molecule. As potential therapeutics larger protein molecules have very limited oral availability, less membrane permeability and potential immunogenicity.



Title: Designing the specific antibody-selecting probes consisting of the conserved regions of the Hepatitis C envelope in the native conformation

PI: Dr. Dr. Syed Shahzad ul Hussan

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Health

Description: HCV infections are the major threat to the healthcare all over the world. In Pakistan roughly 5% of the population is infected with HCV. In the current project the aim is to design antibody-selecting probes consisting of HCV envelope variants with

exposed conserved regions and truncated variable regions so that these probes can be used to fish out only the conserved-region specific antibodies from the sera of patients. Understanding the fundamental details of how these antibodies bind to the virus will provide the basis for rational immunogen design as potential vaccine as the long-term goal.



DEPARTMENT OF CHEMISTRY

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Profile: Dr. Basit Yameen received his M.Sc. degree (1998-2000) in the subject of Chemistry with distinction (awarded a gold medal and an academic roll of honor) from Government College University, Lahore, Pakistan. During early 2001, he moved to the Department of Chemistry, Quaid-e-Azam University, Islamabad Pakistan, where he completed his M.Phil. Degree (2001-2003) with a specialization in Organic Chemistry while carrying out his one year thesis research in the field of Polymer Chemistry. He was later awarded a Ph.D. scholarship from the Higher Education Commission of Pakistan and received his Ph.D. degree (2004-2008) from Johannes Gutenberg University, Mainz, Germany for his research work which was carried out under the supervision of Prof. Dr. Wolfgang Knoll in the Materials Science Research Group of the Max Planck Institute for Polymer Research, Mainz, Germany. During his Ph.D. and post doctoral stay at Max Planck Institute for Polymer Research, he published several research articles in peer reviewed journals and chapter contributions to two books titled "Surface Design: Applications in Bioscience and Nanotechnology" published by Wiley-VCH, Weinheim, Germany, and "Electroactive Polymers, Materials and Devices" published by Rajiv Beri for Macmillan Publishers India Ltd. Before joining SSE Dr. Basit Yameen has worked as Assistant Professor at the Faculty of Materials Science and Engineering, GIK Institute of Engineering Sciences and Technology.

Recent Publications:

- Picco, A. S., Yameen, B., Knoll, W., Ceolin, M. R., & Azzaroni, O. (2016). Temperature-driven self-assembly of self-limiting uniform supraparticles from non-uniform unimolecular micelles. *Journal of Colloid and Interface Science*, 471, 71-75.
- Farrukh, A., Ashraf, F., Kaltbeitzel, A., Ling, X., Wagner, M., Duran, H., Yameen, B. (2015). Polymer brush functionalized SiO_2 nanoparticle based Nafion nanocomposites: A novel avenue to low-humidity proton conducting membranes. *Polymer Chemistry*, 6(31), 5782-5789. doi: 10.1039/c5py00514k
- Butt, A., Farrukh, A., Ghaffar, A., Duran, H., Oluz, Z., Ur Rehman, H. Yameen, B. (2015). Design of enzyme-immobilized polymer brush-grafted magnetic nanoparticles for efficient nematocidal activity. *RSC Advances*, 5(95), 77682-77688. doi: 10.1039/c5ra10063a



Title: Summer Internship in Science and Engineering (RISE) for Young Community – RISE Community

PI: Dr. Basit Yameen

Co-PI: Dr. Irshad Hussain, Dr. Falak Sher

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 200,000

Project Initiated in: 2016

Duration: 1 Month

Description: This proposal aims at developing a 4-week training program named as "Summer Internship in Science and Engineering (RISE) for Young Community – RISE Community where students (matric/intermediate) and teachers from the public schools

in our less developed neighborhood will spend one month in different research groups engaging in cutting-edge research at various departments at SBA SSE at LUMS. Students will be engaged in the research and training activities of research groups and departments focusing on understanding and resolving the issues of national relevance. Besides, they will attend research seminars at research group, at respective department, at SSE, and at LUMS level. Seminars will be organized on specific topics where speakers from LUMS and from other local institutions will be invited to delivery lectures on current developments in science and engineering in a manner understandable to the RISE audience.

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Profile: Dr. Falak Sher is working as an Assistant Professor of Chemistry at the School of Science and Engineering (SSE), LUMS. Before this, he worked in the same capacity for three years at the Department of Chemical and Materials Engineering, PIEAS, Islamabad. He obtained his PhD degree in Chemistry from the University of Cambridge, UK. His research interests are in the field of synthesis and properties of interesting magnetic and electronic metal oxides. He has a number of publications in the journals of international repute.

Recent Publications:

- Wildman, E. J., Sher, F., & Mclaughlin, A. C. (2015). Absence of Colossal Magnetoresistance in the Oxypnictide PrMnAsO_{0.95}F_{0.05}. *Inorganic chemistry*, 54(6), 2536-2542.
- Ashraf, S., Sher, F., Khalid, Z. M., Mehmood, M., & Hussain, I. (2014). Synthesis of cellulose–metal nanoparticle composites: development and comparison of different protocols. *Cellulose*, 21(1), 395-405.
- Arévalo-López, A. M., Sher, F., Farnham, J., Watson, A. J., & Attfield, J. P. (2013). Cation, vacancy, and spin ordered 15R-superstructures in Sr (Cr 1-xFex)O_{3-y} (0.4 ≤ x ≤ 0.6) perovskites. *Chemistry of Materials*, 25(11), 2346-2351. doi: 10.1021/cm401062u
- Makhdoom, A. R., Akhtar, M. J., Khan, R. T. A., Rafiq, M. A., Hasan, M. M., Sher, F., & Fitch, A. N. (2013). Association of microstructure and electric heterogeneity in BiFeO₃. *Materials Chemistry and Physics*, 143(1), 256-262.
- Chen, W. T., Sher, F., Mathur, N. D., Kavanagh, C. M., Morrison, F. D., & Attfield, J. P. (2012). Structural, magnetic, and electrical properties of Bi 1-xLa xMnO 3 (x = 0.0, 0.1, and 0.2) solid solutions. *Chemistry of Materials*, 24(1), 199-208.

Most Cited Publications:

- Mclaughlin, A. C., Sher, F., & Attfield, J. P. (2005). Negative lattice expansion from the superconductivity–antiferromagnetism crossover in ruthenium copper oxides. *Nature*, 436(7052), 829-832.
- Venimadhav, A., Sher, F., Attfield, J. P., & Blamire, M. G. (2004). Oxygen assisted deposition of Sr 2 FeMoO 6 thin films on SrTiO 3 (100). *Journal of magnetism and magnetic materials*, 269(1), 101-105.



Title: UK Researcher Links program

PI: Dr. Falak Sher

Sponsor: British Council, UK

Funding Amount: PKR 1,346,625

Project Initiated in: 2014

Duration: 6 Months

External Collaborator: University of Edinburgh, UK

Category: Natural Sciences

Description: The aim of this study is to significantly increase thermopower (or Seebeck coefficient) of transition metal oxides so that they become competitive with other known TE materials. Use of good and reliable TEoxide materials in thermoelectric devices

makes an impact in reducing our dependence, to some extent, on fossil fuels.

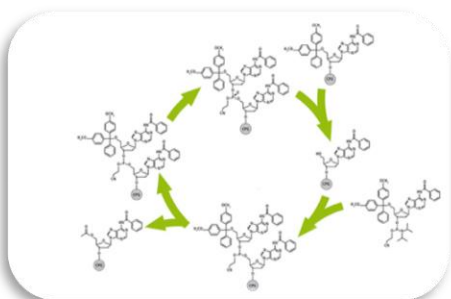
Dr. Ghayoor Abbas Chotana
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Profile: Dr. Ghayoor Abbas obtained his MSc in Chemistry from Quaid-i-Azam University, Islamabad, Pakistan. After serving as lecturer in chemistry in the Punjab Education Department/GCU Lahore for couple of years, he went to the Michigan State University, USA for his PhD studies. At MSU, he worked on the applications of iridium catalysed aromatic C-H borylation in organic synthesis, and completed his PhD in Chemistry in 2008. He later worked as a Postdoctoral Associate at Indiana University, Bloomington, USA, before joining Syed Babar Ali School of Science and Engineering (SSE), LUMS in fall 2009. Dr. Ghayoor Abbas has presented his research work in various international conferences including the meetings of the American Chemical Society, the US National Organic Symposium, and the Gordon Organometallic Conference. He has a number of research publications in peer reviewed international journals as well as several patents to his credit. His current research interests include synthesis and study of new ligands for transition metal catalysed cross coupling reactions, development of new synthetic methodologies and their applications in the synthesis of medicinally active small organic molecules, design and synthesis of new aromatic building blocks for applications in material science.

Recent Publications:

- Batool, F., Parveen, S., Emwas, A. H., Sioud, S., Gao, X., Munawar, M. A., & Chotana, G. A. (2015). Synthesis of Fluoroalkoxy Substituted Arylboronic Esters by Iridium-Catalyzed Aromatic C-H Borylation. *Organic Letters*, 17(17), 4256-4259. doi: 10.1021/acs.orglett.5b02050
- Ikram, H. M., Rasool, N., Ahmad, G., Chotana, G. A., Musharraf, S. G., Zubair, M., & Jaafar, H. Z. (2015). Selective C-Arylation of 2, 5-Dibromo-3-hexylthiophene via Suzuki Cross Coupling Reaction and Their Pharmacological Aspects. *Molecules*, 20(3), 5202-5214.
- Hall, D. G. (Ed.). (2006). *Boronic acids: preparation, applications in organic synthesis and medicine*. John Wiley & Sons.



Title: Regiospecific Syntheses of Carbazoles

PI: Dr. Ghayoor Abbas Chotana

Sponsor: Comstech-Twas

Funding Amount: PKR 478,436

Project Initiated in: 2015

Duration: 18 Months

Category: Natural Sciences

Description: The present proposal plans to develop a methodology for the concise & regiospecific synthesis of carbazoles using readily commercially available starting materials. This methodology will provide access to substituted carbazoles with substituents on any of the eight positions of carbazole. The significance of the newly

developed methodology will be demonstrated by synthesizing various naturally occurring carbazole products which previously have been synthesized using long routes.



Title: Design and Synthesis of New Boscalid Analogs

PI: Dr. Ghayoor Abbas Chotana

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2016

Duration: 12 Months

Category: Natural Sciences

Description: Boscalid is an important fungicide belonging to the class of carboxamides. It was introduced in 2003 in US and now its worldwide annual production exceeds 1000 Metric Ton per year. Boscalid is used in the agricultural fields of various horticultural crops, such as green beans, spring onions, strawberries, grapes

blueberries, tomatoes, and raspberries etc. Boscalid protects crops from gray mold, powdery mildew and other fungus. Boscalid acts by inhibiting spore germination, germ tube elongation and is also effective on all other stages of fungal development. The current proposal aims to design and synthesize new analogs of Boscalid.



Title: Rapid & Convenient Synthesis of Biologically Active Aryl/Heteroaryl Indole Alkaloids

PI: Dr. Ghayoor Abbas Chotana

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 990,000

Project Initiated in: 2014

Duration: 12 Months

Category: Natural Sciences

Description: This research proposal is based on a new synthetic route which bypasses the need to synthesize haloindoles in the first step, by using iridium catalyzed direct C-H borylation reaction, and thus yielding the desired product in only two steps. The

new proposed route will provide rapid & convenient access to these important classes of molecules which are known to possess antimicrobial, antiprotozoal, antimalarial, antifungal, and anticancer activities.

Dr. Habib Ur Rehman

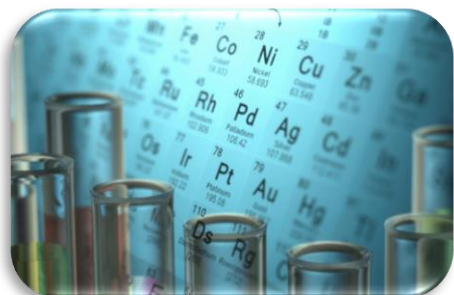
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Profile: Dr Habib Ur Rehman holds an MPhil degree in physical/polymer chemistry from QAU, Islamabad and Ph.D. in Materials Engineering Degree from the Institute for New Materials, Saarbrucken, Germany. He is currently working as an Assistant Professor of Chemistry. Before joining Syed Babar Ali School of Science and Engineering (SSE), LUMS, he served as Head of Optical Materials, R & D Group at Exxelis Limited, U.K. There, he developed a number of new materials for optical displays and optimised innovative processes for making LED backlights and light management films. He previously worked for Terahertz Photonics, UK, and was responsible for the development of low loss optical materials for data-comm and groundbreaking sol-gel based silica on silicon deposition technology.

Selected Publications:

- Javed, Ibrahim, Hussain, Syed Zajif, Rehman, Habib Ur, Hussain, Irshad.....(2015) Synthesis, characterization and evaluation of lecithin-based nanocarriers for the enhanced pharmacological and oral pharmacokinetic profile of amphotericin B : Journal of Materials Chemistry B :10.1039/c5tb01258a
- Javed, Ibrahim, Hussain, Syed Zajif, Rehman, Habib Ur, Hussain, Irshad.....(2015) Synthesis, characterization and evaluation of lecithin-based nanocarriers for the enhanced pharmacological and oral pharmacokinetic profile of amphotericin B : Journal of Materials Chemistry B :10.1039/c5tb01258a
- Farrukh, A., Akram, A., Ghaffar, A., Tuncel, E., Oluz, Z., Duran, H., . . . Yameen, B. (2014). Surface-functionalized silica gel adsorbents for efficient remediation of cationic dyes. Pure and Applied Chemistry, 86(7), 177-1188.
- Yousaf, A., Farrukh, A., Oluz, Z., Tuncel, E., Duran, H., Doğan, S. Y., . . . Yameen, B. (2014). UV-light assisted single step route to functional PEEK surfaces. Reactive and Functional Polymers, 83, 70–75.



Title: Development of Novel Optically Clear High Refractive Index Photo-Curable Nano-Composites for Flat Panel Displays

PI: Dr. Habib Ur Rehman

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

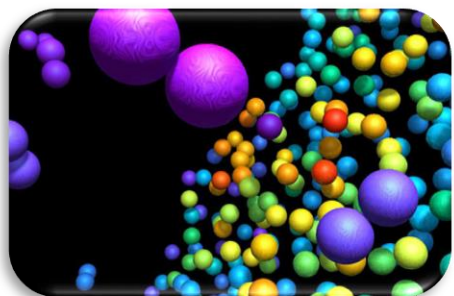
Project Initiated in: 2014

Duration: 12 Months

Category: Natural Sciences

Description: This research aims to utilize polymer brushing technique to synthesize functionalized Nano-particles of different metal oxides having very high refractive indices, and prepare novel high refractive index acrylate-nanocomposites based

photocurable materials. These materials are expected then to be tested for optical displays by making brightness enhancement films through UV embossing.



Title: Development of Optically Clear Novel High Refractive Index Photo-polymerizable Nano-composites for Light Management Films and their Applications in Flat Panel Display

PI: Dr. Habib Ur Rehman

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 13,786,200

Project Initiated in: 2015

Duration: 36 Months

Category: Natural Sciences

Description: This proposal aims to, utilize polymer brushing technique to synthesize functionalized metal oxide nanoparticles, preferably acrylate functionalized

nanoparticles of different metal oxides having high refractive indices, to prepare novel high refractive index acrylate-nano-composites based photo-polymerizable materials. These materials will then be tested for their light management potential in optical displays by making prismatic as well as microlens-based micro-structured brightness enhancement films through UV embossing. Finally recycling efficiencies of these films will be compared with the ones available in market.

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Profile: Dr. Hussain is among the founding members of SBA School of Science & Engineering (SSE), LUMS and has played a key role to lead the development of the Chemistry Department. Prior to joining LUMS, Dr. Hussain spearheaded research and development program in Nanobiotechnology at National Institute for Biotechnology & Genetic Engineering (NIBGE), Faisalabad, Pakistan, and developed a Nanobiotech group/facility for the synthesis of metal nanoparticles and explored their applications in biotechnology and advanced materials fabrication, which is now among the few best facilities in Pakistan. He has published more than 50 research articles in prominent journals including Nature Materials, Angewandte Chemie - Int. Ed., Advanced Materials, and Journal of the American Chemical Society, Small, ChemCommun, Langmuir, and Nanoscale. Dr. Hussain has developed several effective research collaborations with the leading research groups in USA, Europe, China (HUST), Saudi Arabia (KAUST) and several National Institutions in Pakistan. He has got several competitive National/International research grants to explore the applications of metal nanoparticles/ nanoclusters in Chemical/Biomedical Sciences and Renewable Energy Technologies.

Recent Publications:

- Javed, I., Hussain, S. Z., Shahzad, A., Khan, J. M., Rehman, M., Usman, F., & Hussain, I. (2016). Lecithin-Gold Hybrid Nanocarriers as Efficient and pH Selective Vehicles for Oral Delivery of Diacerein—In-Vitro and In-Vivo Study. *Colloids and Surfaces B: Biointerfaces*.
- Muhammad, G. a., Hussain, M.A.a , Ashraf, M.U.b, Haseeb, M.T.b, Hussain, S.Z.c, Hussain, I.c (2016). Polysaccharide based superabsorbent hydrogel from Mimosa pudica: Swelling-deswelling and drug release. [Article]. *RSC Advances*, 6(28), 23310-23317. doi: 10.1039/c5ra23088h
- Razzaque, S., Hussain, S. Z., Hussain, I., & Tan, B. (2016). Design and Utility of Metal/Metal Oxide Nanoparticles Mediated by Thioether End-Functionalized Polymeric Ligands. *Polymers*, 8(4), 156.
- Espinosa, A., Sohail, M., Habib, M., Naveed, K., Saleem, M., Rehman, H. U., Ahmad, S. (2015). Synthesis, crystal structure, theoretical calculations, and electrochemical and biological studies of polymeric (N,N,N',N'-tetramethylethylenediamine)bis(thiocyanato-κN)copper(II), [Cu(tmeda)(NCS)₂]_n. *Polyhedron*, 90, 252-257.
- Ihsan, A., Katsiev, H., Alyami, N., Anjum, D. H., Khan, W. S., & Hussain, I. (2015). From porous gold nanocups to porous nanospheres and solid particles - A new synthetic approach. *Journal of Colloid and Interface Science*, 446, 59-66. : 10.1016/j.jcis.2014.12.091



Title: Development of Ultrasensitive, Robust and Affordable Nanoparticle-Based Test Strips for Detecting Bacteria

PI: Dr. Irshad Hussain

Co-PI: Dr. Sohail Asif Qureshi

Sponsor: Higher Education Commission (HEC) and U.S. Agency for International Development (USAID)

Funding Amount: PKR 33,080,474

Project Initiated in: 2013

Duration: 36 Months

Category: Health

Description: The goals of the research are to develop an ultrasensitive, robust and affordable method that can be used for detecting bacteria in drinking water. A key attribute of the programme is the porting of nanotechnology to an inkjet platform, facilitating both small-scale innovation and large-scale manufacturing of these systems. The test strips may be used to rapidly and effectively detect contaminated water and serve as a first step towards preventing outbreak of diseases.



Title: Synthesis and Characterization of Metal Nanoparticles Chemicals and Consumables

PI: Dr. Irshad Hussain

Co-PI: Dr. Najeeb Ullah (UET Peshawar)

Sponsor: UET, Peshawar

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 24 Months

Category: Health

Description: Dr. Irshad Hussain received funding for Synthesis and Characterization of Metal nanoparticles Chemicals and consumables from UET Peshawar.



Title: Development of Nanoparticles-Based Sensitive Method for the Detection of Bacteria in Drinking Water

PI: Dr. Irshad Hussain

Co-PI: Shaper Mirza

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 990,000

Project Initiated in: 2016

Duration: 12 Months

Category: Health

Description: It is extremely important to have proper domestic, municipal and industrial wastewater disposal and effective treatment plants for drinking water with appropriate maintenance and monitoring at all times. In particular, the bacterial detection assay

needs to be sensitive and accessible to common man for on-site monitoring of drinking water for bacterial contamination. The monitoring of microbial contamination of drinking water is of a paramount importance for public health and food safety to minimize the risk of outbreak of waterborne diseases. The purpose of this proposal is, therefore, to supplement the funds for the purchase of chemicals and consumables to enable clean drinking water, Furthermore the proposal will also help us better understand the interaction of bacteria with nanoparticles. This information will later be harnessed for developing projects to combat multidrug resistance in pathogenic bacteria.

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Profile: Dr. Saeed is an Associate Professor at the Department of Chemistry/SBASSE, LUMS. He received his M.Sc. in chemistry from the University of the Punjab, Lahore, Pakistan with distinction (Punjab University topper with Gold Medal) in 1996. Before his PhD research, he served at Research Assistant/Research Officer at H.E.J. Research Institute of Chemistry, University of Karachi. During this time he was awarded DAAD fellowship to conduct PhD research at the University of Tübingen, Germany under the supervision of Prof. Dr. h.c. (mult.) Wolfgang Voelter. In 2000, he was selected by the DAAD to represent its students in the 50th Annual Nobel Laureate Meeting at Lindau, Germany. By 2001, he was able to synthesize several natural products and their unnatural analogs, which earned him a PhD degree from the University of Tübingen in the span of less than three years. From 2001 to 2009, Dr. Saeed conducted post-doctorate research in the area of chemical carcinogenesis and cancer biology, by investigating the metabolism of estrogens, formation of genotoxic metabolites and their reactions with DNA to induce cancer-specific mutations, and the initiation of cancer. He has published more than 40 peer-reviewed articles in reputed international journals, such as Journal of Biological Chemistry, International Journal of Cancer, Free Radical Biology and Medicine, Chemical Research in Toxicology, and Tetrahedron Letters and has presented his research in several National and International meetings and conferences.

Recent Publications:

- Nilaweera, T. D., Saeed, M., & Kohen, A. (2015). Targeting the de Novo Biosynthesis of Thymidylate for the Development of a PET Probe for Pancreatic Cancer Imaging. *Biochemistry*, 54(5), 1287-1293.
- Saeed, M. U., Chen, Z., Chen, Z., & Li, B. (2014). Compression behavior of laminated composites subjected to damage induced by low velocity impact and drilling. *Composites Part B: Engineering*, 56, 815-820.

Most Cited Publications:

- Abdel-Jalil, R. J., Voelter, W., & Saeed, M. (2004). A novel method for the synthesis of 4 (3H)-quinazolinones. *Tetrahedron letters*, 45(17), 3475-3476.
- Cavalieri, E. L., Li, K. M., Balu, N., Saeed, M., Devanesan, P., Higginbotham, S., & Rogan, E. G. (2002). Catechol ortho-quinones: the electrophilic compounds that form depurinating DNA adducts and could initiate cancer and other diseases. *Carcinogenesis*, 23(6), 1071-1077.



Title: Isolation, purification and characterization of protein(s) that are modulated by estrogen-DNA depurinating adducts to induce cancer-specific mutations and drug resistance

PI: Dr. Muhammad Saeed

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Health

Description: This project is focused on the isolation, purification and characterisation of the protein(s) involved in generation of mutations by the estrogen-DNA depurinating

adducts. In this regard we aim to synthesize modified depurinating estrogen-DNA adducts containing linkers, which will be utilised to prepare an affinity-based solid support (beads or resin) to furnish affinity-columns for selective retention of the proteins of interest from a complex cellular protein extract. Purified protein(s) will be structurally and functionally characterised by several spectroscopic methods. Discovery of these proteins will be a big step toward unraveling the mechanism of the induction of mutations and cancer initiation by estrogens and will provide new targets for biomarkers development and therapeutic targets for breast cancer intervention.



Title: Antiviral Drug Design by Targeting Viral Specific Proteases

PI: Dr. Muhammad Saeed

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2016

Duration: 12 Months

Category: Health

Description: Dengue Fever (DF) is a clinical manifestation of infection by dengue virus (DENV), which, in most cases, is very mild and self-healing ailment. Nevertheless, development of DF to dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) can be fatal and life threatening. Currently, there is no therapeutic treatment or

vaccine against DENV infection. Conventional practice to tackle DENV infection involves extensive use of insecticides to curb the transmitting mosquitos. This approach has many negative effects, both on the ecosystem, as well as on the environment. Thus, an alternative approach based on the development of specific drugs against DENV infections is highly desired. Viral specific protease enzyme is a promising drug target. The DENV protease is essential for the maturation and proliferation the virus. Recently, several X-ray co-crystal structures of DENV protease with the substrate have been solved and provided details on the interactions of the substrate for its catalytic activity. The chemical environment of the active site can be exploited for designing small organic molecules as inhibitors of the protease. Therefore, the main objective of this pilot project is to structurally characterize the DENV protease, followed by designing and synthesizing potent inhibitors.

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Profile: Dr. Muhammad Zaheer earned his MPhil degree from Quaid-i-Azam University. In 2009, he was awarded with HEC Overseas Scholarship for PhD studies in Germany. He completed his degree under the supervision of Prof. Dr. Rhett Kempe from the University of Bayreuth. During his PhD, he worked on the development of robust heterogeneous catalysts for sustainable chemistry applications including biomass transformation into fuels and chemicals. Dr. Zaheer has got published papers in the scientific journals of high impact like Chemical Society Reviews and Chemistry of Materials. He was a post-doctoral fellow at the Department of Inorganic Chemistry, University of Bayreuth before joining LUMS as an assistant professor. His research interests include the development of heterogeneous catalysts for the conversion of biomass to obtain fuels/chemicals, renewable energy generation/storage and green chemistry.

Recent Publications:

- Zaheer, M., & Kempe, R. (2015). Catalytic Hydrogenolysis of Aryl Ethers: A Key Step in Lignin Valorization to Valuable Chemicals. *ACS Catalysis*, 5(3), 1675-1684.
- Zaheer, M., Hermansdörfer, J., Kretschmer, W. P., Motz, G., & Kempe, R. (2014). Robust heterogeneous nickel catalysts with tailored porosity for the selective hydrogenolysis of aryl ethers. *ChemCatChem*, 6(1), 91-95.
- Zaheer, M. P. M. (2013). Design of Robust Heterogeneous Catalysts for Sustainable Chemistry (Doctoral dissertation, University of Bayreuth).

Most Cited Publications:

- Shah, A., Zaheer, M., Qureshi, R., Akhter, Z., & Nazar, M. F. (2010). Voltammetric and spectroscopic investigations of 4-nitrophenylferrocene interacting with DNA. *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 75(3), 1082-1087.
- Shah, A., Zaheer, M., Qureshi, R., Akhter, Z., & Nazar, M. F. (2010). Voltammetric and spectroscopic investigations of 4-nitrophenylferrocene interacting with DNA. *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 75(3), 1082-1087.



Title: Green Catalytic Conversion of Waste Paper to Fuels and Chemicals

PI: Dr. Muhammad Zaheer

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 860,000

Project Initiated in: 2015

Duration: 12 Months

Category: Environment

Description: Current project aims to design robust heterogeneous catalysts based on polymer derived SiCN ceramics with catalytically active metal (Ni, Pd and Ni/Pd) nanoparticles (NPs) on surface. The beauty of the design lies in the fact that Si-C-N network can stabilize very small NPs (which would provide high activity) firmly so that

metal leaching is avoided. Basicity of the support and synergic catalysis (in the case of the bimetallic Ni/Pd catalyst) may be helpful in the selective cleavage of ether and glycosidic bonds of the solid biomass (using waste paper as a model) leading to the depolymerization of it into soluble sugar compounds which would be upgraded catalytically to produce chemical and fuels. The project would not only be helpful in the solid waste management of the local industry (sugar, paper) but could also contribute significantly in the global effort for scaling up and commercialization of biomass conversion processes.



Title: Catalytic Conversion of Agricultural Waste into Potential Fuels and Chemicals

PI: Dr. Muhammad Zaheer

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 9,401,250

Project Initiated in: 2015

Duration: 36 Months

Category: Environment

Description: This project focuses on the utilization of chemical methods in order to derive chemicals from rice husk and potentially gears about its selective degradation to simple molecules, playing with these simple molecules to prepare chemicals of industrial importance including solvents, fuels (e.g., ethanol) building blocks of polymers (e.g., nylon, PET) and finally preparation of the materials by which the aforementioned processes can be achieved.

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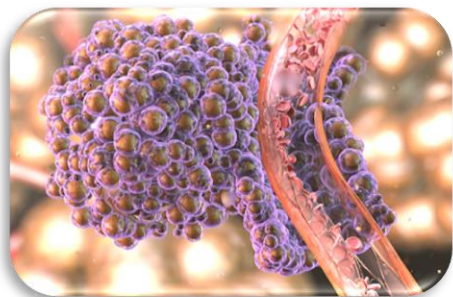
Profile: Dr. Saleem joined LUMS in 2012 and since then he has been actively developing his drug discovery research group. He is interested in the synthesis of the libraries of novel molecules that could modulate various cellular proteins involved in the cell cycle (notably kinases (Aurora kinases), centrosome clustering, Phosphohistone 3P, MDM2-p53, AAA+ ATPase & 12-TM), development of new methodologies to access novel scaffolds, novel ligands for nanoparticle and the isolation, characterisation & synthesis of the natural products of biological importance and food & toxicology. Dr. Saleem is also actively involved in the collaborative research across various departments in different universities to advance the scientific output and help the students with his expertise. Earlier, he obtained his MSc in Chemistry from GC University, Lahore, Pakistan with distinction (Gold Medal and Academic Role of Honor) in 2002 and MPhil in Chemistry in 2004. He was awarded Orient Dr. Ata-ur-Rehman Chemistry Award & XIVth Star Award and was selected to present Pakistan in the 56th Meeting with Nobel Laureates in Lindau, Germany. In 2006, he obtained Fulbright scholarship for PhD in Chemistry at Michigan State University, USA and completed it in 2011. There, he worked at the interface of chemistry and biology and focused on various research projects aimed towards cancer research. During his PhD, Dr. Saleem synthesized natural products and their analogs aimed at inhibiting checkpoint kinase 2 and imidazole based inhibitors of NF- κ B pathway to study their binding interaction with proteasome 26S, developed the methodology for the synthesis of 1, 2, 4-triazoline and 1, 2, 4-triazoles via [2+3]-cycloaddition reactions of oxazolones and prepared photoaffinity labelled molecules to study the drug protein interaction.

Recent Publications:

- Saleem, R. S. Z., & Tepe, J. J. (2015). A concise total synthesis of hymenialdisine. *Tetrahedron Letters*, 56(23), 3011-3013.
- Mehnaz, S., Saleem, R. S. Z., Yameen, B., Pianet, I., Schnakenburg, G., Pietraszkiewicz, H., & Gross, H. (2013). Lahorenic acids A-C, ortho-dialkyl-substituted aromatic acids from the biocontrol strain *Pseudomonas aurantiaca* PB-St2. *Journal of natural products*, 76(2), 135-141.

Most Cited Publications:

- Saleem, R. S. Z., & Tepe, J. J. (2010). Synthesis of 1, 2, 4-triazolines and triazoles utilising oxazolones. *The Journal of organic chemistry*, 75(12), 4330-4332.
- Nguyen, T. N., Saleem, R. S., Luderer, M. J., Hovde, S., Henry, R. W., & Tepe, J. J. (2011). Radioprotection by hymenialdisine-derived checkpoint kinase 2 inhibitors. *ACS chemical biology*, 7(1), 172-184.



Title: Synthesis of tethered biaryls and their evaluation to selectively kill the cancer cells with supernumerary centrosomes

PI: Dr. Rahman Shah Zaib Saleem

Co-PI: Dr. Amir Faisal

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Natural Sciences

Description: Centrosome is an important organelle that plays a role in the cell cycle proliferation. The centrosomal amplification is observed in various tumors and provides

a basis for selectively targeting the cancer cells. In the current project, the aim is to explore this area by synthesizing a novel library of organic compounds and evaluating it against cancer cell lines and normal cell lines to assess the selectivity in killing the cancer cells and avoid side effects on the normal cells.

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Profile: Dr. Salman Noshear Arshad is an Assistant Professor of Chemistry in SBASSE, LUMS. He did his BS in Metallurgy and Materials Engineering from GIK Institute of Engineering Sciences and Technology, Pakistan. He then went to South Korea for Masters in Materials Science and Engineering from Korea Advanced Institute of Science and Technology (KAIST) under Korea Science and Engineering (KOSEF) fellowship. At KAIST he developed novel bottom-up methods to synthesize carbon nanotubes reinforced metal and ceramic nanocomposite materials with enhanced mechanical and multifunctional properties. His work was published twice in *Advanced Materials* (Impact Factor 14.8) with ~300 citations to date. On his return to Pakistan, he joined GIK Institute as Research Associate where he taught undergraduate courses in materials science and engineering and continued his research on carbon nanotubes reinforced nanocomposites. Dr. Arshad was awarded with Fulbright fellowship for graduate studies in University of Illinois at Urbana-Champaign (UIUC, USA). While at UIUC he did another Masters in Aerospace Engineering and PhD in Materials Science and Engineering. He developed optimised polymer and carbon nanofibers with modulated surfaces for enhanced strengthening and toughening for structural composite materials. This work earned him a US Patent. He also worked on developing bulk nanostructured alloys using severe plastic deformation with grain and second phase precipitate sizes on the order of 10 nm. His research work at UIUC was supported by grants from National Science Foundation and Office of Naval Research and got published in *Carbon*, *Polymer*, *Scripta Materialia*, *Acta Materialia*, and *Journal of Materials Research*.

Recent Publications:

- Dilpazir, S., Usman, M., Rasul, S., & Arshad, S. N. (2016). A simple UV-ozone surface treatment to enhance photocatalytic performance of TiO₂ loaded polymer nanofiber membranes. *RSC Advances*, 6(18), 14751-14755.
- Arshad, S. N., Lach, T. G., Ivanisenko, J., Setman, D., Bellon, P., Dillon, S. J., & Averbach, R. S. (2015). Self-organisation of Cu–Ag during controlled severe plastic deformation at high temperatures. *Journal of Materials Research*, 1-14.
- Ren, F., Arshad, S. N., Bellon, P., Averbach, R. S., Pouryazdan, M., & Hahn, H. (2014). Sliding wear-induced chemical nanolayering in Cu–Ag, and its implications for high wear resistance. *Acta Materialia*, 72, 148-158.
- Arshad, S. (2014). Shear induced mixing and self-organisation in immiscible alloys during severe plastic deformation (Doctoral dissertation, University of Illinois at Urbana-Champaign).

Most Cited Publications:

- Cha, S. I., Kim, K. T., Arshad, S. N., Mo, C. B., & Hong, S. H. (2005). Extraordinary Strengthening Effect of Carbon Nanotubes in Metal-Matrix Nanocomposites Processed by Molecular-Level Mixing. *Advanced Materials*, 17(11), 1377-81.
- Arshad, S. N., Naraghi, M., & Chasiotis, I. (2011). Strong carbon nanofibers from electrospun polyacrylonitrile. *Carbon*, 49(5), 1710-1719.



Title: Self-Cleaning Water Filter Based on Polymer Nanofibers for Bacterial and Viruses' Removal from Drinking Water

PI: Dr. Salman Noshear Arshad

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 981,090

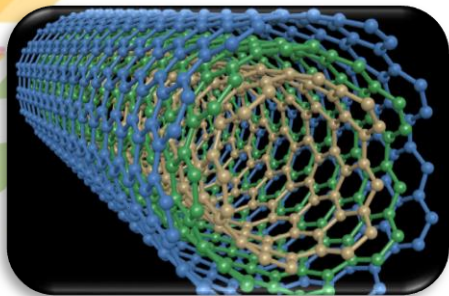
Project Initiated in: 2015

Duration: 12 Months

Category: Water

Description: This interdisciplinary project is focused on developing materials chemistry based strategies for bacterial and viral removal from water. A technologically mature process, electro spinning, will be utilised to obtain filters that can discriminate

nanoscale species in the water. These filters are actually commercially available. Electro spinning process will be developed in which nanofibers of relevant polymer or polymer blends will be doped with tailored bandgap oxide nanoparticles. The electro spun polymer mesh will carry out the filtering part, isolating bacteria and most viruses, whereas the oxide nanoparticles, through photo catalysis, will oxidize these species with the final product of the oxidation being CO₂ and H₂O.



Title: Surface Modulated Carbon Nanofibers for Enhanced Toughening in Nano-Composites

PI: Dr. Salman Nosheer Arshad

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 13,587,209

Project Initiated in: 2015

Duration: 36 Months

Category: Water

Description: This research proposal aims to investigate the performance of carbon nanofiber reinforced polymer nanocomposites where the surface of the carbon nanofiber will be tailored to maximize its performance. These large scale

nanocomposites will find applications as structural material, in automotive industry, and as sensors etc.



DEPARTMENT OF COMPUTER SCIENCE

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Profile: Dr. Arif Zaman was a member of the Statistics Department at Purdue University and later at Florida State University for 12 years before he joined LUMS in 1994. He has also published papers on generalizations of Markov chains, and on using computers to solve various theoretical problems in mathematics and statistics. His publications have been in various journals including: The Annals of Probability, Mathematics of Computation, Journal of Applied Probability, and Journal of Statistical Computation.

Selected Publications:

- A new class of random number generators G Marsaglia, A. Zaman the Annals of Applied Probability,
- Toward a universal random number generator G Marsaglia, A Zaman, WW Tsang Statistics & Probability Letters 9 (1), 35-39
- Monkey tests for random number generators, G Marsaglia, A. Zaman, Computers & mathematics with applications 26 (9), 1-10
- A random number generator for PC's, G Marsaglia, B Narasimhan, A. Zaman Computer Physics Communications 60 (3), 345-349
- Some portable very-long-period random number generators, G Marsaglia, A. Zaman Computers in physics 8 (1), 117-12



Title: Analysis of winning probabilities in Pakistan Prize Bonds

PI: Dr. Arif Zaman

Sponsor: K Legal Solicitors

Funding Amount: PKR 1,362,019

Project Initiated in: 2016

Duration: 12 Months

Category: Computer Vision

Description: The aim of this project is to deliver an expert witness report on the analysis of the probabilities of winning multiple lotteries in Pakistan Prize Bonds and an associated software used in computing the above mentioned probabilities.

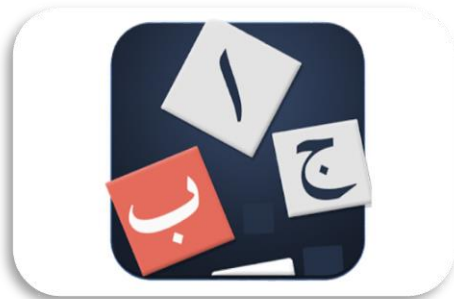
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Profile: Dr. Karim holds a B.Sc. degree from UET Lahore and a doctorate from The Ohio State University (OSU). Before joining LUMS in 2002, he worked as a research associate in the Knowledge Engineering Lab at OSU. Dr. Karim is an internationally recognized researcher in the areas of data mining, machine learning, and applied artificial intelligence. He has authored over 50 articles at leading venues including two books and 19 journal articles. At LUMS, Dr. Karim has been instrumental in developing and strengthening the graduate program in data mining and machine learning. He is founding director of the Knowledge and Data Engineering Lab, which is the center of his research activities. The lab's recent publication venues include ICDM, CIKM, PAKDD, and COLING. Dr. Karim has supervised four PhD graduates in the data mining/machine learning area.

Recent Publications:

- Babar, Z., Mannan, A., Kamiran, F., & Karim, A. (2015, November). Understanding the Impact of Socio-Economic and Environmental Factors for Disease Outbreak in Developing Countries. In 2015 IEEE International Conference on Data Mining Workshop (ICDMW) (pp. 124-131). IEEE.
- Hassan, M. T., Karim, A., Kim, J. B., & Jeon, M. (2015). CDIM: Document Clustering by Discrimination Information Maximization. Information Sciences, 316, 87-106. doi: 10.1016/j.ins.2015.04.009
- Iqbal, M., Karim, A., & Kamiran, F. (2015, April). Bias-aware lexicon-based sentiment analysis. In Proceedings of the 30th Annual ACM Symposium on Applied Computing (pp. 845-850). ACM.



Title: Modeling and Normalizing Roman-Urdu Text for Automatic Processing

PI: Dr. Asim Karim

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 930,000

Project Initiated in: 2016

Duration: 12 Months

Category: Technology

Description: Roman-Urdu is widely used in online textual communications in Pakistan. From SMS messages to Twitter tweets users compose predominantly Urdu content using English alphabets. This writing style has developed to the extent that serious communications like public service messages and advertisements are also being done

in Roman-Urdu. Currently, there is no acceptable standard for Roman-Urdu writing, nor is there a reliable way of processing Roman-Urdu text for applications like event detection, topic modeling, and sentiment analysis. The goal of this project is to identify variants of the same word and map all those variants to its normal form. The prime objective is to focus on statistical natural language processing techniques to model and normalize Roman-Urdu text.



Title: An Open-Source Project for Accessible LaTeX-based Authoring and Presentation of Mathematical Documents

PI: Dr. Asim Karim

Sponsor: ICT R&D Fund

Funding Amount: PKR 12,525,099

Project Initiated in: 2015

Duration: 28 Months

Category: Computer Vision

Description: The primary purpose of this project is to develop ALAP, an integrated Accessible LaTeX-based Authoring and Presentation software for PVI. ALAP will provide advanced math-to-speech and basic math-to-Braille capabilities. ALAP will be developed

with open-source technologies to enable its widespread usability. As part of this project, existing technologies for accessible math will also be evaluated. The primary beneficiaries of this project are PVI in general and those in Pakistan specifically, and educational and business organizations dealing with mathematical content.

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Profile: Basit Shafiq received his BS degree in Electronic Engineering from GIK Institute of Engineering Sciences and Technology, Pakistan, MS and PhD degrees in Electrical and Computer Engineering from Purdue University, USA. He is currently an Assistant Professor in the Computer Science Department at LUMS. Prior to joining LUMS, he was a Research Assistant Professor at the Centre for Information Management, Integration and Connectivity (CIMIC), Rutgers University, USA. Dr. Shafiq's interests include information systems security and privacy, access-control management in distributed systems, Web services composition and verification, ontologies, and distributed multimedia systems. His research work resulted in several publications in well-renowned journals, including, IEEE Transactions on Knowledge and Data Engineering, ACM Transactions on Information and System Security, IEEE Transactions on Multimedia, IEEE Transactions on Service Computing, IEEE Computer, IEEE Communications Magazine, and Journal on Information and Computer Systems.

Recent Publications

- Irshad, H., Shafiq, B., Vaidya, J., Bashir, M. A., Asif, H. S., Ghayyur, S., ... & Nabil, A. (2015). A Privacy-Sensitive Collaborative Approach to Business Process Development. In E-Business and Telecommunications (pp. 318-342). Springer International Publishing.
- Vaidya, J., Shafiq, B., Atluri, V., & Lorenzi, D. (2015). A Framework for Policy Similarity Evaluation and Migration Based on Change Detection. In Network and System Security (pp. 191-205). Springer International Publishing.
- Irshad, H., Shafiq, B., Vaidya, J., Bashir, M. A., Shamail, S., & Adam, N. Preserving Privacy in Collaborative Business Process Composition.
- Vaidya, J., Shafiq, B., Fan, W., Mehmood, D., & Lorenzi, D. (2014). A random decision tree framework for privacy-preserving data mining. Dependable and Secure Computing, IEEE Transactions on, 11(5), 399-411.
- Lorenzi, D., Vaidya, J., Shafiq, B., Chun, S., Vegesna, N., Alzamil, Z., & Atluri, V. (2014, June). Utilising social media to improve local government responsiveness. In Proceedings of the 15th Annual International Conference on Digital Government Research (pp. 236-244). ACM.



Title: Codec: Composition and Management of E Government Processes in the Cloud of Public Services

PI: Dr. Basit Shafiq

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 960,000

Project Initiated in: 2015

Duration: 12 Months

Category: Technology

Description: Governments are increasingly investing in their information technology (IT) for provisioning of e-government services. These e-government services can be composed as workflow for realization of intra-departmental or inter-departmental

government processes replacing the paper-based information exchange between different government departments with electronic information exchange. To address the IT infrastructure ownership and management issues, governments are increasingly adopting cloud infrastructure for hosting and deployment of their e-government services. This project addresses the issue of collaborative business process composition through research and development. Specifically, the objective is to develop a framework that enables generation of an executable business process from the high level design specification in an automated manner. The basic idea is to exploit the knowledge of the existing business processes of related organisations to compose an executable business process of a given organisation based on its requirements and design specifications.



Title: Codec: Composition and Management of E Government Processes in the Cloud of Public Services

PI: Dr. Basit Shafiq

Co-PI: Dr. Shafay Shamail, Prof. Nabil Adam (Rutgers University)

Sponsor: Higher Education Commission (HEC)

External Collaboration: Rutgers University

Funding Amount: PKR 20,136,738

Project Initiated in: 2015

Duration: 36 Months

Category: Technology

Description: The objective of the proposed work is to develop a middleware based

system (called Codec) to support composition and management of e-government processes by utilizing the services available in the Government Cloud or Public Cloud. The term Government Cloud is used to refer to the cloud infrastructure that hosts the e-government services provided by different government departments but managed by a single cloud service provider which may be a government department. Whereas, Public Cloud infrastructure hosts services provided by commercial or non-governmental service providers (e.g., Amazon, Google). Together, both Government Cloud and Public Cloud form the "Cloud of Public Services." The proposed Codec system will provide the modeling of the e-government process requirement specifications; composition of an executable e-government process from services available in the "Cloud of Public Services" and the process of re-engineering.



Title: A Privacy-Preserving Framework for Collaborative Business Process Composition

PI: Dr. Basit Shafiq

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 450,000

Project Initiated in: 2013

Duration: 12 Months

Category: Development Management

Description: This project addresses the issue of collaborative business process composition through research and development. Specifically, the objective is to develop a framework that enables generation of an executable business process from the high level design specification in an automated manner. The basic idea is to exploit the

knowledge of the existing business processes of related organisations to compose an executable business process of a given organisation based on its requirements and design specifications.



Title: Information Sharing and Integration and Framework for Emergency Management and Response

PI: Dr. Basit Shafiq

Co-PI: Prof. Sohaib Ahmad Khan, Prof. Shahab M. Baqai

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 3,278,705

Project Initiated in: 2015

Duration: 24 Months

Category: Technology

Description: The objective of the proposed work is to address the research and development challenges for development of a decision support system for emergency

response planning and management. Such a system will enable shared situational awareness (SSA) and common operating picture (COP) among the relevant organizations (governmental, NGOs, private) for the purpose of providing effective decision support concepts at the operational and strategic levels during different phases of an emergency situation (prevention, response, and recovery).



Title: End-to-End Solution for Business Process Composition and Management (BP-Com)

PI: Dr. Basit Shafiq

Co-PI: Naveed Arshad, Dr. Shafay Shamail, Prof. Abdul Aziz

Sponsor: ICT R&D Fund

Funding Amount: PKR 12,764,045

Project Initiated in: 2014

Duration: 24 Months

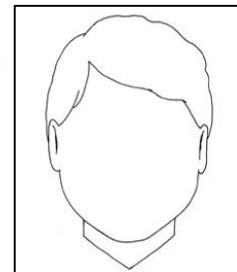
Category: Technology

Description: The project aims at improving efficiency and reducing cost for development, deployment, and management of business processes (BPs) for small and

medium enterprises (SMEs). Specifically, the objective is to utilize the cloud-based services and resources for rapid development and deployment of BPs for SME organizations that cannot bear with the high cost of personnel and software/hardware resources for coding, administration, and hosting of their business processes.

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Profile: Dr. Hamid Abdul Basit did his bachelors from Ghulam Ishaq Khan Institute of Engineering Sciences and Technology (GIKI) in 2000 and his PhD from National University of Singapore in 2007 on the analysis and semi-automated detection of similarity patterns in software. He worked as a post-doctoral researcher in the Software Engineering Lab at NUS in 2006-2007 on the extraction of software design from software similarities. Dr Hamid developed a tool called Clone Miner for recovering higher-level similarity patterns in software using state-of-the-art string algorithms and data mining techniques. The results were presented at top software engineering conferences.

Recent Publications:

- Basit, H. A., Hammad, M., Jarzabek, S., & Koschke, R. (2015). What do we need to know about clones? deriving information needs from user goals. Paper presented at the 2015 IEEE 9th International Workshop on Software Clones, IWSC 2015 - Proceedings
- Basit, H. A., Khan, H. S., Hamid, F., & Suhail, I. (2015). Tool support for managing method clones. Paper presented at the 2015 IEEE 9th International Workshop on Software Clones, IWSC 2015 - Proceedings.
- Basit, H. A., Hammad, M., & Koschke, R. (2015, September). A survey on goal-oriented visualization of clone data. In Software Visualization (VISUOFT), 2015 IEEE 3rd Working Conference on (pp. 46-55). IEEE.
- Basit, H. A., Ali, U., Haque, S., & Jarzabek, S. (2012). Things structural clones tell that simple clones don't.
- Basit, H. A., Ali, U., & Jarzabek, S. (2011). Viewing simple clones from structural clones' perspective.



Title: Design and Implementation of a Language-Independent Software Clone Management Tool Suite for Single and Multiple Systems

PI: Dr. Hamid Abdul Basit

Co-PI: Dr. Shafay Shamail

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2014

Duration: 12 Months

Category: Technology

Description: The goal of this project is to develop a prototype tool for complete clone management capability. This includes an integrated environment where developers can

locate and mark clones, track them across the different versions of a software system, create a generic representation of a group of clones automatically, and generate new variants of a given clone using the generic representation.



Title: Research and Development of a Cloud-based Systematic Code Reuse Platform for Public Administration Web Services

PI: Dr. Hamid Abdul Basit

Co-PI: Dr. Basit Shafiq

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Technology

Description: The overall goal of our proposed cloud-based reuse platform for Public Administration (PA) systems is to enable the development of new PA systems using

reusable artifacts extracted from existing e-government systems and services. These artifacts will be searched using simple keywords, which would provide the developer with appropriate reusable code artifacts to implement and integrate desired functionality in a time and effort efficient manner. The basis of this research is the integration of solutions offered by independent research areas from software engineering, data mining and service oriented architecture to provide a robust multifaceted solution. The major areas of research include code reuse, code mining, reusable code repositories, keyword based code search, and cloud computing.



Title: Design and Implementation of a Language Independent Software Clone Management Tool Suite for Single and Multiple Systems

PI: Dr. Hamid Abdul Basit

Co-PI: Dr. Shafay Shamail, Dr. Basit Shafiq

Sponsor: National ICT R&D Fund

External Collaboration: Softech Systems

Funding Amount: PKR 17,099,617

Project Initiated in: 2015

Duration: 24 Months

Category: Technology

Description: Pakistan has a growing software industry with revenues exceeding couple

of billion dollars. This project proposal aims to design and develop the prototype of a software engineering tool to be used by the software development organizations. The tool will capitalize on the untapped potential of software similarities (code clones) that abound in existing software systems, helping our software industry to increase its efficiency in software development, and to enhance its potential to capture new customers and new market segments globally.

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Profile: Ihsan Ayyub Qazi received his BSc (Hons) degree from the Lahore University of Management Sciences (LUMS), Pakistan with a double major in Computer Science and Mathematics, in 2005, and the PhD degree in Computer Science from the University of Pittsburgh, PA, in 2010. From 2010 to 2011, he was a Postdoctoral Research Fellow with the Centre for Advanced Internet Architectures, Australia. In 2009, he worked at BBN Technologies, Cambridge, MA USA on the Global Environment for Network Innovations (GENI) project. His research interests are in computer networks and distributed systems and span cloud computing and data centres, high speed wireless networks, smart grids, and performance modelling of networked systems. He has published in top-tier networking journals, such as IEEE/ACM Transactions on Networking, as well as top-tier conferences (e.g., ACM SIGCOMM and IEEE INFOCOM). He is the recipient of the Andrew Mellon Fellowship and the Best Graduate Student Research Award from the University of Pittsburgh in 2009. His research has been sponsored by the United States National Science Foundation (NSF), Australian Research Council (ARC), University of Pittsburgh, and LUMS. He is a member of ACM and IEEE.

Recent Publications:

- Hafeez, U. U., Kashaf, A., Mushtaq, A., Zaidi, H., Qazi, I. A., & Uzmi, Z. A. (2015, December). Mitigating Datacenter Incast Congestion Using RTO Randomization. In 2015 IEEE Global Communications Conference (GLOBECOM) (pp. 1-6). IEEE.
- Nisar, A., Kashaf, A., Uzmi, Z. A., & Qazi, I. A. (2015, November). A Case for Marrying Censorship Measurements with Circumvention. In Proceedings of the 14th ACM Workshop on Hot Topics in Networks (p. 2). ACM.
- Pirzada, H. A., Mahboob, M. R., & Qazi, I. A. (2015, August). eSDN: Rethinking Datacenter Transports Using End-Host SDN Controllers. In Proceedings of the 2015 ACM Conference on Special Interest Group on Data Communication (pp. 605-606). ACM.
- Mushtaq, A., Ismail, A. K., Wasay, A., Mahmood, B., Qazi, I. A., & Uzmi, Z. A. (2015). Rethinking buffer management in data center networks. Paper presented at the Computer Communication Review.



Title: A High Performance Cloud Data Center Architecture Using Software-Defined Networks

PI: Dr. Ihsan Ayyub Qazi

Co-PI: Dr. Zartash Afzal Uzmi

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 5,612,842

Project Initiated in: 2015

Duration: 24 Months

Category: Technology

Description: The goals of this paper are to: (i) design and analyse a high performance cloud data centre network architecture using Software-Defined Networks (SDNs) to

address critical challenges of performance and efficiency in such environments; (ii) design and analyse a scalable and low-complexity framework (including protocols and algorithms) for monitoring and managing cloud data centre resources, and (iii) implement a prototype and demonstrate the efficacy of the proposed scheme in achieving high performance. The proposed architecture has many advantages, including high performance due to its ability to manage cloud resources using a distributed control framework for the SDN traffic, scalable monitoring by using a framework that collects statistics from network devices in an efficient manner, as well as scalability of SDN management, leveraging the hierarchical structure of data centre topologies and the use of low-complexity algorithms for coordination.



Title: Towards Predictable and Resilient Multi-Tenant Cloud Datacenters
PI: Dr. Ihsan Ayyub Qazi
Co-PI: Dr. Zartash Afzal Uzmi, Dr. Fahad Rafique Dogar (Assistant Professor, Computer Science Department, Tufts University, USA)
Sponsor: LUMS Faculty Initiative Fund (FIF)
Funding Amount: PKR 960,000
Project Initiated in: 2015
Duration: 12 Months
Category: Technology

Description: Users increasingly rely on cloud computing services for managing their computation, storage and communication requirements. Thus, a key goal for cloud

datacentres is to provide predictable performance to tenants. Unpredictable performance is not only a key hindrance to cloud adoption but also hurts application performance and causes provider loss. While prior works improve predictability by guaranteeing each tenant a certain minimum network bandwidth, they ignore an important reality of datacentres: failures. The goals of this project are as follows: (i) to analyse the resilience properties of existing data centre topologies (e.g. FatTree and Jellyfish) under realistic datacentre workloads; (ii) to design, analyse and implement resource management techniques for providing resilience (including design of the control plane and the data plant) in datacentre architecture; (iii) to quantify the cost of providing resilience on datacentre topologies (the cost is usually in terms of cloud resources such as replicas of VMs and backup network bandwidth reservations); (iv) to design new datacentres topologies with predictable performance and resilience to failures as first order goals.



Title: Joint Congestion Control and Load Balancing in Cloud Data Centers Using SDN
PI: Dr. Ihsan Ayyub Qazi
Sponsor: National ICT R&D Fund
Funding Amount: PKR 79,500
Project Initiated in: 2015
Duration: 8 Months
Category: Technology

Description: By using end-host SDN controllers at the end hosts, the project aims to vastly improve the performance of data center networks. The objective is to conduct a thorough analysis of the designed protocol on a real test bed as well as in simulations and reach a working deployable implementation of the SDN-based protocol and a

detailed measurement study. The intent is to build efficient and low cost data centers for developing regions like Pakistan. Improved management of data center resources will allow for high performance at low costs. Moreover, it will allow dynamic power management techniques for reducing electricity costs in such data centers. This will benefit the Governments, NGOs, and Universities.



Title: RoWiFi: Long Distance WiFi with Rotating Antennas
PI: Dr. Ihsan Ayyub Qazi
Sponsor: National ICT R&D Fund
Funding Amount: PKR 86,250
Project Initiated in: 2015
Duration: 8 Months
Category: Technology

Description: This project aims to implement a wireless rate-adaptation scheme suitable for a rotating system that suffers from disconnections at large distances when the antenna faces away. The experimentation involves generating sample network traffic using the iperf traffic generator. This will involve sending traffic from the central

rotating node to receiving devices at long distances and study the effect on connectivity.



Title: Centralized Wireless Local Area Networks (WLANs)

PI: Dr. Ihsan Ayyub Qazi

Sponsor: National ICT R&D Fund

Funding Amount: PKR 70,000

Project Initiated in: 2014

Duration: 12 Months

Category: Technology

Description: In Wireless Local Area Networks (WLANs) access points operate independently and the lack of coordination among them affects network performance in several. The goal of this project is to design and implement a centralized controller for WLANs which knows the overall network state and can configure parameters of all

the access points in a network to maximize performance gains. In a centralized WLAN system, there are many opportunities to enhance the throughput of the network. A centralized controller which is aware of the global state, knows the network topology, and can differentiate between different traffic types has the potential to significantly increase the performance of a WLAN.



Title: Efficient and Resilient Datacenter Architecture

PI: Dr. Ihsan Ayyub Qazi

Sponsor: National ICT R&D Fund

Funding Amount: PKR 70,000

Project Initiated in: 2014

Duration: 12 Months

Category: Technology

Description: The aim of this project is to produce a working real test bed implementation of efficient and resilient datacenter as well as a flow-level simulator that will be able to reserve more primary bandwidth than previous implementation while keeping the probability of service level agreement (SLA) violations low this project is

that data centers would be able to accommodate more customers at the end of this project. As a result, hopefully, we should see more support and infrastructure available for users in Pakistan such that they would be able to avail the facility of cloud computing more easily. Especially as more customers could be accommodated with less requirements.

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Profile: Dr. Awais received his PhD from Imperial College, University of London. Prior to joining LUMS, Dr Awais conducted European Union research and development projects for a UK based SME. His PhD work was related to the development of on-line models for parametric estimation of solid fuel-fired industrial boilers. Dr Awais has also conducted research work on a class of iterative methods pertinent to Krylov subspaces for optimisation, such as the oblique projection and implicitly restarted model reduction methodologies.

Recent Publications:

- Khalid, A., & Awais, M. M. (2015). Comparing distance to consensus of collective relations using OWA operators. *Journal of Intelligent and Fuzzy Systems*, 28(4), 1647-1657. doi: 10.3233/ifs-141450
- Rana, Z.A., Mian, M.A., Shamail, S. (2015) Improving Recall of software defect prediction models using association mining: *Knowledge-Based Systems*. DOI: 10.1016/j.knosys.2015.10.009
- Javaid, M. M., Yousaf, M. A., Sheikh, Q. Z., Awais, M. M., Saleem, S., & Khalid, M. (2015, November). Real-Time EEG-based Human Emotion Recognition. In *Neural Information Processing* (pp. 182-190). Springer International Publishing.
- Baig, M. M., El-Alfy, E. S. M., & Awais, M. M. (2015, November). Learning Rule for Linear Multilayer Feedforward ANN by Boosted Decision Stumps. In *Neural Information Processing* (pp. 345-353). Springer International Publishing.
- Mateen, A., Raza, B., Sher, M., Awais, M. M., & Mustapha, N. (2014). Workload management: A technology perspective with respect to self-*characteristics. *Artificial Intelligence Review*, 41(4), 463–489.



Title: Knowledge Management for All - Tool (KMAT)

PI: Dr. Mian Muhammad Awais

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 2,429,067

Project Initiated in: 2015

Duration: 16 months

Category: Technology

Description: Knowledge is considered a broad concept and in the decade interest in treating and processing knowledge has grown tremendously. This importance has arisen due to the emphasis on knowledge economy. The interest in KM and KM systems has given a thrust to formalizing the domain of KM. In the recent past the

competitive edge which the application of KM systems has provided to organisations has further strengthened the belief in developing such systems. KM is a multi-dimensional and faceted concept. This project aims at developing a generic knowledge management system, Knowledge Management for All Tool (K-MAT) that would have the following features: (i) readily integrateable to most common existing DIMS, and legacy systems; (ii) Adaptable for any SME sector with complete KM control; (iii) Easily manageable by SMEs without incurring specialised human resource cost.

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Profile: Dr. Muhammad Fareed Zaffar is an Assistant Professor of Computer Science at the School of Science and Engineering (SBASSE) at LUMS. He holds a PhD in Computer Science from Duke University, with specialisation in network and distributed systems security. Prior to joining LUMS, Dr. Zaffar worked at IBM and SRI International. He has provided technical assistance to the National Judicial Automation Commission (NJAC) in finding technology based interventions in order to facilitate transport and efficient management of the judicial system in Pakistan. Dr. Zaffar's research interests include Network and Distributed Systems Security as well as in networking, storage systems, computer architecture, as well as performance evaluation and distribution systems.

Selected Publications:

- Farooqi, S., Zaffar, F., & Zaffar, M. A. (2015). Who's holding the bag? Accountability in the criminal justice system.
- Lakhani, H., & Zaffar, F. (2014). Covert channels in online rogue-like games. Paper presented at the 2014 IEEE International Conference on Communications, ICC 2014.
- Rahman, A., Nawaz, H., Naem, O., Zaffar, F., Naseer, F., & Zaffar, A. (2014). c: Effective remote monitoring of courts (pp. 1906–1915). Presented at the Proceedings of the Annual Hawaii International Conference on System Sciences.
- Lakhani, H., Tahir, R., Aqil, A., Zaffar, F., Tariq, D., & Gehani, A. (2013). Optimized rollback and re-computation. Paper presented at the Proceedings of the Annual Hawaii International Conference on System Sciences
- Malik, T., Gehani, A., Tariq, D., & Zaffar, F. (2013) Sketching distributed data provenance. Vol. 426. Studies in Computational Intelligence (pp. 85-107).



Title: Access to Justice for Poor and Vulnerable Groups through Support to Legal and Civil Society Organisations and Judiciary in Punjab, Pakistan

PI: Dr. Muhammad Fareed Zaffar

Sponsor: Global Development Services International (GDSI)

Funding Amount: PKR 3,079,560

Project Initiated in: 2015

Duration: 10 months

Category: Law & Policy

Description: The proposed scope of work for this project includes documentation of up to date statistics and the preparation of flow-charts to understand existing processes in courts of Multan, Bahawalpur and Muzaffargarh. It will also include analysis of the

documented material with an aim to streamline laws and procedures to highlight service delivery gaps which can serve as foundation for any future interventions. More specifically, proposed scope of our project can be divided into the following parts: Documentation of up-to-date statistics as well as the parallel assessment of caseload and case processing times in prosecutor office.



Title: Learn While You Teach

PI: Dr. Muhammad Fareed Zaffar

Sponsor: Society for Advancement of Higher Education (SAHE)

Funding Amount: PKR 2,620,365

Project Initiated in: 2015

Duration: 13 months

Category: Education

Description: The project seeks to develop an android based application which will allow record attendance of teachers per visit as well as provide a video browsing menu for DTE to videos filtered by school, teachers and class. In addition to this, the android application will provide the facility to update videos to the tablet using cards, submit

data from the application to a central server and collect data in a manageable format. The android application will contain both English and Urdu Language support.



Title: Development of Software for Punjab Prosecution Department- SPPS Project

PI: Dr. Muhammad Fareed Zaffar

Co-PI: Dr. Sohaib Ahmad Khan

Sponsor: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Funding Amount: PKR 2,865,651

Project Initiated in: 2014

Duration: 12 Months

Category: Law & Policy

Description: The major problem lies in the tracking of files at different stages in the prosecution process. Dr. Muhammad Fareed Zaffar addresses the problem in four stages. Firstly, a detailed study of the business processes is expected to be conducted including identification of existing and potential bottlenecks. Secondly, an online

software prototype is expected to be developed to capture data at each entry and transition point in the lifecycle of a case. The aim is to make the interface as simple as possible so it does not add to the workload of prosecutors and junior staff. A minimum viable product is intended to be quickly developed and launched in the model prosecution branch. Thirdly, based on the feedback of users, the entry forms are considered to be enhanced and streamlined. Fourthly, the final version of the software and the lessons learned are expected to be documented and shared in the form of a report.



Title: Re-development of software (Prosecution Case Flow Management System) for public criminal prosecution services (PCPS) in Punjab.

PI: Dr. Muhammad Fareed Zaffar

Co-PI: Dr. Sohaib Ahmad Khan

Sponsor: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Funding Amount: PKR 2,924,995

Project Initiated in: 2015

Duration: 12 Months

Category: Law & Policy

Description: In order to propose a model to improve the overall prosecution process, Prosecution department facilitated a pilot effort in 2014 supported by GIZ to automate

the process flow to encourage maintenance of a live database to address these dated challenges. The technical support was provided by Technology for People Initiative at Lahore University of Management Sciences. The initiative was successful in highlighting the importance of IT-based systems in the department and the rollout in the field provided necessary lessons learnt by exposing shortcomings and challenges in its adoption in daily prosecutorial work. The steep learning curve during the pilot implementation provides a foundation for a redesign of the system, while incorporating the up-dated needs and requirements of the reforming prosecution department. This proposal highlights the Scope of Engagement by Technology for People Initiative, the technology partner, in the next phase of implementation, which concentrates on redesign and adaptation on current redefined needs based on lessons during first phase of pilot implementation.



Title: STATISTAN

PI: Dr. Muhammad Fareed Zaffar

Co-PI: Dr. Tariq Mahmood Jadoon, Dr. Suleman Shahid

Sponsor: United States Institute of Peace (USIP)

Funding Amount: PKR 7,858,630

Project Initiated in: 2016

Duration: 16 Months

Category: Development Management

Description: In this project Dr. Muhammad Fareed Zaffar under Technology for People Initiative (TPI), propose to develop an innovative data platform called Statistan: an open-access web tool that would allow users to visualize structured datasets using

maps and charts along with a sub-platform that aims to stimulate a culture of civic engagement with data and research by tracking the mood of the country across different times and after historic events.



Title: STATISTAN and MOODISTAN
PI: Dr. Muhammad Fareed Zaffar
Co-PI: Dr. Suleman Shahid
Sponsor: Center for Economic Research in Pakistan (CERP)
Funding Amount: PKR 1,885,410
Project Initiated in: 2016
Duration: 12 Months
Category: Development Management

Description: Dr. Fareed Zaffar along with TPI-LUMS will be developing a two-part data innovation platform that aims to expose policymakers, young researchers, NGOs and the public to high quality data and research in useful, interesting and compelling ways

as a means of increasing the demand and ability to use this information. The first platform, called Statistan, targets policymakers, researchers, journalists and NGOs to increase the availability of meaningful data and research on the specific issue areas in which they work. The second platform a mood analyzer, Moodistan, which will be able to evaluate how different media agencies report same news items and how the citizens' mood can be gauged from it.



Title: Improve Efficiency, reliability and trenchancy of the school education department by automating HR processes

PI: Dr. Muhammad Fareed Zaffar
Sponsor: Adam Smith International (ASI)
Funding Amount: PKR 5,344,979
Project Initiated in: 2015
Duration: 10 Months
Category: Development Management

Description: The overall objective of the project is to improve efficiency, reliability and transparency of the school education department by automating the HR processes. This system will enable the authorities to make informed decisions based on reliable

information, in a timely manner.

Dr. Muhammad Hamad Alizai

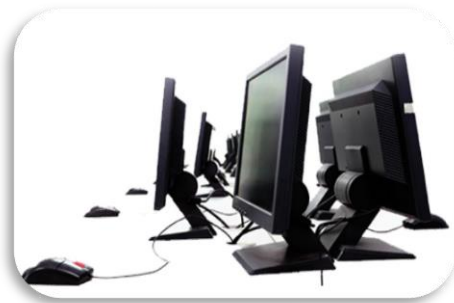
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Profile: Dr. Muhammad Hamad Alizai completed his BSc Computer Engineering from UET Peshawar, and his MSc in Software Systems Engineering and PhD in EE and CS from RWTH Aachen University, Germany. Dr. Alizai has over 10 years of experience in Germany and Pakistan as a researcher, software engineer, and technical lead both in industrial and academic settings. He has authored book, book chapters and published numerous scientific papers, while abroad and indigenously from Pakistan, several of them in top flight ACM SIG sponsored venues. He is experienced in leading innovative research projects in pervasive computing technologies such as Internet of things, sensor and delay tolerant networks, ICT4D, and mobile computing. He was employed as a software engineer in several European Union projects and has a wealth of experience in teaching/training cutting edge technologies and courses in theoretical and practical computer sciences at grad, post grad and professional level. He is also a visiting researcher at alma mater - ComSys, RWTH Aachen, Germany - due to his post graduate research excellence.

Most Cited Publications:

- Bhatti, N. A., Syed, A. A., & Alizai, M. H. (2015). Laser Based Energy Distribution Architecture for Decoupling Energy and Sensing Planes in WSN. International Journal of Distributed Sensor Networks, 2015.
- Munawar, W., Alizai, M.H., Landsiedel, O., Wehrle, K. (2015) Modular remote reprogramming of sensor nodes,.International Journal of Sensor Networks:
- Modeling and tools for network simulation - chapter 7 K Wehrle, M Günes, J Gross Springer Science & Business Media 2010
- KleeNet: discovering insidious interaction bugs in wireless sensor networks before deployment R Sasnauskas, O Landsiedel, MH Alizai, C Weise, S Kowalewski, Proceedings of the 9th ACM/IEEE International Conference on Information 2010



Title: iCompute

PI: Muhammad Hamad Alizai

Co-PI: Prof. Klaus Wehrle, RWTH Aachen University

Sponsor: German Pakistani Research Cooperation Programme (DAAD)

External Collaboration: RWTH Aachen University

Funding Amount: PKR 8,945,976

Project Initiated in: 2015

Duration: 24 Months

Category: Technology

Description: Miniaturized self powered devices are transforming the way we interact with everyday physical objects. These devices, as part of the Internet of Things (IoT),

embed computing in the physical world and deliver their data over a low-power, wireless mesh network. As these devices become smaller and more numerous, possibly the next billion, plugging them in to provide power is unfeasible. Computing at such scales is thus difficult to realize until these devices either find their own energy, possibly by harvesting ambient sources or charged wirelessly from a remote location, excluding the need for intrusive power infrastructure. However, ambient and wireless energy sources are both intermittent and unpredictable. Thus there is a need to adapt computing and communication to this new constraint of unpredictable and intermittent supply of energy: this requires revisiting basic assumptions about system startup, state checkpointing across activation cycles, discovering and communicating with neighbors, predicting future energy availability, and scheduling operations under energy uncertainty. The key idea of this proposal is to develop a new computing paradigm that will enable IoT devices to resume their operation, not restart from scratch, across different activation cycles.



Title: Intermittent Computing for the Intermittently Powered Internet of Things

PI: Dr. Muhammad Hamad Alizai

Co-PI: Dr. Tariq Mahmood Jadoon

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Technology

Description: The scope of this project is to investigate the challenges and implement a prototypical solution along the first dimension (system software) of IoT operation. The objective is to start a new research initiative at LUMS in this area, ultimately seeking

funds from national and international funding agencies for further investigations along the other two dimensions.



Title: Extending the Cyberphysical Systems R&D Paradigm using Energy Transference

PI: Dr. Muhammad Hamad Alizai

Co-PI: Dr. Syed Affan Ahmed – Director Engineering, PLUMgrid Inc.

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 5,207,031

Project Initiated in: 2016

Duration: 21 Months

Category: Technology

Description: The main objective of this project is to develop the world's first energy transference system to route energy from energy-abundant locations within a deployment to where the energy is most needed. An equally important objective is to

quantify the benefit of such an architecture, thereby convincing the academic, research and industrial communities of the viability of new and ground-breaking idea. Another objective is to identify and enable new and interesting, both to academia and the industry, applications that are enabled on through our proposed architecture. Due to the cutting-edge nature of this project, successful completion of this project will result in a number of highly visible research (conference and journal) publications. These publications can make Pakistan visible as a credible partner in the worldwide systems research community. This will bring positive visibility to the emerging research culture in Pakistani universities.

Dr. Murtaza Taj

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Profile: Dr. Taj earned his PhD and MSc degrees in electronic engineering and computer science from Queen Mary University of London (QMUL), United Kingdom, in 2009 and 2005, respectively. He received his BE (IT) degree (with distinction) in Engineering from Hamdard University, Pakistan, in 2003. Currently, he is holding the position of Visiting Assistant Professor at Lahore University of Management Sciences, Pakistan. His research interests are object detection and tracking using multimodal sensors. He has served as a reviewer for the IEEE Transactions on Circuits and Systems for Video Technology and the International Workshop on Content-Based Multimedia Indexing. He has also served as the Electronic Media Chair of IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS 2007).

Recent Publications:

- Hassan, A., & Taj, M. (2014). 2D articulated human pose tracking: A hybrid approach. Paper presented at the 2014 IEEE International Conference on Image Processing, ICIP 2014.
- Khalid, A. R., Hassan, A., & Taj, M. (2014). Efficient 2D human pose estimation using mean-shift. Paper presented at the 2014 IEEE International Conference on Image Processing, ICIP 2014.
- Khalid, A. R., Hassan, A., & Taj, M. (2014, October). Efficient 2D human pose estimation using mean-shift. In Image Processing (ICIP), 2014 IEEE International Conference on (pp. 3387-3391). IEEE.

Most Cited Publications:

- Maggio, E., Taj, M., & Cavallaro, A. (2008). Efficient multitarget visual tracking using random finite sets. Circuits and Systems for Video Technology, IEEE Transactions on, 18(8), 1016-1027.
- Taj, M., & Cavallaro, A. (2011). Distributed and decentralised multicamera tracking. Signal Processing Magazine, IEEE, 28(3), 46-58.



Title: Digital Preservation Pakistan's Heritage

PI: Dr. Murtaza Taj

Co-PI: Dr. Sohaib Ahmad Khan , Nadhra Shahbaz Naeem Khan

Sponsor: U.S Agency for International Development (USAID) | LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 18,382,000

Project Initiated in: 2014

Duration: 12 Months

Category: Computer Vision

Description: Pakistan has inherited several prestigious significant monuments and historical sites. On every step is a magnificent cultural heritage site that captivates the

attention of many and is a striking contrast against the sky-high buildings and malls which surround it today. This project, funded by Ambassador's Fund Program which is a 1 year project of U.S. Agency for International Development (USAID), seeks to preserve several sites and monuments using 3D models with high resolution images of frescos and artwork. One of the aim of this project is to promote virtual tourism which will ultimately promote actual tourism and portray a soft image of Pakistan in the outside while simultaneously preserving the history for future generations. To carry out digital preservation, laser scanners will be used. At present, the three historic sites are planned to be digitally preserved which include the beautiful Masjid Wazir Khan in Punjab, the majestic Kot Diji Fort in Sindh with its 50 bastions and the aesthetic Shah Jahan Masjid which stands, in all its glory, in Sindh. In future, the plan is to extend this project to cover other heritage sites as well.



Title: Augmented Reality Enabled by Scalable, Adaptive Projector Kinect Units

PI: Dr. Murtaza Taj

Sponsor: National ICT R&D Fund

Funding Amount: PKR 82,500

Project Initiated in: 2015

Duration: 15 Months

Category: Computer Vision

Description: The project is an extension and refinement of the RoomAlive project of Microsoft where an immersive, augmented reality experience for a user is generated inside any room. The user can interact with virtual objects that co-exist with his or her physical existing environment. The Project is divided into 3 phases. Phase 1 involves

generating a 3D model of a static scene in a room with the help of 4 kinects using kinect fusion. Phase 2 involves projecting images/animations on the walls/floors of the room with the help of 4 projectors, attached alongside each kinect. Phase 3 involves human interaction with the projected images/animations.

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Profile: Dr Naveed Arshad completed his PhD from University of Colorado at Boulder, USA. Before joining LUMS, he has worked with ABN AMRO Global IT Systems, Pakistan International Airline. He is a part of the Software Engineering Research Group (SERG) at LUMS which undertakes research in various areas of software engineering such as engineering of autonomic systems, conceptual modelling, large scale systems development, etc.

Recent Publications:

- Hassan, T., Javed, F., & Arshad, N. (2014). An empirical investigation of V-I trajectory based load signatures for non-intrusive load monitoring. IEEE Transactions on Smart Grid, 5(2), 870–878.
- Arshad, N., Ali, U., & Javed, F. (2013). A highly configurable simulator for assessing energy usage. Paper presented at the Energy Procedia
- Arshad, N., Javed, F., & Liaqat, M. D. (2013) Towards a self-managing tool for optimizing energy usage in buildings. Vol. 22. Smart Innovation, Systems and Technologies (pp. 425-434).
- Javed, F., Arshad, N., Wallin, F., Vassileva, I., & Dahlquist, E. (2012). Forecasting for demand response in smart grids: An analysis on use of anthropologic and structural data and short term multiple loads forecasting. Applied Energy, 96, 150-160.



Title: GreenSMS: A Low-cost and Non-invasive System to Reduce Load Shedding

PI: Dr. Naveed Arshad

Co-PI: Dr. Dr. Mohammad Jahangir Ikram

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 580,000

Project Initiated in: 2014

Duration: 12 Months

Category: Energy

Description: This project presents an idea of an SMS based energy notification system to reduce electricity usage. The system is called as GreenSMS. The goal of GreenSMS system is to provide a low-cost and non-invasive capability of avoiding power

shutdowns as much as possible. This notification system monitors the demand and supply of the electricity. As soon as the demand is surpassing the supply it sends out SMS notification to the people in the community. The SMS warns the community of an imminent load shedding and urges them to reduce electricity usage by turning off extra electric appliances, lights, fans etc. It is believed that even if a small part of the community responds to the call of energy conservation it could result in avoiding load shedding.



Title: Attaining Maximum Solar Energy through Fine Grained Clustering in Home Area Networks

PI: Dr. Naveed Arshad

Co-PI: Dr. Mohammad Jahangir Ikram

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2014

Duration: 12 Months

Category: Energy

Description: In this proposal, the aim is to discuss the design and development of a standalone PV system that intelligently utilizes maximal PV energy during daytime with minimal batteries. This system is mostly targeted towards small-scale

commercial consumers but could be installed on any building where most consumption is during daylight hours such as schools. To reap maximum benefits from solar energy this system is primarily developed and designed for tropical regions where daylight is available during official working hours throughout the year.



Title: Simulation Modeling, Analysis and Forecasting of Electricity generation and consumption in Pakistan using System Dynamics approach

PI: Dr. Imran Mahmood- National University of Sciences and Technology (NUST)

Co-PI: Dr. Naveed Arshad

Primary Sponsor: U.S Agency for International Development (USAID)

Secondary Sponsor: National University of Sciences and Technology (NUST)

Funding Amount: PKR 2,980,200

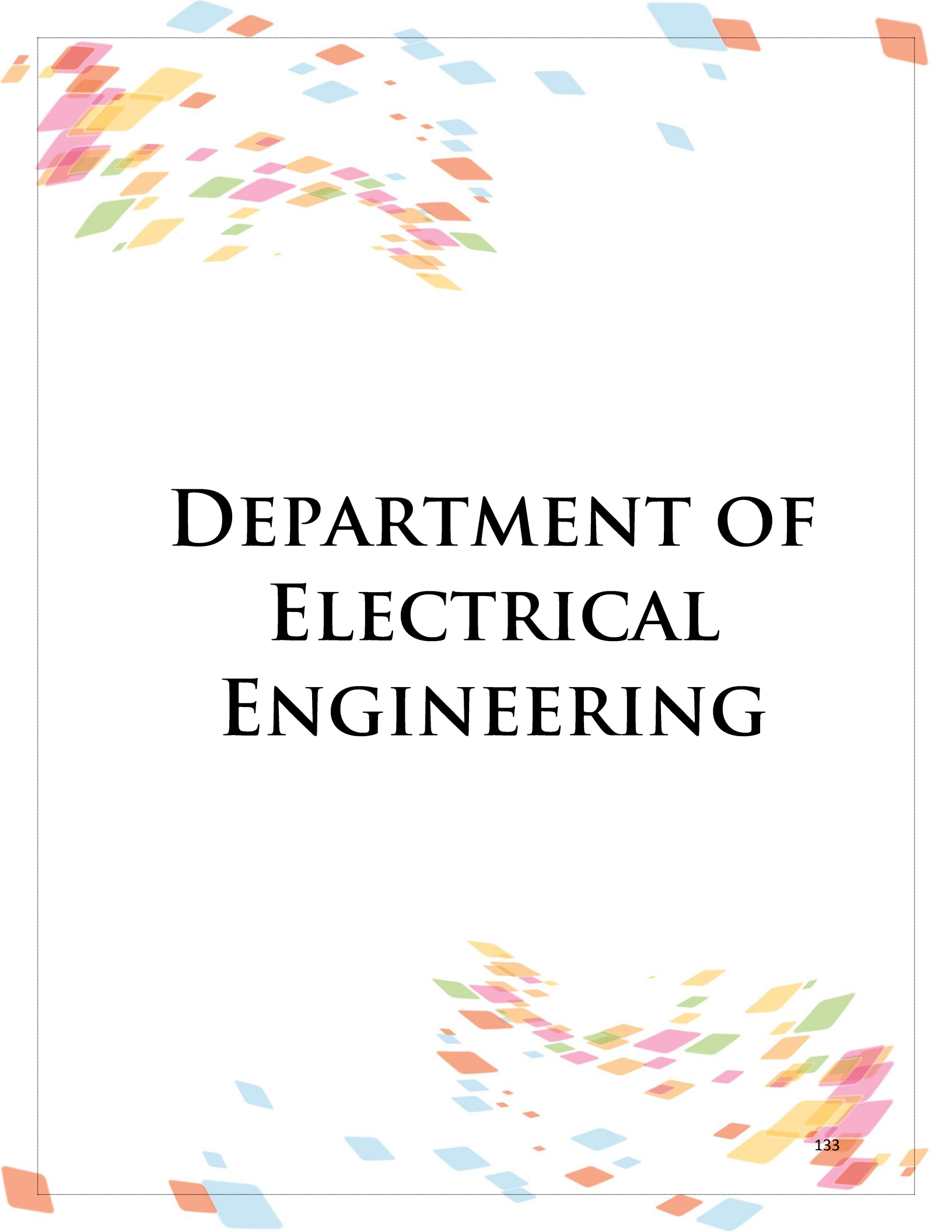
Project Initiated in: 2016

Duration: 12 Months

Category: Energy

Description: Electricity usage planning is a main concern for electricity stakeholders in a country. To meet the compelling demand for electricity and to deal with different

uncertainties involved in this process, development of sustainable policies through proper planning is becoming increasingly challenging. The current project proposes development of a macro level, multi-scale, multi-resolution, hierarchical simulation model of nationwide energy generation and consumption using System Dynamics approach. The SD based simulation will provide a conceptual modeling framework and a tool for simulation, visualization and analysis of the future demand and supply of electricity energy in Pakistan. Furthermore various influencing factors including prices, tariffs, policies, regulations, available resources and the environment will be coupled with the simulation model to study their sensitivity. The proposed simulation framework will be used by analysts to answer different energy related research questions, which further will lead the decision makers to adopt optimal choices for future electricity energy planning in the country.



DEPARTMENT OF ELECTRICAL ENGINEERING

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Profile: Dr. Abubakr received his PhD in Electrical Engineering from Georgia Institute of Technology (2005). As a graduate student, he also got a Masters degree in Mathematics (2005) and a Masters degree in Electrical Engineering (2002) from Georgia Tech. He completed his BSc in Electrical Engineering from the University of Engineering & Technology Lahore, Pakistan (2000). Before joining LUMS, he has taught and done research as a postdoctoral fellow at McGill University Canada (2007-2008) and at the University of Pennsylvania, USA (2006-2007). Dr. Abubakr Muhammad does fundamental research at the interface of systems engineering, applied mathematics and applied physics, on various problems in robotics, and distributed sensing, network dynamics and quantum information sciences. His interests span the study of connections and complexity in large-scale distributed networks; topological methods for information discovery in massive data sets; and communication, computation & control issues in the physics of information. He has also worked and consulted for the industry on the design of air traffic control systems, radar & sonar systems, communication equipments and medical instrumentation. His current research focuses on the development of cyber-physical systems for development and critical infrastructures in Pakistan, in particular issues related to water.

Recent Publications:

- Ahmad, Z., & Muhammad, A. (2014). Low power hydrometry for open channel flows. In Industrial Electronics Society, IECON 2014-40th Annual Conference of the IEEE (pp. 5314-5320). IEEE.
- Manzoor, T., Aseev, S., Rovenskaya, E., & Muhammad, A. (2014). Optimal Control for Sustainable Consumption of Natural Resources. In World Congress (Vol. 19, No. 1, pp. 10725-10730).
- Aleem, S. A., Muhammad, A., & Nasir, H. A. (2014). System Identification of Distributory Canals in the Indus Basin. In World Congress (Vol. 19, No. 1, pp. 8743-8748).
- Brádler, K., Dutil, N., Hayden, P., & Muhammad, A. (2010). Conjugate degradability and the quantum capacity of cloning channels. Journal of Mathematical Physics, 51(7).



Title: Canal Drones: Precise 3D Profiling of Siltation in Waterways

PI: Dr. Abubakr Muhammad

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 792,000

Project Initiated in: 2014

Duration: 12 Months

Collaborator: Robotics Research Lab, TU Kaiserslautern

Category: Robotics

Description: The study proposes to develop a 3D perception system, which can be deployed on a commercial agricultural machine (excavator or a tractor) or on board a micro aerial vehicle to assist the human operator in cleaning the canal effectively. State

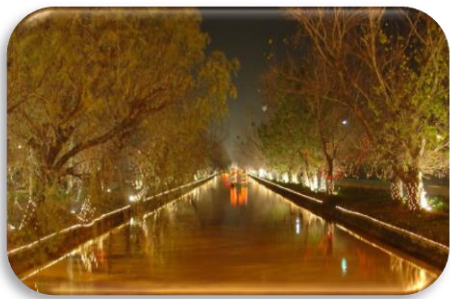
of the art techniques from field robotics and visual mapping algorithms such as SLAM (Simultaneous Localisation & Mapping) are expected to be deployed to process sensor data from 3D laser scanners and RGB-D cameras to create precise 3D terrain profiles of the canals. The profiles help in identifying defects in canal linings, locate and estimate silt accumulations and help the human operator continuously monitor the excavation operation.



Title: RoPWAT: Robotic Profiling for Clearing Waterways
PI: Dr. Abubakr Muhammad
Sponsor: German Pakistani Research Cooperation Programme (DAAD)
Funding Amount: PKR 794,160
Project Initiated in: 2014
Duration: 36 Months
Collaborator: Robotics Research Lab, TU Kaiserslautern
Category: Robotics

Description: Every year a forced closure of the canals is inevitable for canal cleaning, entailing a very large scale and costly operation. The extent and precision of silt removal is prone to inefficiencies due to subjective decision making in the cleaning

process, shortage of time and lack of verification. This proposal is aimed at developing a semi-autonomous robotic profiling system to increase the efficiency of this process. We propose to develop a 3D perception system, which can be deployed on a commercial agricultural machine (excavator or a tractor) or on board a micro aerial vehicle to assist the human operator in cleaning the canal effectively. The proposed system envisages efficient cost effective cleaning, reduced water discharge variability, and enhanced agricultural productivity.



Title: Real Time Control of Irrigation Network
PI: Dr. Abubakr Muhammad
Sponsor: National ICT R&D Fund
Funding Amount: PKR 53,613
Project Initiated in: 2014
Duration: 12 Months
Category: Water

Description: This project aims to automate the control of water flow in irrigation canals especially in the context of Pakistan's Irrigation network and provide the appropriate demand response catering to the needs of the end user. This will not only improve the efficiency of the system as compared to the current setup used for water supply but

also provide a deployable and scalable solution to control water supply with minimum involvement of active labor. The final objective of the project is to develop an autonomous closed-loop feedback control system that is capable of maintaining the water level of the canal at a particular reference level.



Title: Development of Water Resources Management Information System (WRMIS) and Decision Support System (DSS) For Efficient Irrigation Water Management in Punjab
PI: Dr. Abubakr Muhammad
Sponsor: National Engineering Services Pakistan (NESPAK)
Funding Amount: PKR 1,611,500
Duration: 4 Months
Project Initiated in: 2015
Category: Development Management

Description: The overall scope of this consultancy is to assist Water Resources Management Information System (WRMIS) in the Modeling, Development of system-wide flow routing model through rivers and link canals based on water availability in

the basin, irrigation water requirements and other constraints and the optimization, Developing optimal routes of river reaches and link canals to meet the demands at system nodes (barrages) keeping in view the lag times and complexity of the system.



Title: Safe Roadmaps: Vehicle-specific Traversability & Safety Verification of Broken-Roads and Off-Road Pathways

PI: Dr. Abubakr Muhammad

Co-PI: Dr. Haider Ali, German Aerospace Center (DLR), Munich, Germany

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 963,000

Project Initiated in: 2015

Duration: 12 Months

Category: Development Management

Description: The need to build and improve on transportation facilities and road networks is an important pillar of Pakistan's development strategy and a prime driving

force for industrial development, agricultural productivity and improvements in education, healthcare and other services. In Pakistan, roads undergo rapid deterioration due to various economic, social and technical reasons. The uncertainty and unavailability of road safety information has become a major issue in reliably transporting agricultural produce to markets, movement of heavy machinery and oversized cargo to remote localities, transport of people and materials to/from disaster areas and in even giving plain guarantees for safe traversability of a road that is good on paper. In this project the aim is to propose a revolutionary approach towards reducing this uncertainty. Instead of asking qualitative questions about whether a road network is generally traversable for a general class of vehicles, the focus is on providing a solution that will give precise quantitative answers as a distance modulated roadmap and confirm whether a particular segment of the road is traversable for a particular type of vehicle.



Title: Water Informatics & Technology - Center of Water Research at LUMS

PI: Dr. Abubakr Muhammad

Sponsor: Nestle

Funding Amount: PKR 10,000,000

Project Initiated in: 2015

Duration: 60 Months

Category: Development Management

Description: Pakistan is facing rapid large-scale environmental changes unleashed by climate change; historical forces driven by social, political and demographic changes; and global transitions triggered by new technologies and changes in living style. The impact of these changes is felt most in the water sector in poor management of

irrigation networks, depleting groundwater, deterioration in water quality, poor sanitation and difficulties in preservation of eco-systems. Engineers, scientists, economists and policy makers must pay attention to understanding these issues in developing new technologies, solutions and institutions under integrated frameworks for tackling the governance issues of participatory management, water entitlements and accountability. In this context, the aim of this project is to establish an interdisciplinary center for research on water at LUMS with a particular focus on areas of systems analysis and hydro-informatics.

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Profile: Dr Ahmad Kamal Nasir is director of Engineering Laboratory at LUMS and he is an assistant professor (IPFP) of electrical engineering at LUMS. He received his PhD in Mobile Robotics in 2014 from University of Siegen Germany on Cooperative SLAM. As a graduate student, he also obtained two masters degrees in Mechatronics from Uni-Siegen and UET Lahore. Before that, he completed his BSc in Mechanical Engineering from UET Lahore, Pakistan. He has also worked in industry as product development manager at research and development department of MicroTech Industries, Lahore, Pakistan. In 2014, he joined LUMS and affiliated with CYPHYNETS, the Laboratory for Cyber Physical Networks and Systems at LUMS. He does research in mobile ics, computer vision and embedded control systems. Dr. Nasir's students are developing visual-inertial navigation devices and control systems for aerial robots.

Selected Publications:

- Ahmad Kamal Nasir, Hubert Roth. (2012). Pose Estimation by Multisensor Data Fusion of Wheel encoders, Gyroscope, Accelerometer and Electronic Compass. 1st IFAC Conference on Embedded Systems, Computational Intelligence and Telematics in Control.
- Ahmad Kamal Nasir, Aiman Hsino, Klaus Hartmann, Cheng Chen, Hubert Roth. Heterogeneous Capability Multi-Robots Cooperative Framework. 1st IFAC Conference on Embedded Systems, Computational Intelligence and Telematics in Control, 2012 Würzburg, Germany.
- Ahmad Kamal Nasir, Christof Hille, Hubert Roth. (2012). Data Fusion Of Stereo Vision And Gyroscope For Estimation Of Indoor Mobile Robot Orientation. 1st IFAC Conference on Embedded Systems, Computational Intelligence and Telematics in Control.
- Ahmad Kamal Nasir, Christof Hille, Hubert Roth. (2012). Plane Extraction and Map Building Using a Kinect Equipped Mobile Robot. Workshop on Robot Motion Planning: Online, Reactive, and in Real-time, IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS 2012, Vilamoura, Algarve, Portugal.
- Cheng Chen, Wennan Chai, Ahmad Kamal Nasir, Hubert Roth. (2012). Low Cost IMU Based Indoor Mobile Robot Navigation with the Assist of Odometry and Wi-fi Using Dynamic Constraints. IEEE Position Location and Navigation Symposium, Myrtle Beach, South Carolina, USA.



Title: Embedded 6 DOF Visual-Inertial Odometry for Aerial and Ground Robots

PI: Dr. Ahmad Kamal Nasir

Co-PI: Dr. Abubakr Muhammad

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 500,000

Project Initiated in: 2014

Duration: 12 Months

Category: Robotics

Description: This research aims to create an inexpensive solution based on mobile devices which can be used as standalone navigation device by aerial and ground mobile robots. The project seeks to use a cheap android based tablet, which nowadays

has enough computational power, to perform real time navigation for aerial and ground mobile robots. The proposed solution helps to reduce the unbounded IMU pose drift errors and therefore makes it possible to use the mobile platform as standalone device for mobile robot applications. This proposed inexpensive navigation solution will assist humans and mobile robotics platforms to accurately determine their 6 DOF pose in the absence of external localising systems.



Title: Precision Forestry: GreenDrone -Deforestation and Forest Degradation Estimation using an Unmanned Aerial Vehicle

PI: Dr. Ahmad Kamal Nasir

Co-PI: Dr. Mian Muhammad Awais, Prof. Hubert Roth - University of Siegen, Germany,

Sponsor: German Pakistani Research Cooperation Programme (DAAD)

External Collaboration: University of Siegen, Germany

Funding Amount: PKR 9,016,218

Project Initiated in: 2015

Duration: 24 Months

Category: Robotics

Description: This research cooperation focuses on the installation of a long-term

research cooperation between the University of Siegen and the Lahore University of Management Sciences. The joint research collaboration will explore the possibilities of development of low-cost robotic systems for aerial mapping of forests using Unmanned Aerial Vehicles (UAV(s)) in order to estimate carbon sink and/or stock in forest vegetation.



Title: Development of a low cost high resolution aerial mapping system for carbon sequestration: Potential of trees in and around Lahore city

PI: Dr. Ahmad Kamal Nasir

Co-PI: Dr. Mian Muhammad Awais

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 965,000

Project Initiated in: 2015

Duration: 12 Months

Category: Robotics

Description: The proposed research project will explore the possibilities of development of low-cost robotic systems for aerial mapping of areas using Unmanned

Aerial Vehicles (UAV(s)) in order to estimate carbon sink and/or stock and vegetation. The system can be used as a monitoring, reporting and verification tool for Reducing carbon Emission of Deforestation and forest Degradation (REDD). Since the research topic has a big impact on the environmental sustainable development, therefore, we focus of the project would also be to evaluate the possibilities to apply it for bigger funds such as United Nation REDD+ Program.



Title: Autonomous Control of unmanned ground vehicle

PI: Dr. Ahmad Kamal Nasir

Co-PI: Dr. Abubakr Muhammad

Sponsor: National ICT R&D Fund

Funding Amount: PKR 83,000

Project Initiated in: 2014

Duration: 8 Months

Category: Robotics

Description: Cutting grass with traditional lawn mowers is a hectic and menial task. The automated lawn mowers available in the market requires the user to setup a border around the lawn that defines the area to be mowed. The aim of this research project at CYPHYNETS lab at LUMS-SSE is to develop a lawn mower that works in any unknown

environment without any human intervention.

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Profile: Dr. Farasat Munir received his B.S. in electrical engineering from University of Engineering and Technology, Lahore, Pakistan. Following that he worked in the industry in the field of Image processing, Machine vision, and Communication system design. He later received Fulbright scholarship and went to Georgia Institute of Technology, Atlanta, USA, where he earned his Masters and Ph.D in electrical engineering. His Ph.D. work focused on the design of highly sensitive and selective biosensors for cancer diagnosis and prognosis. After Ph.D, he joined Emory University, USA as a Post-Doctoral Fellow where he worked on the design of a biomedical system for radiation compatible ultrasonic image acquisition and processing. Since 2014 he is working as an Assistant Professor in the department of electrical engineering at SBA School of Science and Engineering LUMS, Pakistan. At LUMS his focus is on multidisciplinary experimental research involving areas of Physics, Electrical engineering and Biomedical engineering. His research interests include biosensors, biomedical instrumentation, MEMS, RF and Microwave circuits and Microelectronic fabrication. He has published in several peer reviewed international journals and conferences.

Selected Publications:

- A Novel Technology for Automatically Obtaining Digital Facial Photographs Near-Simultaneously with Portable RadiographsS Ramamurthy, P Bhatti, F Munir, T Ng, K Applegate, S Tridandapani Journal of digital imaging 28 (3), 259-263 2015
- Multi-mode bulk-acoustic-wave resonators A Wathen, F Munir, AJ Dickherber, CD Corso, W Hunt US Patent 8,810,108 2014
- Thin-film bulk acoustic wave delay line A Wathen, W Hunt, F Munir, KS Davis, JG Maloney, RS Westafer US Patent App. 13/530,029 2012



Title: Development of an ultrasonic test bed for biomedical and detection applications.

PI: Dr. Dr. Farasat Munir

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Technology

Description: The purpose of this project is to develop a test bed that can be used to train students and develop an understanding of various aspects of the ultrasonic system design. Our approach in the design of this platform is the development of modular software and hardware components. Moreover we are aiming to have the

hardware system in particular to be configurable and will explore the approach of software defined radio (as in communication systems). This platform will allow us to develop and test not only novel algorithms but also develop ultrasonic systems for a variety of applications due to the configurability of the hardware.

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Profile: Dr. Khan received a BEng degree in electronic engineering from GIKI, Pakistan in 2005. From 2005 to 2010, he was with School of Electrical Engineering, The University of Manchester, UK where he first received his MSc (with distinction) and then PhD in electrical and electronic engineering. His doctorate thesis was on characterisation of GaAs and InP based devices for optoelectronic applications. His current work is on the research and development of solar cells through low cost techniques and optimised conversion and transmission of the generated energy to diversify power systems. His research work has been published in top tier journals such as IEEE Quantum Electronics, IEEE Electron Device Letters, Journal of Applied Physics, IET Optoelectronics, European Physical Journal and Renewable & Sustainable energy reviews.

Selected Publications:

- Pervaiz S., Khan, H. A. (2015). Low irradiance loss quantification in c-Si panels for photovoltaic systems. Journal of Renewable and Sustainable Energy 7 (1), 013129.
- Photoresponse Modeling and Analysis of InGaP/GaAs Double-HPTs, Hassan A Khan, Ali A Rezazadeh, Yongjian Zhang IEEE Journal of Quantum Electronics, 50(12).
- Bilal, M., Saleem, R., Shafique, M. F., & Khan, H. A. (2014). MIMO application UWB antenna doublet incorporating a sinusoidal decoupling structure. Microwave and Optical Technology Letters, 56(7), 1547–1553.
- Jaffery, S.H.I., Khan, M., Ali, L., Khan, H.A., Mufti, R.A., Khan, A., Khan, N., Jaffery, S.M. (2014). The potential of solar powered transportation and the case for solar powered railway in Pakistan. Renewable and Sustainable Energy Reviews 39, 270-276.
- Khan, H. A. & Pervaiz S. (2013). Technological Review on Solar PV in Pakistan: Scope, Practices and Recommendations for Optimized System Design. Renewable and Sustainable Energy Reviews", Elsevier, 23, 147-154.



Title: Power Flow Control for Optimised Solar PV Systems

PI: Dr. Hassan Abbas Khan

Co-PI: Mr. Nauman Ahmad Zaffar

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 940,000

Project Initiated in: 2014

Duration: 12 Months

Category: Energy

Description: The basic goal of this research is to develop system to allow maximum utilisation of PV through indigenous design from fundamental blocks to gain complete control over all design parameters in the development and deployment phase. Solar

inherently produces DC and generally it is converted into AC which is subsequently converted to DC for most of our electronic loads such as laptops, computers, LED lights etc. This conversion process generally results in more than 20% of the overall power loss. In order to limit the size and in turn the overall cost of the system, it is imperative to have efficient DC converters working with a DC grid, with PV panels attached, for most optimum utilisation. This can result in an overall decrease in the panel sizing resulting in the reduction of overall cost making PV investment more viable.



Title: Optimized solar PV energy integration to Weak-Grids for Developing Countries

PI: Dr. Hassan Abbas Khan

Co-PI: Dr. Mohammad Jahangir Ikram

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Energy

Description: The current project proposes an optimum hardware architecture which allows Efficient self-generation (solar PV resource), Efficient power processing (through power electronic converters and interconnects) and Monitoring (internet

based) to integrate produced power into the energy mix of the country. The Prime beneficiaries of this technology will be domestic consumers and small/medium scale enterprises who are disproportionately affected from the current electricity shortage. This project will also lay foundation through intelligent electronic infrastructure for future smart grid deployments with emphasis on indigenous development power electronics for solar PV based systems in the country. Dr. Hassan Abbas Khan will also implement low-cost Irradiance (to measure sunlight potential) and wind speed to assess performance of local systems with emphasis on long term monitoring for net-metering and feed-in-tariffs when allowed by the government .



Title: Decentralized electric power delivery model for rural electrification in Pakistan

PI: Dr. Hassan Abbas Khan

Co-PI: Mr. Nauman Ahmad Zaffar, Dr. Husnain Fateh Ahmed

Sponsor: International Growth Centre (IGC)

Funding Amount: PKR 2,331,034

Project Initiated in: 2015

Duration: 18 Months

Category: Energy

Description: The main objectives of this project are to study both the feasibility of DC microgrids in Pakistan and to study the dynamics of the take-up of new technology and its effects on the socio-economic wellbeing and aspirations of off-grid communities. A

solar microgrid in the context of Pakistan, will present a completely novel disruption to traditional behaviour. The prime focus of the project is to study both its direct socioeconomic impact in rural communities, its rate of take up, based on interventions on pricing mechanisms and by making the design schematics open source, the effect of lowered RnD fixed costs on market viability.



Title: DC Microgrids for Rural Electrification

PI: Dr. Hassan Abbas Khan

Sponsor: National ICT R&D Fund

Funding Amount: PKR 100,000

Project Initiated in: 2015

Duration: 9 Months

Category: Energy

Description: The aim of this project is to Design and implementation of a modular, scalable and viable architecture for a DC Microgrid to supply electrical power to off-grid communities, particularly for rural regions of Pakistan where grid electricity is unavailable or is largely intermittent. The purpose of this project also is to provide a low

cost, environmental friendly solution to energy crisis that our country is going through.

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Profile: Dr. Ijaz Haider Naqvi received his BSc Electrical Engineering from University of Engineering & Technology Lahore (2003), Masters in Radio Communications degree from SUPELEC Paris (2006) and PhD degree in Electronics and Telecommunications from IETR-INSA Rennes, France (2009). He has been a recipient of prestigious ministerial scholarship of French Ministry of Research to pursue his PhD and HEC overseas scholarship for his Masters. Dr. Ijaz has several years of research experience in the wireless communications and wireless sensor networks. His current research focuses on ultra wideband communications, system level aspects in wireless sensor networks and RF optimisation and network management issues in wireless mobile networks. He has published several refereed papers in international journals and peer reviewed international conferences.

Recent Publications:

- Shahid, N., Naqvi, I. H., & Qaisar, S. B. (2015). One-class support vector machines: analysis of outlier detection for wireless sensor networks in harsh environments. *Artificial Intelligence Review*, 1-49.
- Khan, M. Y., Qaisar, S., Naeem, M., Aslam, A., Shahid, S., & Naqvi, I. (2015). Detection and self-healing of cluster breakages in mines and tunnels: an empirical investigation. *Sensor Review*, 35(3).
- Zia, U., Naqvi, I. H., & Uppal, M. (2015). Performance of ultra-wideband time-reversal systems under imperfect channel side information at the transmitter. *Electronics Letters*, 51(7), 585-586.
- Zia, U., Uppal, M., & Naqvi, I. H. (2015). Robust Feedback Design for Time Reversal UWB Communication Systems Under CSIT Imperfections. *Communications Letters, IEEE*, 19(1), 102-105.

Most Cited Publications:

- Khaleghi, A., El Zein, G., & Naqvi, I. H. (2007). Demonstration of time-reversal in indoor ultra-wideband communication: time domain measurement. In *Wireless Communication Systems. ISWCS 2007. 4th International Symposium on* (pp. 465-468). IEEE.
- Shahid, N., Naqvi, I. H., & Qaisar, S. B. (2012). Quarter-sphere SVM: attribute and spatio-temporal correlations based outlier & event detection in wireless sensor networks. In *Wireless Communications and Networking Conference (WCNC), 2012 IEEE* (pp. 2048-2053). IEEE.



Title: Design and Development of Wireless Sensor Networks in Industrial Monitoring and Control

PI: Dr. Ijaz Haider Naqvi

Co-PI: Mr. Nauman Ahmad Zaffar

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 500,000

Project Initiated in: 2013

Duration: 12 Months

Category: Technology

Description: This project aims to develop a Wireless Sensor Network in the industry which would monitor the key stress points in the plant. The network of sensor nodes measures

various parameters of plant and the readings of these individual sensor nodes communicate to a centralised sink node. The aim is to build the sensor nodes indigenously in order to control the design parameters and tailor them for optimisations suitable for the environment.



Title: Indoor Localization: Improvements in Accuracy and Range

PI: Dr. Ijaz Haider Naqvi

Sponsor: Umm Al Qura University

Funding Amount: PKR 832,661

Project Initiated in: 2015

Category: Technology

Description: The aim of this consultancy is to provide independent advisory services to the Company for Research and Innovation of projects at GISTIC-Um Al Qura University. The tasks of the Consultant shall consist of collaboration with regards to the Navi Bees project for localization of mobile node using beacon signals of BLE radios, an improved accuracy of this localization solution, an improved robustness of this localization

solution with regards to multi paths which results in large fluctuations in the received signal strength over very small distances and thus result in arbitrary location of mobile nodes, a reduced node density with satisfactory performance and an improved accuracy even with large number of localization nodes.



Title: Design and Development of an RF Coverage Optimization System using Spatio-Temporal Mobile User Densities and Autonomic Network Management Approach

PI: Dr. Ijaz Haider Naqvi

Co-PI: Ahmad Shabbar Kazmi

Sponsor: LUMS Faculty Initiative Fund (FIF) | National ICT R&D Fund

Funding Amount: PKR 9,080,000

Project Initiated in: 2015

Duration: 12 Months

Category: Technology

Description: The aim of this project is to develop a prototype SW application for data measurement, transmission, storage and analysis of the spatio-temporal user

information for system capacity enhancement purposes in mobile networks, to test the developed prototype application in the field and to motivate industry to use this system for performance enhancement of call and network services through industrial partners.

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Profile: Dr. Momin Uppal received his BS degree in electronic engineering with highest distinction from GIK Institute of Engineering Sciences and Technology, Pakistan, in 2002. He then received his MS and PhD degrees in electrical engineering from Texas A&M University, College Station, in 2006 and 2010, respectively. Dr. Uppal spent the summers of 2009 at NEC Labs of America, Inc., Princeton, New Jersey as a Research Assistant, and the summers of 2012 at Texas A&M University Qatar as a Visiting Researcher and has been associated with the LUMS School of Science and Engineering (SSE) since October 2010.

Recent Publications:

- Zia, U., Naqvi, I. H., & Uppal, M. (2015). Performance of ultra-wideband time-reversal systems under imperfect channel side information at the transmitter. *Electronics Letters*, 51(7), 585-586.
- Zia, U., Uppal, M., & Naqvi, I. H. (2015). Robust Feedback Design for Time Reversal UWB Communication Systems Under CSIT Imperfections. *Communications Letters, IEEE*, 19(1), 102-105.
- Uppal, M., Yue, G., Xin, Y., Wang, X., & Xiong, Z. (2013). A robust multi-level design for dirty-paper coding. *IEEE Transactions on Communications*, 61(7), 2612-2623.
- Tariq, M., Baig, M. U., & Uppal, M. (2014). Layered compress-and-forward cooperation in wireless multicast with M-ary PAM transmissions. In *Global Communications Conference (GLOBECOM), 2014 IEEE* (pp. 4324-4329). IEEE.



Title: Projectile Tracking using Acoustic Localisation

PI: Dr. Momin Ayub Uppal

Co-PI: Dr. Abubakr Muhammad

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 826,000

Project Initiated in: 2014

Duration: 12 Months

Category: Technology

Description: The proposed project aims to build a low-cost embedded system capable of (a) locating the origin of a specific acoustic event, and (b) using the localisation capability to estimate the trajectory of a projectile that generates a specific acoustic

signature. As important applications of the localisation functionality, the technology thus developed could be used (a) to determine the exact location from which law-enforcement personnel are being fired upon by criminal elements, and (b) to track the trajectory of artillery shells fired from behind enemy lines, leading to pinpointing the location of their artillery batteries.



Title: Wireless Sensors Integrated Mobile Decision Support System for Antenatal Healthcare in Rural Settings

PI: Dr. Momin Ayub Uppal

Co-PI: Dr. Safee Ullah Chaudhary, Dr. Salman Noshear Arshad, Dr. Zahid Bashir - Shalamar Medical and Dental College

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 835,000

Project Initiated in: 2015

Duration: 12 Months

Category: Telecommunications

Description: In this project the aim is to improve antenatal healthcare access in LMICs

by developing a mobile antenatal diagnostics platform powered by an intelligent and automated decision support system (DSS) that is supplemented by clinical data seamlessly acquired from a wide range of portable healthcare sensors. The proposed platform is envisaged to be deployable in rural areas through local healthcare workers, thus constituting a mobile pointofcare diagnostics system for pregnant women in LMIC settings. The salient objective of this project is to develop a technology demonstration platform for providing antenatal health care in rural settings of Pakistan.

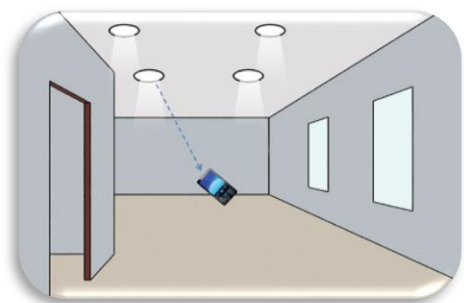
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Profile: Dr. Muhammad Adeel Pasha received his BSc Electrical Engineering degree from UET Lahore in 2004 and his M.S. Research in Embedded Systems degree from University of Nice Sophia-Antipolis in 2007. He then received a merit scholarship from government of France to continue his research work and received his PhD degree from University of Rennes-1 in 2010. His research interests include low-power micro-architecture, energy-efficient WSN node platforms, hardware specialisation & electronic design automation tools, LED-based optical communication & localisation, and smart power grid (algorithms and hardware development).

Recent Publications:

- Pasha, M. A., Siddiqui, B., & Farooq, U. (2015). A design-flow for high-level synthesis and resource estimation of reconfigurable architectures. In Design & Technology of Integrated Systems in Nanoscale Era (DTIS), 2015 10th International Conference on (pp. 1-6). IEEE.
- Rehman, M. M. U., Pasha, M. A., & Hassan, N. U. (2015, October). Clean consumer energy technologies in developing countries: A case study of energy efficient lights in Pakistan. In 2015 International Conference on Smart Grid and Clean Energy Technologies (ICSGCE) (pp. 85-89). IEEE.
- Siddiqui, B., Pasha, M. A., Naeem, A., Hassan, N. U., & Jadoon, T. (2015, December). LED-based Visible Light Communication System for Low Data Rate Point-and-Grab Applications. In 2015 13th International Conference on Frontiers of Information Technology (FIT) (pp. 258-263). IEEE.
- Pasha, M. A., Khan, J. H., & Masud, S. (2015). I-LEACH: Energy-efficient routing protocol for monitoring of irrigation canals. Simulation, 91(8), 750-764. doi: 10.1177/0037549715602957



Title: Indoor Positioning System Using Visible Led Lights

PI: Dr. Muhammad Adeel Ahmed Pasha

Co-PI: Dr. Naveed Ul Hassan and Dr. Tariq Mahmood Jadoon

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 480,000

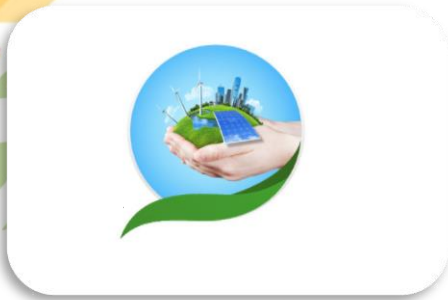
Project Initiated in: 2014

Duration: 12 Months

Category: Energy

Description: Light Emitting Diodes (LEDs) due to their numerous advantages over other lighting methods are generally expected to become the most widely used indoor lighting technology in future. LED lighting can save up to 85% and 50% of the energy

consumed by incandescent and fluorescent lights respectively. Keeping these aspects in mind, researchers study their use in developing an Indoor Positioning System (IPS). The positioning information obtained through IPS can be used to provide indoor location based services (LBS) or navigation support application for robots, humans, etc. Some methods of indoor positioning have been looked at and positioning using Wi-Fi, Bluetooth, RFID, Infrared, and Ultrasound have been suggested. However, all these methods have their limitations and none of them can be considered as a definitive solution in indoor environment. Positioning using LEDs is a relatively novel concept and may prove to be a better choice for indoor positioning since it also utilises preinstalled LED ceiling lights (like Wi-Fi based schemes) but provides better localisation accuracy. Current LED-based IPS either requires expensive cameras and image-based transformation methods or relatively inexpensive photodiodes. However, photodiode-based IPS needs perfect synchronisation among all the transmitting LEDs which increases the complexity of the system design and hinders its practical implementation. In this project, researchers study the effects of synchronisation errors on localisation accuracy. Furthermore, design of asynchronous LED-based IPS is expected to be studied.



Title: GreenComm: Toward Developing an Energy-Efficient Platform for Internet of Things (IoT)-Enabled Devices

PI: Dr. Muhammad Adeel Ahmed Pasha

Co-PI: Dr. Momin Ayub Uppal

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 930,000

Project Initiated in: 2016

Duration: 12 Months

Category: Energy

Description: System-level energy trade-offs have already been studied in other wireless communication paradigms such as WSN systems and hardware acceleration of

computational subsystem has shown great promise in bringing down the overall system energy. The same idea should be explored in a relatively less explored area of IoT where computational challenges are more severe than simple WSN. But they could lead to larger power/energy savings through dedicated hardware. The prime objective of the project is to eventually be an important step towards developing energyefficient platforms for future IoT-enabled devices (such as embedded industrial sensors, actuators, smart-phones, tablets, personal health-monitoring devices, etc. Hence, the project will contribute towards forming the future technologically more-connected society into an energy-efficient (green) society.

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Profile: Dr. Muhammad Tahir received the Bachelor of Science in Electrical Engineering in 2007 from University of Engineering and Technology, Lahore and the Master of Science in Electronic Engineering in 2009 from Politecnico di Torino, Italy. In April 2013, he obtained his Ph.D. degree also from Politecnico di Torino, Italy in the field of Electronics and Telecommunication. His research activity is focused on the development of novel algorithms for satellite navigation receiver technology. His research interests include receiver baseband signal processing algorithm design and development, Bayesian signal processing, detection and estimation theory, channel coding in communication networks, machine learning and sequential Monte Carlo methods.

Recent Publications:

- Tahir, M., Presti, L., & Fantino, M. (2014). A novel acquisition strategy for weak GNSS signals based on map criterion. *Aerospace and Electronic Systems*, IEEE Transactions on, 50(3), 1913-1928.
- Fantinato, S., Foglia, L., Iacone, P., Rovelli, D., Facchinetti, C., & Tuozi, A. (2012, December). PEGASUS-GNSS receiver platform for safety of life user segment. In *Satellite Navigation Technologies and European Workshop on GNSS Signals and Signal Processing, (NAVITEC), 2012 6th ESA Workshop on* (pp. 1-8). IEEE.
- Tahir, M., & Presti, L. L. (2012). Performance analysis of pre-correlation differential acquisition scheme. In *Satellite Navigation Technologies and European Workshop on GNSS Signals and Signal Processing, (NAVITEC), 6th ESA Workshop on* (pp. 1-8). IEEE.

Most Cited Publications:

- Tahir, M., Presti, L. L., & Fantino, M. (2012). A novel quasi-open loop architecture for GNSS carrier recovery systems. *International Journal of Navigation and Observation*, 2012.
- Tahir, M., Fantino, M., & Presti, L. L. (2011). Sequential bayesian detection of gnss signals. In *Localisation and GNSS (ICL-GNSS), 2011 International Conference on* (pp. 87-92). IEEE.



Title: Development of a Software Defined Radio Test-bed utilising GPS Signals for Navigation Applications

PI: Dr. Muhammad Tahir

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 990,000

Project Initiated in: 2015

Duration: 12 Months

Category: Telecommunications

Description: Global navigation satellite system (GNSS) provides position, velocity and time information in all weather conditions, anywhere on or near the earth, where there

is an unobstructed line of sight to four or more GNSS satellites. This research project deals with the design and development of a basic software GNSS receiver. The main objectives of the research are to develop a basic GNSS fully reprogrammable receiver prototyping platform based on the software radio technology, which would provide basic foundation for future research activities. Moreover, digital signal processing involved within GNSS receiver is a mixture of signal detection, estimation and optimisation problems. During this research activity, novel algorithms within these domains will be explored which will provide a deep understanding in the theoretical and fundamental research problems in this domain.

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Profile: Nadeem Khan received his Ph.D. from the Eindhoven University of Technology. Dr Khan Joined LUMS in May 2002. Earlier, he worked at Streaming Networks (Pvt) Ltd, Islamabad where he performed several projects related to image processing and video compression in the context of multimedia products. His Ph.D. research work was on minimal training dependent and robust text recognition systems. This research work and rest of his graduate study have been in close association with Philips especially with its facilities of Philips Research Lab (LEP), France, Centre for Manufacturing Technology, The Netherlands and Philips International Institute, The Netherlands. In between his degrees he had worked both locally and abroad including teaching at University of Engineering and Technology, Lahore and working as a Hardware Design Engineer at Philips Industrial Automation Systems, Eindhoven, the Netherlands.

Recent Publications:

- Ahmad, M. A., Ayaz, Y., Jamil, M., Omer Gillani, S., Rasheed, M. B., Imran, M., Javaid, N. (2015). Comparative analysis of classifiers for developing an adaptive computer-assisted EEG analysis system for diagnosing epilepsy. BioMed research international, 2015.
- Ahmad, M. A., Majeed, W., & Khan, N. A. (2014). Advancements in computer aided methods for EEG-based epileptic detection. Paper presented at the BIOSIGNALS 2014 - 7th Int. Conference on Bio-Inspired Systems and Signal Processing, Proceedings; Part of 7th Int. Joint Conference on Biomedical Engineering Systems and Technologies, BIOSTEC 2014
- Ahmad, M. A., Majeed, W., & Khan, N. A. (2014). An alive electroencephalogram analysis system to assist the diagnosis of epilepsy. Paper presented at the European Signal Processing Conference.
- Zafar, Z., & Khan, N. A. (2014). Pain intensity evaluation through facial action units. Paper presented at the Proceedings - International Conference on Pattern Recognition



Title: Enabling EEG Signal Technology for Home Health Care

PI: Dr. Nadeem Ahmad Khan

Co-PI: Dr. Mumtaz Ali Sheikh

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 878,000

Project Initiated in: 2015

Duration: 12 Months

Category: Technology

Description: To investigate and develop techniques for multichannel EEG signal enabling its use from the perspective of home health care through the use of portable and wearable (preferably wireless) headsets for the purpose of diagnose, prediction

and early detection of important neurological disorders like epilepsy, autism etc. Aspects on specific focus will be (i) R&D on real-time compression methods (both lossless and lossy) for multichannel EEG with quality acceptable for use in prediction and detection tasks like epilepsy and autism (ii) to explore and extend earlier collaboration with local health care sector (like Punjab Institute of Mental Health on epilepsy detection to cover epileptic seizure prediction for mobile and rehabilitated patients at home; (iii) to explore collaboration with Technical University of Madrid (UPM) in their ongoing project on linguistic disorder screening in children with special focus on autism cases.

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Profile: Mr. Nauman Ahmad Zaffar received his BS (1990) and MS (1991) in Electrical Engineering from University of Pennsylvania. He then continued his work at the Electro-Optic / Magneto-Optic Labs at the University on development of a high resolution frequency swept microwave diversity imaging system in multiple simultaneous bands from 2GHz-60GHz. His areas of work include understanding business needs, proposing and designing solutions and carrying out development, rollout and support lifecycle of the solutions in the domains of Electric Utilities, Telecom and Manufacturing. He has worked with Techlogix to establish and extend practice areas of Business Process Management, ERP implementation, Enterprise Architecture and Software Product Engineering. Mr. Nauman joined LUMS School of Science and Engineering (SSE) in 2010 as full-time faculty member in the department of Electrical Engineering. He is now part of LUMS Energy Optimisation Committee and is working on establishing a research base at SBASSE in the area of Power Electronics, Smart Grids and Renewable Energy. His current areas of interest include dc/dc converters for Solar PV applications, dc/ac inverters for grid-tie distributed energy sources and VFDs for industrial, off-grid and automotive applications. He has also worked with Pepco and various Distribution Companies in Pakistan to propose solutions for Power Distribution management and smart solutions for load management.

Recent Publications:

- Aslam, W., Soban, M., Akhtar, F., & Zaffar, N. A. (2015). Smart meters for industrial energy conservation and efficiency optimization in Pakistan: Scope, technology and applications. *Renewable and Sustainable Energy Reviews*, 44, 933-943.
- Ibrahim, S., Hassan, M.S., Zaffar, N.A. (2015) Networked control of single-phase induction motor air conditioners for constrained power systems: IEEE International Symposium on Industrial Electronics:DOI: 10.1109/ISIE.2015.7281522
- Farooq, R., Mateen, L., Ahmad, M., Akbar, S. Q., Khan, H. A., & Zaffar, N. A. (2014). SMart DC microgrids: Modeling and power flow analysis of a DC Microgrid for off-grid and weak-grid connected communities. Paper presented at the Asia-Pacific Power and Energy Engineering Conference, APPEEC.
- Shabbir, H., Ur Rehman, M., Rehman, S. A., Sheikh, S. K., & Zaffar, N. (2014). Assessment of harmonic pollution by LED lamps in power systems. Presented at the 2014 Clemson University Power Systems Conference, PSC 2014.



Title: Measurement of noise levels in LT distribution network of LESCO to assess viability of narrowband over power line communication in 95khz – 500khz bands

PI: Mr. Nauman Ahmad Zaffar

Co-PI: Dr. Asim Loan

Sponsor: Lahore Electric Supply Company (LESCO)

Funding Amount: PKR 1,800,000

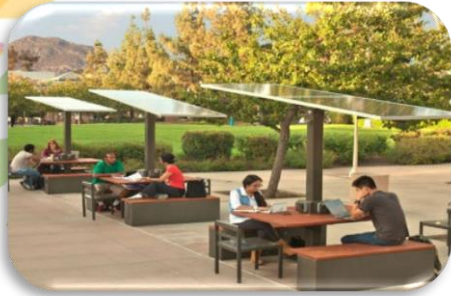
Project Initiated in: 2015

Duration: 2 Months

Collaborator: University of Engineering and Technology, Lahore

Category: Energy

Description: This project seeks to undertake the assessment of noise level and signal propagation on the LT network at carefully sampled and selected locations on the distribution network that will cover the diversity of load, operating conditions and variations in the network. The work will be divided into two phases. First phase will cover the measurement of noise levels under ambient and different load conditions. The scope of load conditions to be created on the network will be finalised with LESCO once the project is initiated. The second phase will work with a subset of locations to insert modulated PLC signal conforming to the power level output of the standard transmitter. It will then be observed on the neighboring locations of the network to tabulate signal to noise ratio and understand signal propagation.



Title: Design and Development of a 1000W Solar Charge Controller

PI: Mr. Nauman Ahmad Zaffar

Co-PI: Dr. Hassan Abbas Khan

Sponsor: PakShine

Funding Amount: PKR 885,000

Project Initiated in: 2015

Duration: 4 Months

Category: Energy

Description: The aim of this project is to develop the solution of the Solar UPS to not only charge the backup battery unit but also to provide direct power for the AC appliance to reduce grid electricity cost of the end customer. This engagement is considered to be the first of other R&D initiatives that PakShine plans to undertake in Pakistan with the collaboration of LUMS.



Title: Strategic Consulting

PI: Mr. Nauman Ahmad Zaffar

Sponsor: Microtech Industries Pvt. Ltd

Funding Amount: PKR 300,000

Project Initiated in: 2015

Duration: 2 Months

Category: Energy

Description: The project involves holding weekly discussions between Microtech and Mr. Nauman Ahmad Zaffar on Smart grids, Advanced Metering Infrastructure, structuring of the comp for hardware, firmware and software requirements of AMI and on dealings and discussions with strategic clients of MICROTECH as and when the need

arises.



Title: High Power Density Inverter for intermittent grid and electrical drives with enhanced efficiency and low switch stresses.

PI: Mr. Nauman Ahmad Zaffar

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Energy

Description: The proposed work aims to develop power electronic topologies for a high power density, reliable and efficient DC-AC inverter, operating at a very high switching frequency. The input voltage is 450 VDC with a 50Hz, 220 Vrms sinusoidal output to

drive 2kVA AC-loads. As the size of the inverter becomes smaller and the frequency becomes higher, a number of problems arise in the design of the inverter that have to be addressed. An additional design objective will be to design the inverter with a control over output voltage and frequency to drive motor loads from power constrained systems.



Title: Strategic Consulting Phase 2

PI: Mr. Nauman Ahmad Zaffar

Sponsor: Microtech Industries Pvt. Ltd

Funding Amount: PKR 600,000

Project Initiated in: 2016

Duration: 5 Months

Category: Energy

Description: The project involves holding regular discussions between Microtech and Mr. Nauman Ahmad Zaffar on Smart grids, Advanced Metering Infrastructure, structuring of the company for hardware, firmware and software requirements of AMI and on dealings and discussions with strategic clients of MICROTECH as and when the need arises.



Title: Solar Assisted Electric Vehicle with single phase induction motor and regenerative braking
PI: Mr. Nauman Ahmad Zaffar
Sponsor: National ICT R&D Fund
Funding Amount: PKR 91,250
Project Initiated in: 2015
Duration: 10 Months
Category: Energy

Description: The current energy crisis in Pakistan and a long term energy solution for the country require a high focus in research & development of renewable energy sources. Solar energy in theory is sufficient to meet all of humanity's energy needs, the

challenge however is to make the cost of solar energy generation compatible with the conventional energy generation that is where innovations in materials and technology can play a significant role. The current project aims to establish a comprehensive framework of investigating the emerging low cost solar cell technologies which will explore methods of fabrication, efficiency optimization through computational modeling, and stability/reliability of the technology through electrical characterization. The findings will be applied to optimize the cell design and to bridge the gap of efficiency loss going from cell to the panel.



Title: Measurement of Noise Levels in Lt Network of Lesco to Assess Viability of Broadband Over Plc (BPL)
PI: Mr. Nauman Ahmad Zaffar
Sponsor: National ICT R&D Fund
Funding Amount: PKR 70,000
Project Initiated in: 2014
Duration: 12 Months
Category: Energy

Description: This work is a logical extension of the first phase of this project where LUMS carried out the feasibility analysis for LESCO LT Distribution Network on Narrow Band PLC (NB-PLC) communication for AMI. The process to be adopted in this phase will be

the same as the first phase and BPL modems shall be utilized for the measurements to assess the working and performance of the technology. Huawei Broadband PLC modems that are designed as embedded communication modules of smart meters for AMI communications in FAN (Field Area Network), along with associated control and monitoring software and logistical support will be provided by Huawei for this study.



Title: Efficient Storage Less of Motor Lads with Intermittent Energy Source
PI: Mr. Nauman Ahmad Zaffar
Sponsor: National ICT R&D Fund
Funding Amount: PKR 70,000
Project Initiated in: 2014
Duration: 12 Months
Category: Energy

Description: Variable Frequency Drives (VFDs) have gained a wide spread use in the industry for both energy conservation and a finer process control. They not only improve the operational efficiency, but also protect against heavy currents at the startup and under varying load operation. This project aimed to establish local expertise in this area

as the facilities in Pakistan to manufacture VFDs indigenously do not currently exist. The imported VFDs are both expensive and lack local maintenance support and support contracts are both expensive and time consuming. This project introduced custom designed VFDs in Pakistan to allow low cost local manufacturing to enable their wide spread use in industrial sector for finer process control and energy conservation initiatives.

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Profile: Nauman Z. Butt did his Ph.D. in Electrical Engineering from Purdue University in 2008 and B.S. in the same field from University of Engineering & Technology, Lahore in 2002. From 2008 to 2012, he was a member of technical staff in Semiconductor Research & Development Center (SRDC) in IBM Microelectronics Division, Hopewell Junction, New York. Dr. Butt's research interests include investigating physics and technology of microelectronic and optoelectronic devices through theory, compact modeling, simulations and experiments. His Ph.D. thesis was on computational study of scaling and radiation damage in nanoscale memory devices. In IBM, he has been involved in the development of embedded DRAM and dense SRAM devices in 32nm and 14nm SOI technology.

Recent Publications:

- Butt, Nauman Z.Sarker, Biddut K.Chen, Yong, Alam, Muhammad Ashraf Shraful (2015) Substrate-Induced Photofield Effect in Graphene Phototransistors: IEEE Transactions on Electron Devices. 10.1109/TED.2015.2475643.
- Imran, H., & Butt, N. Z. (2015). Computational Study of Hybrid Nanomaterial/Insulator/Silicon Solar Cells. Electron Devices, IEEE Transactions on, 62(10), 3111-3116.
- Imran, H., Sarker, B. K., Chen, Y. P., Alam, M. A., & Butt, N. Z. (2015, June). The role of substrate in the photoresponse of graphene transistors. InDevice Research Conference (DRC), 2015 73rd Annual (pp. 107-108). IEEE.
- Butt, N. Z., Sarwar, A., Sadiq, M. M., & Mazher, K. U. (2014). Dark current suppression in quantum dot solar cells through interfacial engineering. Paper presented at the 2014 IEEE 40th Photovoltaic Specialist Conference, PVSC 2014.
- Modeling and analysis of transistor mismatch due to variability in short channel effect induced by random dopant fluctuation, N. Z. Butt, and J.B. Johnson, IEEE Electron Device Letters, Vol. 33, Issue 8, 2013.



Title: Optimization of Contacts for Silicon Solar Cell Technology For Efficiency Enhancement

PI: Nauman Zafar Butt

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 727,000

Project Initiated in: 2015

Duration: 12 Months

Category: Technology

Description: This project aims to design the contacts that eliminate the aforementioned problems by exploring alternate materials such as emerging transparent conducting oxides. An optimal cell structure with alternate contacts will be demonstrated for

commercial silicon solar cells. The project involves physics based modeling to identify the material/physical requirements for an optimal contact. The model based design will then be fabricated using the equipment available at SBASSE, LUMS. Finally, the fabricated solar cells will be characterized using optical and electrical measurements and the results will be compared with the benchmark commercial solar cell.

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Profile: Dr. Naveed Ul Hassan received his B.E. degree in avionics engineering from the College of Aeronautical Engineering (CAE), Risalpur, Pakistan, in 2002 and his M.S. and Ph.D. degrees in electrical engineering, with specialization in digital and wireless communications, from the Ecole Supérieure d'Electricité (Supelec), Gif-sur-Yvette, France, in 2006 and 2010, respectively. In 2011, he joined as an Assistant Professor at the Department of Electrical Engineering, Lahore University of Management Sciences (LUMS), Lahore, Pakistan. Since 2012, he has also been a visiting Assistant Professor at Singapore University of Technology and Design (SUTD), Singapore during the months of June-August. He has several years of research experience and has authored/co-authored numerous research papers published in refereed international journals and conference proceedings. His major research interests include cross layer design and resource optimization in wireless networks, demand response management and integration of renewable energy sources in smart grids, indoor localization and heterogeneous networks. He is a senior member of the IEEE.

Recent Publications:

- Wang, X., Yuen, C., Ul Hassan, N., Wang, W., & Chen, T (2015) Migration-aware virtual machine placement for cloud data centers. Paper presented at the 2015 IEEE International Conference on Communication Workshop, ICCW 2015. 10.1109/ICCW.2015.7247464
- Wang, X., Yuen, C., Ul Hassan, N., Wang, W., & Chen, T. (2015, June). Migration-aware virtual machine placement for cloud data centers. In Communication Workshop (ICCW), 2015 IEEE International Conference on (pp. 1940-1945). IEEE.
- Hassan, N. U., Naeem, A., Pasha, M. A., Jadoon, T., & Yuen, C. (2015). Indoor Positioning Using Visible LED Lights: A Survey. ACM Computing Surveys (CSUR), 48(2), 20.
- Naeem, A., Shabbir, A., Ul Hassan, N., Yuen, C., Ahmad, A., & Tushar, W. (2015). Understanding Customer Behavior in Multi-tier Demand Response Management Program.
- Li, W. T., Yuen, C., Hassan, N. U., Tushar, W., Wen, C. K., Wood, K. L., ... & Liu, X. (2015). Demand Response Management for Residential Smart Grid: From Theory to Practice. Access, IEEE, 3, 2431-2440.



Title: Experimental Validation of Smart Grid Technologies by Building a Test Bed at LUMS

PI: Dr. Naveed Ul Hassan

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 920,000

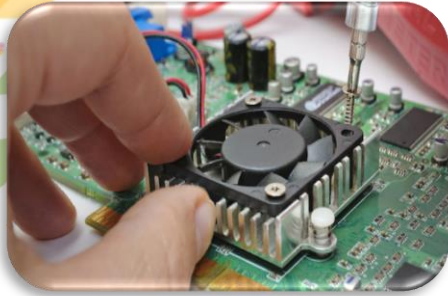
Project Initiated in: 2015

Duration: 12 Months

Category: Technology

Description: The objective of this project is to develop a scalable test bed for residential smart grids, equipped with necessary automation and communication capabilities. The test bed will mainly consist of a software simulator and a single actual 'home'

environment created inside the lab (referred as a lab-home). The lab-home will consist of physical appliances (loads), e.g., lights, fans etc., which will be connected to a Home Control Center (HCC); responsible for controlling and monitoring their electricity consumption. HCCs of the simulated homes and lab-home will be connected to the grid operator, modeled in our test bed as a Grid Control Center (GCC). Due to interactive nature of the smart grid, an efficient and reliable communication infrastructure with low latency will be established for bi-directional communication between various nodes. The test bed will enable experimental validation of various smart grid technologies and would also be helpful in identifying and suggesting cost effective pathways and guidelines for smart grid transition in Pakistan.



increases reliability and transparency.

Title: Smart Grid Test Bed

PI: Dr. Naveed Ul Hassan

Sponsor: National ICT R&D Fund

Funding Amount: PKR 62,500

Project Initiated in: 2014

Duration: 12 Months

Category: Technology

Description: The aim of this project is to develop a Smart grid, an emerging modern electrical grid system which incorporates two way communications between power suppliers and consumers. Smart algorithms will employed to monitor power flow and control appliances at the consumer level. This will save energy, reduce costs and

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Profile: Dr. Shahid Masud received BSc Electrical Engineering from EME College, Rawalpindi, Pakistan in 1990, MSc in Electronics from the University of New South Wales, Sydney, Australia in 1992 and PhD in Electrical Engineering from Queen's University, Belfast, UK in 1999. He has been a recipient of prestigious AIDAB EMSS scholarship (Australia) and Commonwealth scholarship (UK). He was a Senior Design Engineer at Amphion Semiconductor Ltd. (later Conexant / NXP Semiconductor) before joining LUMS in 2002. His research interests include design and implementation of DSP Systems and computer architecture. Dr. Masud has published over fifty refereed papers in major international journals and conferences and holds three patents in VLSI design. He is also a Senior Member of IEEE, Member of IET and a Chartered Engineer.

Recent Publications:

- Khalid, F. B., Masud, S., & Uppal, M. (2013). Design and implementation of an ML decoder for tail-biting convolutional codes. Paper presented at the Proceedings - IEEE International Symposium on Circuits and Systems.
- Yousaf, A., & Masud, S. (2013). High performance fine grained dynamic power estimation technique for multilevel caches using architectural simulator - Imperas. Paper presented at the 2013 10th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology, ECTI-CON 2013
- Athar, S., Siddiqi, M. A., & Masud, S. (2012). Teaching and research in FPGA based digital signal processing using Xilinx system generator.
- Bilal, M., Masud, S., & Athar, S. (2012). FPGA design for statistics-inspired approximate sum-of-squared-error computation in multimedia applications. Circuits and Systems II: Express Briefs, IEEE Transactions on, 59(8), 506-510.

Most Cited Publications:

- Ahmad, A., Khan, N., Masud, S., & Maud, M. A. (2004). Efficient block size selection in H. 264 video coding standard. Electronics letters, 40(1), 19-21
- Masud, S., & McCanny, J. V. (2004). U.S. Patent No. 6,785,700. Washington, DC: U.S. Patent and Trademark Office.



Title: DAAD En²A²S²W² Project

PI: Dr. Shahid Masud

Co-PI: Dr. Abubakr Muhammad, Prof. Dr.-Ing. Axel Sikora, University of Offenburg

Sponsor: German Pakistani Research Cooperation Programme (DAAD)

Funding Amount: PKR 3,063,326

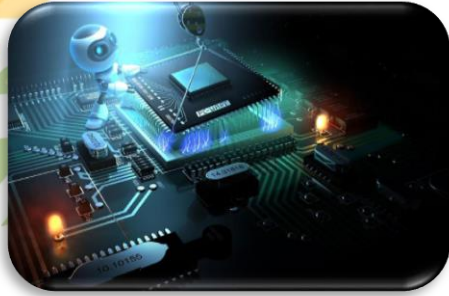
Project Initiated in: 2013

Duration: 30 Months

Collaborator: University of Offenburg

Category: Technology

Description: The proposed research focuses on the development and the prototype application of energy-autarkic and autonomous wireless sensor nodes for the real time monitoring of large scale sparsely distributed waterways. Embedded system hardware and software is being developed for water flow sensing and control applications. The new platforms will be tested on the Offenburg WSN-testbed. It is expected to have available a very low cost, but however robust and powerful platform for distributed WSN based monitoring.



Title: Automated Testbed for Spatially Distributed Wireless Real Time Monitoring System of Large Scale Waterways Auto Test Wireless Water (ATWW)

PI: Dr. Shahid Masud

Co-PI: Dr. Muhammad Adeel Ahmed Pasha, Prof. Dr.-Ing. Axel Sikora - University of Offenburg,

Sponsor: German Pakistani Research Cooperation Programme (DAAD)

Funding Amount: PKR 8,140,498

Project Initiated in: 2016

Duration: 24 Months

Collaborator: University of Offenburg

Category: Technology

Description: In Pakistan, the world's largest irrigation system which covers 90.000 km of channels needs to be monitored and managed on different levels. The irrigated agriculture of Pakistan mainly depends on Indus River System and its tributaries. The need for improvement in efficiency and productivity of the irrigation water has become one of key issues for the irrigation and the agriculture sector. Monitoring of the waterways is a key element for efficient and fair water distribution. After specific prototypes in hardware and software for energy efficient wireless sensor nodes have been developed in the project EnA²S²W² (funded by DAAD 2013 - 2015) for the channel monitoring, these systems now need extensive testing. The current project shall address the automated regression test of spatially distributed wireless nodes both in the labs of HS Offenburg (HSO) and in Pakistan in a structured approach, which allows scientific advances and close integration of the two research groups.

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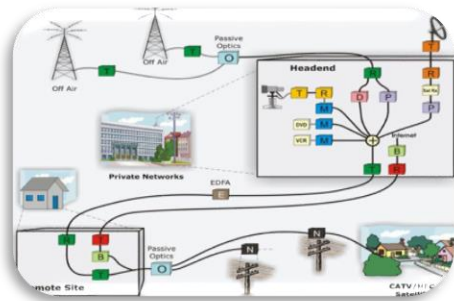
Profile: Dr. Syed Azer Reza completed his BSc in Electronic Engineering from the Ghulam Ishaq Khan Institute of Engineering in 2003. He completed his MSc in Electrical Engineering from Darmstadt University of Applied Sciences in Germany with a specialization in microwave ceramic filter designs. He received his masters and PhD in Optics from the University of Central Florida specialising in Photonic Signal Processing applications for communication and sensing applications. Dr. Reza worked as a post-doctoral research associate at the Laser Interferometer Space Antenna (LISA) Labs at the University of Florida worked on the implementation of a test-bench to verify the relative phase performance of photodetectors that would be used in the LISA space mission. His works have appeared in more than 20 international conferences and journals.

Recent Publications:

- Anjum, A., & Ahsan, M. (2016). A Non-Invasive Remote Pressure Sensor Design for Extreme Environments using Tunable Optics with Conventional Manometry.
- Reza, S. A., & Qasim, M. (2016). Nonbulk motion system for simultaneously measuring the refractive index and thickness of a sample using tunable optics and spatial signal processing-based Gaussian beam imaging. *Applied Optics*, 55(2), 368-378.
- Qasim, M., & Reza, S. A. (2015). Toward the design of a motion-free tunable coupling module for varying spatial beam profiles: foundations of optimal coupling of a Gaussian mode into a fiber collimator with a dynamic two-lens system. *Applied optics*, 54(31), 9242-9252.
- Yu, Y., Mityrk, S., Sweeney, D., Spector, A., Eichholz, J., Donelan, D., & Mueller, G. (2011). Laser Noise Stabilisation, Processing, And Extraction Simulations For The Lisa Mission At The University Of Florida. In *Bulletin of the American Astronomical Society* (Vol. 1, p. 33110).

Most Cited Publications:

- Reza, S. A., & Riza, N. A. (2009). A liquid lens-based broadband variable fiber optical attenuator. *Optics Communications*, 282(7), 1298-1303.
- Riza, N. A., & Reza, S. A. (2009). Noncontact distance sensor using spatial signal processing. *Optics letters*, 34(4), 434-436.



Title: Fiber-Optic Applications using Agile and Tunable Photonics

PI: Dr. Syed Azer Reza

Co-PI: Dr. Mumtaz Ali Sheikh

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 900,000

Project Initiated in: 2014

Duration: 12 Months

Category: Technology

Description: The primary objective of this research is to explore the various advantages that the tunable/agile optics technology offers. The use of agile optics in fiber-optics has been very limited. The applied optics research group aims to expand the horizons

in this regard and perform vital research beneficial to the worldwide optics community in general. The project aims to put to use the agile optics technology and demonstrate with experimental evidence its use in fiber-optic communication and sensing devices and techniques.

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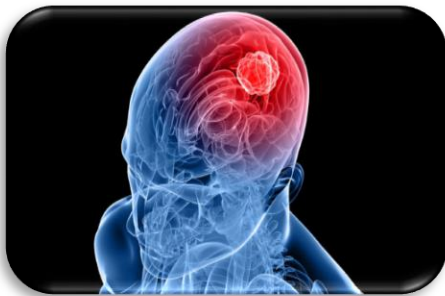
Profile: Waqas Majeed received BS in Electrical Engineering from GIK Institute, Pakistan (2000-2004, gold medallist). During his PhD in bioengineering at Georgia Tech, USA (2005-2010), his research involved fMRI-based functional connectivity, manganese-enhanced MRI for neuronal tract-tracing and diffusion-tensor imaging. The focus of his thesis work was detection and characterisation of propagating waves of spontaneous activity in humans and rats using fMRI. His postdoctoral research at Vanderbilt University, USA (Department of Radiology) involved data-driven analysis of noisy fMRI data to isolate weak and focal patterns of neural activity. Dr. Majeed's goals are to establish a career in academia, promote multidisciplinary medical imaging research and develop links between academia and clinicians.

Recent Publications:

- Ahmad, M. A., Ayaz, Y., Jamil, M., Omer Gillani, S., Rasheed, M. B., Imran, M., & Javaid, N. (2015). Comparative Analysis of Classifiers for Developing an Adaptive Computer-Assisted EEG Analysis System for Diagnosing Epilepsy. *BioMed research international*, 2015.
- Rajpoot, K., Riaz, A., Majeed, W., & Rajpoot, N. (2015). Functional connectivity alterations in epilepsy from resting-state functional MRI. *PLoS ONE*, 10(8). doi: 10.1371/journal.pone.0134944
- Ahmad, M. A., Majeed, W., & Khan, N. A. (2014). Advancements in computer aided methods for EEG-based epileptic detection. Paper presented at the BIOSIGNALS 2014 - 7th Int. Conference on Bio-Inspired Systems and Signal Processing, Proceedings; Part of 7th Int. Joint Conference on Biomedical Engineering Systems and Technologies, BIOSTEC 2014
- Majeed, W., & Avison, M. J. (2014). Robust data driven model order estimation for independent component analysis of fMRI data with low contrast to noise. *PLoS ONE*, 9(4).

Most Cited Publications:

- Majeed, W., Magnuson, M., Hasenkamp, W., Schwarb, H., Schumacher, E. H., Barsalou, L., & Keilholz, S. D. (2011). Spatiotemporal dynamics of low frequency BOLD fluctuations in rats and humans. *Neuroimage*, 54(2), 1140-1150.



Title: Pre-surgical Mapping Using Task-Driven And Resting State FMRI: a Collaborative Project with Aga Khan University Hospital

PI: Dr. Waqas Majeed

Co-PI: Dr. Zaffar Sajjad

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 996,000

Project Initiated in: 2014

Duration: 12 Months

Category: Health

Description: The aim of surgical resection for treatment of brain tumours is to remove as much malignant tissue as possible while minimising damage to healthy brain areas

responsible for critical functions such as voluntary movements, speech/language, somatosensation and vision. Damage to these areas would result in functional deficits, thereby severely affecting patient's quality of life. Brain surgeries are planned so as to minimise unnecessary damage to the eloquent cortex. Location of eloquent brain regions varies from patient to patient due to subject-to-subject variation in size/shape of the brain, tumour-induced physical displacement of cortical areas and functional reorganisation during progression of the disease. Therefore, location of eloquent cortex cannot be determined using stereotactic coordinates of different brain areas, and has to be identified before/during surgery using functional mapping techniques.

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Profile: Wasif Tanveer Khan received the B.Sc. degree in electrical engineering from the University of Engineering and Technology, Lahore, Pakistan, in 2005, the M.S. and Ph.D. degrees in electrical and computer engineering from the Georgia Institute of Technology, Atlanta, USA in 2010 and 2014, respectively. From January 2006 to December 2008, he was a Lecturer with the National University of Computer and Emerging Sciences-FAST, Lahore, Pakistan. He was awarded M.S. Leading to Ph.D. Fulbright scholarship, in 2008. In 2009, he joined Professor John Papapolymerou's research group "Microwave Circuit Technology" at the Georgia Institute of Technology. During his Ph.D. He authored/co-authored more than 30 research papers in peer-reviewed conferences and journals. Since January 2015, he has been working as an Assistant Professor at the department of Electrical Engineering of the Lahore University of Managements Sciences (LUMS), Pakistan.

Recent Publications:

- Khan, W. T., Cagri Ulusoy, A., Dufour, G., Kaynak, M., Tillack, B., Cressler, J. D., & Papapolymerou, J. (2015). A D-band micromachined end-fire antenna in 130-nm SiGe BiCMOS Technology. *IEEE Transactions on Antennas and Propagation*, 63(6), 2449-2459.
- Chlieh, O. L., Khan, W. T., & Papapolymerou, J. (2015). Thermal Modeling of Microfluidic Channels for Cooling High Power Resistors on Multilayer Organic Liquid Crystal Polymer Substrate. *Journal of Electronic Packaging, Transactions of the ASME*, 137(3). doi: 10.1115/1.4030643
- Kim, S., Khan, W. T., Zajic, A., & Papapolymerou, J. (2015). D-band channel measurements and characterization for indoor applications. *IEEE Transactions on Antennas and Propagation*, 63(7), 3198-3207. doi: 10.1109/tap.2015.2426831
- Khan, W. T., Tong, J., Sitaraman, S., Sundaram, V., Tummala, R., & Papapolymerou, J. (2015). Characterization of electrical properties of glass and transmission lines on thin glass up to 50 GHz. Paper presented at the Proceedings - Electronic Components and Technology Conference.



Title: MM- wave integration and embedded antennas in System-in-Package –Work Package 2

PI: Dr. Wasif Tanveer Khan

Sponsor: SONY

Funding Amount: PKR 1,757,171

Project Initiated in: 2015

Duration: 5 Months

Category: Technology

Description: The aim of this consultancy project is to conduct and supervise research activities related to the mm-wave integration and embedded antennas System-in-Package planned within the framework of the mm-wave System-in-Package project. In

particular, the focus of the consultancy is simulation and evaluation of proposed novel antenna / integration designs using a full-wave EM simulator and organization of weekly-based video conference meetings.



Title: Design and Development of RF front-end of a UHF Band Software Defined Radio

PI: Dr. Wasif Tanveer Khan

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2016

Duration: 12 Months

Category: Technology

Description: The objective of the proposed research is to indigenously develop an RF-frontend of a Software Defined Radio in the UHF band and develop the research base to carry out research in the area of RF and Microwave front-end design in the future.

Since RF and microwave is an elusive research area in Pakistan, given the complexity of the task to be undertaken, the professional development of students, which are well versed with the electronic design and hardware prototyping, is a foreseeable outcome of this project. At the very basic infrastructure level, this project will set a precedent for carrying out hardware electronics development in related areas of digital, analog, RF integrated circuit design in Pakistan.



Title: MM- wave integration and embedded antennas in System-in-Package – Work Package 3

PI: Dr. Wasif Tanveer Khan

Sponsor: SONY

Funding Amount: PKR 1,713,733

Project Initiated in: 2016

Duration: 3 Months

Category: Technology

Description: The aim of this consultancy project is to conduct and supervise research activities related to the mm-wave integration and embedded antennas System-in-Package planned within the framework of the mm-wave System-in-Package project. In

particular, the focus of the consultancy is simulation and evaluation of proposed novel antenna / integration designs using a full-wave EM simulator and organization of weekly-based video conference meetings.



Title: Design a Miniaturized Spiral Antenna for Ultra-wideband (2-18 GHz) Applications

PI: Dr. Wasif Tanveer Khan

Sponsor: Re-engineering With Research (RWR) Private Ltd

Funding Amount: PKR 1,000,000

Project Initiated in: 2016

Duration: 6 Months

Category: Technology

Description: The aim of this project is to explore the implementation of many techniques to miniaturise the spiral antenna. Due to rapid progress in computer and personal communication systems, the need for integration of more than one communication systems into a single compact module has increased. Considering the limited space

available, the future antenna must be miniaturised and wideband to cover the possible operating frequency bands. Designing a miniaturised and ultra-wideband antenna is a big challenge and has gained research attention of the many antenna engineers. For certain applications miniaturisation of the spiral antenna is needed, Dr. Khan in his project will explore the implementation of many techniques to miniaturise the spiral antenna.

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Profile: Dr. Zartash Uzmi received his PhD in Electrical Engineering from Stanford University, California in 2002. His graduate research focused on Multi-user Detection for CDMA systems in which he devised schemes and algorithms for practical implementation of multi-user detectors. He has held positions at Nokia Research Centre, Bell Laboratories, and Hewlett Packard Company. He is a part of the LUMS faculty since 2002. At LUMS, his research is focused on scalable network design for wide-area deployments and wireless applications.

Recent Publications:

- Nisar, A., Kashaf, A., Uzmi, Z. A., & Qazi, I. A. (2015, November). A Case for Marrying Censorship Measurements with Circumvention. In Proceedings of the 14th ACM Workshop on Hot Topics in Networks (p. 2). ACM.
- Mushtaq, A., Ismail, A. K., Wasay, A., Mahmood, B., Qazi, I. A., & Uzmi, Z. A. (2015). Rethinking buffer management in data center networks. Paper presented at the Computer Communication Review.
- Hllyas, M. S., Raza, S., Chen, C. C., Uzmi, Z. A., & Chuah, C. N. (2014). RED-BL: Evaluating dynamic workload relocation for data center networks. Computer Networks, 72, 140-155
- Ilyas, M. S., & Uzmi, Z. A. (2013). Electricity cost efficient workload mapping. Paper presented at the Proceedings - IEEE INFOCOM.

Most Cited Publications:

- Ali, M., Saif, U., Dunkels, A., Voigt, T., Römer, K., Langendoen, K., & Uzmi, Z. A. (2006). Medium access control issues in sensor networks. ACM SIGCOMM Computer Communication Review, 36(2), 33-36.
- Ali, M., Suleman, T., & Uzmi, Z. A. (2005). MMAC: A mobility-adaptive, collision-free mac protocol for wireless sensor networks. In Performance, Computing, and Communications Conference, 2005. IPCCC 2005. 24th IEEE International (pp. 401-407). IEEE.



Title: A Scalable Platform for Internet Censorship Measurements

PI: Dr. Zartash Afzal Uzmi

Co-PI: Dr. Ihsan Ayyub Qazi, Prof. Vern Paxson

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 960,000

Project Initiated in: 2016

Duration: 12 Months

Category: Telecommunications

Description: The aim of the project is to carry out three important tasks related to C-Saw:

- (a) To design and implement C-Saw and carry out a public release of the built software,
- (b) Design techniques to analyze censorship data from the C-Saw platform to detect different types of censorship and improve C-Saw's design, and
- (c) Collect Internet censorship measurements from C-Saw users and carry out a longitudinal study of Internet censorship and its impact on various stakeholders.



DEPARTMENT OF MATHEMATICS

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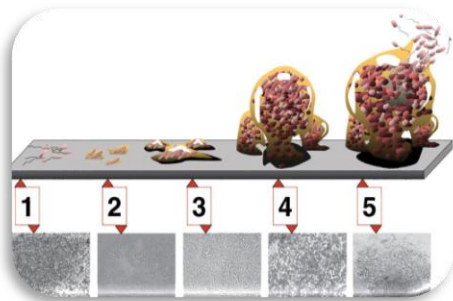
Profile: Dr. Adnan Khan was awarded his PhD from Rensselaer Polytechnic Institute in NY in 2007. His thesis was titled 'Parameterization for Some Multiscale Problems in Biology and Turbulence'. The work involved studying approaches to coarse graining of multiscale systems with applications to turbulent diffusion and protein dynamics. Prior to his doctoral work, he obtained a BE in Electrical Engineering from NED University of Engineering & Technology, Karachi in 1998 and an MS in Applied Mathematics from the University of Delaware in 2002. His current research interests involve modelling and analysis of biological systems, multiscale modelling and asymptotic analysis. Prior to joining LUMS, Dr. Khan has taught at the Rensselaer Polytechnic Institute and University of Delaware. Besides his usual academic interests, he is also interested in reading on a variety of topics including economics, philosophy, and history and world literature.

Recent Publications:

- Khan, A., Waleed, M., & Imran, M. (2015). Mathematical analysis of an influenza epidemic model, formulation of different controlling strategies using optimal control and estimation of basic reproduction number. *Mathematical and Computer Modelling of Dynamical Systems*, 21(5), 432-459. doi: 10.1080/13873954.2015.1016975
- Imran, M., Rafique, H., Khan, A., & Malik, T. (2014). A model of bi-mode transmission dynamics of hepatitis C with optimal control. *Theory in Biosciences*, 133(2), 91-109.
- Dur-e-Ahmad, M., Imran, M., & Khan, A. (2014). Analysis of a Mathematical Model of Emerging Infectious Disease Leading to Amphibian Decline. In *Abstract and Applied Analysis* (Vol. 2014). Hindawi Publishing Corporation.
- Khan, A., Hassan, M., & Imran, M. (2014). Estimating the basic reproduction number for single-strain dengue fever epidemics. *Infectious diseases of poverty*, 3(1), 12.

Most Cited Publications:

- Kramer, P. R., Latorre, J. C., & Khan, A. A. (2010). Two coarse-graining studies of stochastic models in molecular biology. *Communications in Mathematical Sciences*, 8(2), 481-517.



Title: Control of Bacterial Growth in a Biofilm

PI: Dr. Adnan Khan

Co-PI: Dr. Sultan Sial, Dr. Mudassar Imran

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 960,000

Project Initiated in: 2014

Duration: 12 Months

Category: Health

Description: This study plans on developing a deterministic model for bacterial growth in a biofilm and suggesting optimal antibiotic regimen for its control. The project intends to study the conditions under which antibiotic treatment successfully eradicates the

microbial population from a biofilm and the surrounding fluid compartment. It addresses the problem of finding a course of treatment which reduces active bacteria at the end while also minimising the total antibiotic applied. Several studies have indicated the counter-productive effects of over-deployment of antibiotics. Indeed, it has also been suggested that this may even increase the susceptibility to infection by increasing the effective resistance. The high costs of antibiotics are another factor in the motivation to decrease their use. At the same time, the dilution rate, low relative to the maximum growth rate, is unable to flush out the bacteria on its own. Antibiotic application therefore becomes imperative. The study also focuses on optimal strategy of antibiotic application that eliminates bacteria while at the same time ensuring that antibiotic deployment is at a minimum.

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Profile: Dr Imran Naeem received his MPhil Applied Mathematics degree from Quaid-e-Azam University, Islamabad and a PhD degree from University of the Witwatersrand, South Africa in 2004 and 2008, respectively. He did the Post Doctoral Fellowship from University of the Witwatersrand, South Africa and has also been teaching at the University of the Witwatersrand prior to joining LUMS. Dr Naeem has several publications in leading international journals.

Recent Publications:

- Ali, Z., Naeem, I., & Husnine, S. M. (2015). Group classification and exact solutions of generalised modified Boussinesq equation. *Applicable Analysis*, 94(7), 1397-1404.
- Khan, M. D., Naeem, I., & Imran, M. (2014). Analytical solutions of time–space fractional, advection–dispersion and Whitham–Broer–Kaup equations. *Pramana*, 83(6), 885-906.
- Naz, R., Freire, I. L., & Naeem, I. (2014). Comparison of Different Approaches to Construct First Integrals for Ordinary Differential Equations. In *Abstract and Applied Analysis* (Vol. 2014). Hindawi Publishing Corporation.

Most Cited Publications:

- Kara, A. H., Mahomed, F. M., Naeem, I., & Wafo Soh, C. (2007). Partial Noether operators and first integrals via partial Lagrangians. *Mathematical Methods in the Applied Sciences*, 30(16), 2079-2089.
- Hayat, T., Naeem, I., Ayub, M., Siddiqui, A. M., Asghar, S., & Khaliq, C. M. (2009). Exact solutions of second grade aligned MHD fluid with prescribed vorticity. *Nonlinear Analysis: Real World Applications*, 10(4), 2117-2126.



Title: Optimal Control of the Transmission Dynamics of the Hepatitis C with Quarantine

PI: Dr. Imran Naeem

Co-PI: Dr. Mudassar Imran

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 972,000

Project Initiated in: 2014

Duration: 12 Months

Category: Health

Description: In this research, a rigorous mathematical analysis of a deterministic model for the transmission dynamics of Hepatitis C, using a standard incidence function, are expected to be performed. The infected population is divided into three distinct

compartments featuring two distinct infection stages (acute and chronic) along with a quarantine compartment. The study intends that the disease free equilibrium is locally and globally asymptotically stable for basic reproduction number (R_0). The model reveals that for $R_0 > 1$, the endemic equilibrium exists and researchers will show stability properties local as well as global. Two different optimal control strategies (vaccination and quarantine) are planned to be designed to control the disease and reduce the infected population. The analysis is intended to be carried out by using Pontryagin's Maximum Principle in order to illustrate the optimal controls with respect to an optimality system numerically.



DEPARTMENT OF PHYSICS

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Profile: Dr. Muhammad Sabieh Anwar completed his DPhil from the Department of Physics, Oxford University (UK) in 2004, where he studied as a Rhodes Scholar from Pakistan. His dissertation was titled, "Quantum Information Processing using Para-Hydrogen NMR" and revolved around the preparation of pure quantum states for quantum computing. This work also constituted the first demonstration of quantum entanglement in the liquid state. His post-doctoral experience at the University of California, Berkeley (USA) involved the demonstration of hyperpolarized NMR using heterogeneous catalytic systems, microfluidic and "lab-on-a-chip" NMR, synthesis of precise magnetic fields for ex-situ NMR, algorithmic cooling, polarization lifetime studies and hypersensitive nanoparticle MRI. Prior to his doctoral studies, Sabieh received his BSc (Honours) degree in electrical engineering (electronics and communications) from University of Engineering and Technology, Lahore. Sabieh's current research interests include quantum control, spin mechanisms in nanomagnetic materials, nanotechnology, spintronics, magnetic resonance and physics education. His research has been published in various journals notably the Science, Proceedings of the National Academy of Science (PNAS), Physical Review Letters, A and B, Chemical Physics Letters, Analytical Chemistry, Journal of the American Chemical Society, Angewandte Chemie, Magnetic Resonance in Chemistry, Daltons Transactions and the American Journal of Physics.

Recent Publications:

- Yar, M., Shahzad, S., Siddiqi, S. A., Mahmood, N., Rauf, A., Anwar, M. S., & Ur Rehman, I. (2015). Tritethyl orthoformate mediated a novel crosslinking method for the preparation of hydrogels for tissue engineering applications: characterisation and in vitro cytocompatibility analysis. *Materials Science and Engineering: C*.
- Shaheen, A., Majeed, H., & Anwar, M. S. (2015). Ultralarge magneto-optic rotations and rotary dispersion in terbium gallium garnet single crystal. *Applied Optics*, 54(17), 5549-5554.
- Saleem, M., Anwar, M. S., Mahmood, A., Atiq, S., Ramay, S. M., & Siddiqi, S. A. (2015). Defects induced magnetization in B-doped ZnFeO dilute magnetic semiconductors. *Physica B: Condensed Matter*, 465, 16-20.

Most Cited Publications:

- Anwar, M. S. (2005). NMR quantum information processing with para-hydrogen. arXiv preprint quant-ph/0509046.
- Bouchard, L. S., Anwar, M. S., Liu, G. L., Hann, B., Xie, Z. H., Gray, J. W., & Chen, F. F. (2009). Picomolar sensitivity MRI and photoacoustic imaging of cobalt nanoparticles. *Proceedings of the National Academy of Sciences*, 106(11), 4085-4089.



Title: Development of Physics Laboratory at Habib University, Karachi

PI: Dr. Muhammad Sabieh Anwar

Sponsor: Habib University, Karachi

Funding Amount: PKR 3,318,000

Project Initiated in: 2014

Duration: 7 Months

Category: Technology

Description: The project fostered a new episode in sharing cutting-edge tools and techniques in modern, research-inspired science education and also promoted the development and transfer of indigenous instructional systems developed at the Physics Lab of the Syed Babar Ali School of Science and Engineering, LUMS. Through

modernisation and technical advancement, the motive was to establish a technology driven culture and to focus more on innovation.



more efficient utilisation of resources.

Title: Development of Physics Laboratory for Nusrat Jahan College, Rabwah
PI: Dr. Muhammad Sabieh Anwar
Sponsor: Nusrat Jahan College, Rabwah
Funding Amount: PKR 1,675,000
Project Initiated in: 2014
Duration: 8 months
Category: Technology

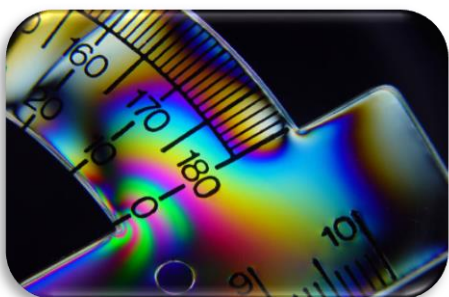
Description: The purpose of this project was to establish the general terms and conditions under which the Parties collaborated to achieve the objectives set out below for both LUMS and Nusrat Jahan College (NIC) through a joint work. The technical expertise from both organisations were used in this collaboration and allowed for a



designed at LUMS and the equipment along with learning material was transferred to Preston University.

Title: Fabrication of Physics Experiment on determination of Planck's constant using a light bulb
PI: Dr. Muhammad Sabieh Anwar
Sponsor: Preston University
Funding Amount: PKR 200,000
Project Initiated in: 2013
Duration: 1 month
Category: Technology

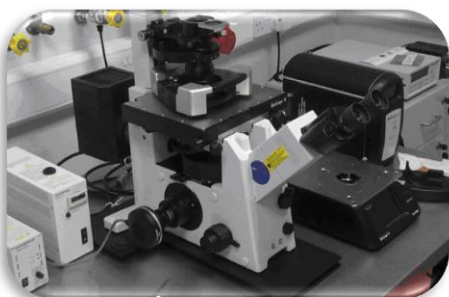
Description: In November 2013, the Physlab developed an introductory experiment on Measurement of Planck's constant using a light bulb for the undergraduate program at Preston University in Islamabad. Two setups of this innovative experiment were



quantum properties. The experimental investigations is complemented by detailed theoretical investigations on (b) Effect of the nuclear spin on magnetization dynamics, (c) Proposals on the possibility of quantum computing using electron and nuclear spin double resonance (ENDOR), (d) Quantum mechanical and semi-classical descriptions of the interaction of polarized harmonic electric fields with giant magnetic moments

Title: Observing Magnetization Dynamics of Single Molecule Magnets Using Polarized Light
PI: Dr. Muhammad Sabieh Anwar
Sponsor: LUMS Faculty Initiative Fund (FIF)
Funding Amount: PKR 450,000
Project Initiated in: 2013
Duration: 12 Months
Category: Natural Sciences

Description: The project starts with the synthesis of SMM's with high blocking temperature (TB) and thin film preparation by binding to functionalized surfaces, without disturbing the native crystal structure and hence preserving its macroscopic



longitudinal features on the order of 20-30 nm on area of 50×50 micron². This project not only harbors immense potential for research and teaching, but can also be commercialized in the near future.

Title: Fine Tuning of an In-house Developed Atomic Force Microscope
PI: Dr. Muhammad Sabieh Anwar
Sponsor: LUMS Faculty Initiative Fund (FIF)
Funding Amount: PKR 1,000,000
Project Initiated in: 2015
Duration: 12 Months
Category: Natural Sciences

Description: The proposed project aims at designing a close loop feedback control system, improvement, fine-tuning, testing, and calibration of a home-made atomic force microscope already developed in Dr. Sabieh's group. The microscope has demonstrated basic imaging capabilities and a proof-of-principle, being able to detect



Title: Fog monitoring in the Indo-Ganges Plain

PI: Dr. Muhammad Sabieh Anwar

Sponsor: National University of Sciences and Technology (NUST)

Funding Amount: PKR 200,000

Project Initiated in: 2016

Duration: 5 Months

Category: Natural Sciences

Description: The Consultancy Services to the Client will include, Sample collection on 12 hour basis as per provided protocols, Proper maintenance and care of the deployed instruments, provision of logistic support and electricity and working space and Indigenous design and manufacture of fog monitoring station for future usage.

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Profile: Mumtaz Ali Sheikh completed his BSc (Honours) degree in Computer Science from LUMS in 2004, graduating on the Dean's Honour List. He then joined the College of Optics and Photonics (CREOL), University of Central Florida from where he completed his PhD degree in Optics in 2009. His PhD work was in the area of extreme environment high temperature optical sensors in which he demonstrated novel temperature sensing techniques using Silicon Carbide. His technical contributions have been reported in several international journals and conference proceedings in the areas of optical sensors, confocal microscopy and laser beam analysis. His academic achievements include receiving the Society of Photo-Instrumentation Engineers (SPIE) Scholarship in 2009, LUMS Merit Scholarship from 2001-2004 and world distinction in A-Level Mathematics.

Recent Publications:

- Khan, S., Khan, S., Chawla, T., & Murtaza, G. (2014). Harmonic scalpel versus electrocautery dissection in modified radical mastectomy: a randomised controlled trial. *Annals of surgical oncology*, 21(3), 808-814.
- Sheikh, M., & Amin, M. J. (2012). Flat spectral response digital micromirror device-based variable fiber optic attenuator. *Photonics Technology Letters, IEEE*, 24(23), 2175-2178.
- Sheikh, M. (2012). Flat spectral response all-digital broadband variable fiber optic attenuator. In *SPIE MOEMS-MEMS* (pp. 82540P-82540P). International Society for Optics and Photonics.

Most Cited Publications:

- Sheikh, Y., Sheikh, M., & Shah, M. (2005). Exploring the space of a human action. In *Computer Vision, 2005. ICCV 2005. Tenth IEEE International Conference on* (Vol. 1, pp. 144-149). IEEE.
- Sheikh, M., & Riza, N. A. (2010). Motion-free hybrid design laser beam propagation analyser using a digital micromirror device and a variable focus liquid lens. *Applied optics*, 49(16), D6-D11.



Title: Super-resolution Confocal Microscopy through Wavefront Control in Complex Media

PI: Dr. Mumtaz Ali Sheikh

Co-PI: Dr. Syed Azer Reza

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 948,000

Project Initiated in: 2014

Duration: 12 Months

Category: Technology

Description: The primary aim of the research is to work on the problem of breaking the classical diffraction limit on the resolution of optical instruments with particular

emphasis on confocal microscopes. The idea is to use a random scattering medium in conjunction with a spatial phase light modulator to focus the illuminating laser light to a smaller spot on the sample than is otherwise permitted by the classical diffraction limit. Besides the obvious utility of this framework in microscopes especially for non-fluorescent samples, it can also potentially be used for optical tweezers in strongly scattering media, to improve sensitivity in spectroscopy and for lithography.



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SAHSOL

DEPARTMENT OF LAW & POLICY



SHAIKH AHMAD HASSAN
SCHOOL OF LAW

Dr. Ali Mohsin Qazilbash
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Profile: Dr. Ali Mohsin Qazilbash is the Head of Department of Law and Policy at LUMS since June 2009. He was also the Assistant Professor in Department of Law and Policy at LUMS from August 2008 to June 2009. Before joining LUMS, Dr. Qazilbash was Dean of Pakistan College of Law (July 2007 – July 2008) and also served there as a lecturer from 2007 to 2008. Apart from that, he was an instructor (2005 – 2007), Research Associate (2005 – 2007) and Adjunct Assistant Professor (2004 – 2005) in University of Notre Dame. Dr. Ali Mohsin Qazilbash has achieved several awards and fellowships such as the Ford Foundation Fellowship (1996 – 1997), Tuition Scholarship at Notre Dame Law School (1996 – 1997), Internship Scholarship (1997) at Notre Dame Law School, Notre Dame Human Rights Fellowship (1998), Tuition Scholarship at Notre Dame Law School (1998 – 2004), Notre Dame Human Rights Fellowship (1999 & 2000 – 2001), Dissertation Scholarship at Institute of World Politics, Washington D.C. (1991 – 2000), Penrose Family Scholarship (2001), Fellow, United Nations, International Law Seminar, organised by International Law Commission, in Geneva (May 21 – June 7, 2002) and Graduate School Research Award as a Post-Doctoral Fellow (2006 – 2007). Dr. Ali Mohsin Qazilbash was a Consultant with the Human rights Watch (May – August 1998), a Legal Associate at the International Peoples Tribunal on Human Rights and the Environment, New York (April 1998 & June, 1997), an Intern at the International Centre for Law in Development, New York (June – November 1997) and also a Senior Associate, AGHS Legal Aid Cell in Lahore (1993 – 1996).



Title: The Supreme Court of Pakistan's Landmark Decisions & Legal Lexicon Project

PI: Dr. Ali Mohsin Qazilbash

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 500,000

Project Initiated in: 2013

Duration: 12 Months

Category: Law & Policy

Description: The goal of the project is to publish a series of edited texts of a select body of the Supreme Court of Pakistan landmark decisions, taking into consideration the full range of decisions since the time the Court assumed its contemporary independent identity in 1956. In addition, to be published along with the edited texts

are readable and rigorous Urdu translations of the texts. This ground-breaking project will have far-reaching implications not only for legal, conceptual and sociological scholarship, but also for a very wide dissemination of the working records of the apex court of Pakistan and towards a general public understanding of the judicial nature in the country. The project aims to serve both LUMS and the society at large.



Title: Urdu Translation of Supreme Court Judgments

PI: Dr. Ali Mohsin Qazilbash

Sponsor: RS Corporate Advisory (Pvt.) Ltd

Funding Amount: PKR 200,000

Project Initiated in: 2013

Duration: 12 Months

Category: Law & Policy

Description: The goal of the project is to publish a series of edited texts of a select body of the Supreme Court of Pakistan landmark decisions, taking into consideration the full range of decisions since the time the Court assumed its contemporary independent identity in 1956. In addition, what are perhaps of prime importance, to

be published along with the edited texts are readable and rigorous Urdu translations of the texts. Once the texts are available, themes were identified that were manifested with some frequency in the decisions, and in this thematic context study the evolution of the Court's approach to certain particular issues of legal, procedural, and philosophical kinds. Finally there is a compilation of an English/Latin to Urdu lexicon, a lexicon which will grow out of the translation process.

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Profile: Professor Sikander Shah is a pioneering member of the SAHSOL, LUMS. He obtained a BA in Economics and a Juris Doctorate (Cum Laude) from the University of Michigan, Ann Arbor. He has been a visiting research faculty at Temple Law School, Wayne State Law School and the University of Michigan Law School. Professor Shah served as the Legal Advisor to the Ministry of Foreign Affairs while he was on sabbatical in 2012-2013. He teaches several advanced public international law and commercial law subjects. His research focuses on International Human Rights, International Humanitarian Law, International Trade Law, Ethics and Corporate Governance.

Selected Publications:

- Sikander A. S. (2014). Nontariff Barriers & Pakistan's Regional Trade: A Legal and Economic Analysis of Nontariff Barriers in Pakistan, India, China and Sri Lanka, International Growth Center - London School of Economics.
- Sikander A. S. (2011). The Provision and Violation of Water Rights (The Case of Pakistan) – A Human Rights Based Approach. LUMS Working Paper.
- Sikander A. S. (2010). War on Terrorism: Self Defense, Operation Enduring Freedom and the Legality of U.S Drone Attacks in Pakistan. 9 Wash. U. Global Stud. L. Rev. 77.
- Sikander A. S. (2009). River Boundary Delimitation and the Resolution of the Sir Creek Dispute between Pakistan and India. 34 Vt. L. Rev. 357.
- Sikander A. S. (2007). The U.S. Attacks on Afghanistan: An Act of Self Defense under Article 51, 6 Seattle J. for Soc. Just. 153.



Title: Rent-Seeking in Pakistan-India Trade under GATT

PI: Mr. Sikander Ahmed Shah

Co-PI: Mr. Uzair Kayani

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 650,000

Project Initiated in: 2014

Duration: 12 Months

Category: Law & Policy

Description: While international trade law encourages countries to lower restrictions on imports from all their trading partners, it allows for significant exceptions to this principle. In particular, under the General Agreement on Tariffs and Trade (GATT), a country may impose special restrictions on imports if it can justify these restrictions as: (i) anti-dumping measures; (ii) countervailing duties; (iii) emergency protection for local industry; or (iv) measures for economic development in a developing state. These legal trade restrictions are known as “safeguards.” Since these GATT safeguards are legal, countries can use them to harm a trading partner without incurring liability. Legally sophisticated countries can use these safeguards more effectively to secure economic rents for their local industries. The research is expected to analyse the use of these safeguards in trade between Pakistan and India since 2000. Specifically the study examines the impetus for their adoption, the legal arguments for their use, the industries affected by them, and the implications of their continued use for Pakistan-India trade in the future. The goal of the research project is to compare the extent to which Pakistan and India are using GATT provisions to legally shelter their own industries from competition from across the border.

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Profile: Professor Uzair teaches Torts, Commercial Law, and Law & Economics. Tort liability distributes the costs of social and economic harms to those parties that can best prevent, bear, or insure against them. Commercial law sets default rules for market exchange (sales, negotiable instruments, and securities), and market participants (partnerships, corporations, and hybrid forms). Economic analysis of law applies microeconomic insights (primarily price theory, game theory, and social choice) to study the incentives created by law and other forms of regulation.

Mr. Uzair studied social choice and game theory with Professors Elizabeth M. Penn and John W. Patty at Washington University in St. Louis. He studied law and economics with Professor Richard Epstein, Judge Richard Posner, Professor William Landes, and Professor Douglas Baird at the University of Chicago. Earlier, Uz studied political philosophy, literature, and the Classics at Middlebury College (Vermont) and Deep Springs College (California).

Research Interests:

- Law & Economics
- Commercial Law
- Corporate Finance
- Game Theory
- Social Choice
- R Statistical programming



Title: International Human Rights Law Clinic for Law Students

PI: Mr. Uzair Kayani

Co-PI: Mr. Sikander Ahmed Shah

Sponsor: American Bar Association (ABA)

Funding Amount: PKR 1,526,325

Project Initiated in: 2016

Duration: 9 Months

Category: Law & Policy

Description: This initiative will be headed by Professor Sikander Shah and Uzair Kayani.

A dedicated team of students will work under their tutelage. In recent years, the Punjab Bar Council, which is required to make provisions for free legal aid for underprivileged

litigants under its constitution, has been woefully inadequate in taking adequate measures to realize this goal, especially in matters of human rights abuse. Over the past few years, students at LUMS have taken an active interest in doing pro-bono work, both as a way of giving back to the community and in order to hone their newly developed skills as lawyers. There is a two-part class taught at LUMS titled 'Legal Aid' which aims to train law students in litigation by encouraging them to aid underprivileged litigants in their legal matters. Furthermore, many law students from LUMS take up clerkships with Supreme Court justices upon graduation, often in the interest of receiving exposure to constitutional and human-rights related matters.

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Profile: Dr. Zubair Abbasi completed his doctorate from the Faculty of Law, Oxford University. The focus of his doctoral thesis was on the transplantation of English legal system in colonial India and the interaction between Islamic law (Fiqh) and English law in this process. He conducted a case study of the developments in Islamic waqf law under the British legal system by analysing the jurisprudence developed in the judgments of the Judicial Committee of the Privy Council and various Indian High Courts. His research revealed the crucial role played by Muslim lawyers, judges, 'ulama', and politicians in the formation of Anglo-Muhammadan Law (later called Muslim Personal Law). It showed how they simultaneously negotiated and collaborated with, and resisted the colonial administrators in the making and operation of the new Indian legal system.

Dr Abbasi is currently exploring the legal process of the 'judicial islamisation' of laws in Pakistan in the historical context of the convergence of the principles of Islamic law and English law in colonial India. He is also examining the relationship between Sharia and the modern state in the larger context of the scholarship that explores the relationship between different legal systems and their impact on economic and political development of a country.

Selected Publications:

- Abbasi, Muhammad Zubair, Sharia and State Law: Relevance of Islamic Legal History for the Application of Muslim Family Law in the West, *Journal of Law, Religion and State*, 2(3) 2015, 124-38
- Abbasi, Muhammad Zubair, Islamic Law and Social Change: An Insight into the Making of Anglo-Muhammadan Law, (*Oxford*) *Journal of Islamic Studies*, 3 (25) 2014, 263-297.
- Abbasi, Muhammad Zubair, Colonial State and Muslim Institutions: History of Regulatory Framework for Awqaf (Religious Endowments) in British India in Brown, Rajeswary Ampalavanar and Pierce, Justin, *Charities in the Non-Western World: The Development and Regulation of Indigenous and Islamic Charities* (2013 Routledge) 310-32.
- Abbasi, Muhammad Zubair, The Classical Islamic Law of Waqf: A Concise Introduction, *Arab Law Quarterly*, Vol. 26, No. 2, 2012, 121-53.



Title: Sharia and the Modern State: Judiciary and the Application of Islamic Jurisprudence in Pakistan

PI: Dr. Zubair Abbasi

Sponsor: LUMS Faculty Initiative Fund (FIF)

Funding Amount: PKR 1,000,000

Project Initiated in: 2015

Duration: 12 Months

Category: Law & Policy

Description: This project proposes to evaluate the contribution of the Shariat Courts in Pakistan in the application and development of Islamic law (Fiqh/Shari'a) by analysing the judgments of the Federal Shariat Court and the Shariat Appellate Bench

of the Supreme Court of Pakistan. This project will assess the way Islamic Jurisprudence (Usul al-Fiqh) is applied in Pakistan by the Federal Shariat Court and the Shariat Appellate Bench of the Supreme Court of Pakistan. It will critically analyse the contribution of case law produced by these courts in the application and development of Islamic Jurisprudence while dealing with various issues relating to property law, commercial law, contract law, penal law, labour law and family law



Title: The Contribution of the Judiciary in the Application and Development of Islamic Jurisprudence in Pakistan

PI: Dr. Zubair Abbasi

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 819,539

Project Initiated in: 2015

Duration: 24 Months

Category: Law & Policy

Description: In Pakistan, judicial organ of the state is employed to islamise the existing laws. This is a unique approach adopted in a Muslim country in order to indigenise transplanted colonial laws and/or to replace them with Islamic law. In this respect, the

jurisprudence produced in the judgments of the Federal Shariat Court and the Shariat Appellate Bench of the Supreme Court provides valuable material for assessing the mechanism of applying Islamic law in a modern nation state. This project proposes to assess the way Islamic Jurisprudence (Usul al-Fiqh) is applied in Pakistan by the Federal Shariat Court and the Shariat Appellate Bench of the Supreme Court of Pakistan since 1980. It will critically analyse the contribution of case law produced by these courts in the application and development of Islamic Jurisprudence while dealing with various issues relating to commercial law, contract law, penal law, labour law and family law.



Title: The Role of Judiciary in Protection of Women's Rights: A Case Study of Divorce Law (Khul')

PI: Dr. Zubair Abbasi

Sponsor: Higher Education Commission (HEC)

Funding Amount: PKR 2,623,320

Project Initiated in: 2016

Duration: 12 Months

Category: Law & Policy

Description: This study has a dual objective, firstLY it explores how Pakistani judiciary justified extension in women's unilateral right to divorce? And secondly what is the impact of this legal change on the institution of family. The first part of the study will be

based on a comprehensive analysis of all reported case law produced by the Lahore High Court and the Supreme Court of Pakistan. The second part will be based on the selected unreported judgments of family courts in the Punjab Interviews of litigants, judges, lawyers and local council officials will also be conducted to analyse the issue in detail.

Index

- Abdul Aziz, 119
Abdul Rauf, 38
Abid Aman Burki, 20, 49, 50, 51, 52, 53, 61
Abubakr Muhammad, 20, 136, 137, 138, 139, 140, 146, 157
Adam Smith International (ASI), 8, 61, 128
Adnan Khan, 165
Aga Khan Cultural Service - Pakistan (AKCS-P), 8, 75
Agriculture, 9, 22, 41, 50, 66
Ahmad Kamal Nasir, 139, 140
Ahmed Jawaad Afzal, 83, 86
Ali Khan, 68
Ali Mohsin Qazilbash, 174
Ali Nobil Ahmad, 69
Ali Raza, 70
Ali Usman Qasmi, 20, 71
American Bar Association (ABA), 176
American University, 8, 32
Amir Faisal, 84, 85, 111
Ammar Anees Malik, 55
Andy McKay, 54
Anne Christine Habbard, 73
Arif Zaman, 115
Arman Rezaee, 66
Asad Alam, 32
Asim Karim, 116
Asim Loan, 151
Assessment and Strengthening Program (ASP), 8, 33
Association of Management Development Institution in South Asia (AMDISA), 8
Atif Saeed Chaudry, 20, 24
Ayaz Qureshi, 20
Ayesha Bhatti, 38
Aziz Mithani, 83, 86, 87, 93, 96
Bahauddin Zakariya University, 86
Barclays, 59
Barclays Bank, Karachi, 8
Basit Bilal Koshul, 72
Basit Shafiq, 117, 118, 119, 120, 121
Basit Yameen, 100
Begum Saida Waheed, 58
Behavioural Studies, 9, 36, 39, 63, 66, 68, 76, 78
Best IT Innovation Awards (BITA), 22
British Council, 8, 101
Business & Innovation, 9, 24, 28, 30, 41, 59
Campaign for Quality Education, 8
Case Research Centre (CRC), 13
Center for Economic Policy Research, 8, 66
Center for Economic Research in Pakistan (CERP), 8, 128
Centre for Advanced Studies in Mathematics (CASM), 15
Centre for High Performance Computing (CHPC), 15
Centre for Water Informatics & Technology (WIT), 15
Choudhry Tanveer Shehzad, 20, 25, 32
Cleaner Production Institute CPI, 8
Coca Cola Beverages Pakistan Ltd. (CCBPL), 8
Colin Williams, 36
Computer Vision, 9, 115, 131, 132, 171
Comstech-Twas, 8, 93, 102
Department for International Development (DfID), 8, 60
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), 8, 51, 127
Development Management, 9, 33, 34, 35, 40, 41, 42, 54, 55, 56, 57, 69, 71, 72, 73, 79, 118, 127, 128, 137, 138
Development Policy Research Centre (DPRC), 14, 61
Disney Research, Pittsburg, 8
Economic and Social Research Council (ESRC), 8, 54
Economic Development, 9, 25, 26, 27, 31, 32, 37, 38, 49, 50, 51, 52, 53, 54, 60, 61, 63, 64
Education, 9, 33, 50, 58, 62, 70, 77, 126
Energy, 9, 133, 134, 142, 143, 147, 148, 151, 152, 153
Enrico Marelli, 32
Environment, 9, 22, 45, 109, 110, 122, 174
Erasmus Mundus, 8
Fahad Rafique Dogar, 123
Fahd Rehman, 20
Faisal Bari, 59
Falak Sher, 100, 101
Farah Shahid Hassan, 57
Farasat Munir, 141
Farrah Arif, 26, 27, 32
Ferhana Ahmad, 28
Florida State University, 44, 59, 115
Furrukh A. Khan, 73
Gallup PakistanDuke University, 55
German Aerospace Center, 138
German Pakistani Research Cooperation Programme (DAAD), 8, 97, 129, 137, 140, 157, 158
Ghayoor Abbas Chotana, 102, 103
Ghazal Mir Zulfiqar, 49
Ghulam Ishaq Khan Institute of Engineering Sciences and Technology (GIKI), 8
GIS, 10
Global Development Network (GDN), 8
Global Development Services International (GDSI), 8, 126
Google Asia Pacific Pte. Ltd., 8
Gurmani Centre for Languages and Literature (GCLL), 14
Habib University, 8, 168
Habib Ur Rehman, 104
Hadia Majid, 54, 55, 64
Haider Ali, 138
Hamid Abdul Basit, 120, 121
Hammad Siddiqui, 59
Hasan H. Karrar, 20, 74

Hassan Abbas Khan, 142, 143, 152
Hassan Rauf Chaudhry, 29
Health, 8, 10, 44, 54, 60, 66, 84, 88, 95, 97, 98, 105, 106, 107, 108, 160, 165, 166
Health and Nutrition Innovation Fund (HANIF), 8, 60
Higher Education Commission (HEC), 8, 22, 41, 77, 85, 87, 88, 90, 91, 93, 94, 96, 98, 100, 104, 105, 110, 113, 118, 122, 125, 130, 139, 178
History & Art, 10, 75
HomeNet, 8, 56
HTSPE International Programme Management, 8
Hubert Roth, 140
Husnain Fateh Ahmed, 20, 55, 56, 143
IGI Insurance Limited, 8, 41
Ihsan Ayyub Qazi, 122, 123, 124, 163
Ijaz Haider Naqvi, 144, 145
Imran Mahmood, 134
Imran Naeem, 166
Imtiaz ul Haq, 57, 59
Indian Council for Research on International Economic Relations (ICRIER), 8
Indus Motor Company (IMC), 8, 52
Ing. Axel Sikora, 157, 158
Institute of Development and Economic Alternatives (IDEAS), 8, 62
Institute of Space Technology (IST), 8
Institutional Review Board (IRB)
IRB, 18
International Food Policy Research Institute (IFPRI), 8, 51, 55
International Growth Centre (IGC), 8, 51, 55, 59, 143
International Water Management Institute (IWMI), 8
Irshad Hussain, 20, 100, 105, 106
Ishtiaq Ahmed, 70
Japan International Cooperation Agency (JICA), 8, 53
Jibran Tahir, 83
K Legal Solicitors, 8, 115
Kalam Reserach and Media, 8, 72
Kamal Ahmad Munir, 58
Kamran Ali Chatha, 30, 35, 38, 41
Kashif Zaheer Malik, 59, 60
Katherine Vyborny, 55
Khalid Mir, 50
Klaus Wehrle, 129
L.J.R. Scholtens, 25
Lahore Electric Supply Company (LESCO), 8, 151
Laila Bushra, 20, 68
Lauge Skovgaard Poulsen, 54
Law & Policy, 10, 50, 51, 126, 127, 174, 175, 176, 177, 178
London School of Economics and Political Science, 8, 54, 63
London School of Economics and Political Science (LSE), 8, 63
London School of Economics and Political Sciences (LSE), 8
LUMS Faculty Initiative Fund (FIF), 8, 24, 25, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37, 39, 43, 44, 45, 54, 59, 63, 68, 69, 70, 71, 73, 74, 76, 78, 79, 83, 84, 85, 89, 91, 92, 93, 98, 103, 104, 106, 107, 108, 109, 111, 112, 116, 117, 118, 120, 123, 130, 131, 133, 136, 138, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 152, 154, 155, 159, 160, 161, 163, 165, 166, 169, 171, 174, 175, 177
Mahvish Shami, 54
Marillis Vahe, 44
McGill University, 8, 58, 89
MGSHSS, 14, 20, 49, 54, 56, 57, 58, 59, 61, 62, 63, 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79
Mian Muhammad Awais, 20, 125, 140
MicroTech Industries (Private) Ltd., 8
Microtech Industries Pvt. Ltd, 9, 152
Misbah Tanveer Chaudhry, 20, 31, 32
Mohammad Jahangir Ikram, 133, 143
Mohammad Usman Khan, 50, 61, 65
Mohammad Waseem, 20
Mohsin Bashir, 33
Momin Ayub Uppal, 146, 148
Mudassar Imran, 165, 166
Muhammad Adeel Ahmed Pasha, 147, 148, 158
Muhammad Adeel Zaffar, 27
Muhammad Azam Roomi, 36
Muhammad Fareed Zaffar, 126, 127, 128
Muhammad Farooq Naseer, 62
Muhammad Hamad Alizai, 129, 130
Muhammad Junaid Ashraf, 38
Muhammad Meki, 59
Muhammad Naiman Jalil, 20, 32, 34
Muhammad Sabieh Anwar, 168, 169, 170
Muhammad Saeed, 107, 108
Muhammad Shakeel Sadiq Jajja, 29, 30, 35
Muhammad Shehryar Shahid, 36
Muhammad Tahir, 149
Muhammad Tariq, 85, 86, 88, 89, 91, 95
Muhammad Zaheer, 109, 110
Mumtaz Ali Sheikh, 150, 159, 171
Murtaza Taj, 131, 132
Mushtaq Ahmad Gurmani School of Humanities & Social Sciences (MGSHSS), 11, 14
Mushtaq Ahmad Khan, 50, 51, 63
Nabil Adam, 118
Nadeem Ahmad Khan, 150
Nadhra Shahbaz Naeem Khan, 75, 131
Najeeb Ullah, 106
National Engineering Services Pakistan (NESPAK), 9, 137
National ICT R&D Fund, 9, 22, 94, 121, 123, 124, 132, 137, 140, 143, 145, 153, 156
National University of Sciences and Technology (NUST), 9, 96, 134, 170
Natural Sciences, 10, 83, 85, 86, 87, 89, 90, 91, 96, 101, 102, 103, 104, 111, 169, 170
Nauman Ahmad Zaffar, 142, 143, 144, 151, 152, 153
Nauman Zafar Butt, 154
Naveed Arshad, 20, 119, 133, 134
Naveed Ul Hassan, 147, 155, 156

Nestle, 9, 138
 Nida Yasmeen Kirmani, 76
 Nusrat Jahan College, Rabwah, 9, 169
 Office of Sponsored Programmes and Research (OSPR), 21
 OSPR, 6, 18
 Open Society Institute (OSI), 9
 Operations Management, 10, 29, 35, 52
 Oxfam International, Pakistan, 9, 50, 56
 Packages Limited, 9, 95
 Pakistan Centre for Philanthropy (PCP), 9, 55
 Pakistan Institute of Corporate Governance (PIGC), 9, 26
 Pakistan Microfinance Network (PMN), 9, 49
 Pakistan Science Foundation (PSF), 22
 Pakistan Strategy Support Program (PSSP), 9
 PakShine, 9, 152
 Political Science, 10, 14, 77
 President's Programme for Care of Highly Qualified Overseas Pakistanis (PPQP), 22
 Preston University, 9, 169
 Prof. Marcello Signorelli, 31
 Punjab Skills Development Fund (PSDF), 9, 40
 Qadri Group, 9, 35
 Rahman Shah Zaib Saleem, 111
 Rashid Memon, 49, 50, 52, 63, 64
 Rasul Bakhsh Rais, 63, 77
 Rausing Executive Development Centre (REDC), 13, 45
 Re-engineering With Research (RWR) Private Ltd, 9, 162
 Robotics, 10, 136, 137, 139, 140
 Robotics Research Lab, TU Kaiserslautern, 136, 137
 RS Corporate Advisory (Pvt.) Ltd, 9, 174
 Rutgers University, 117, 118
 RWTH Aachen University, 129
 S. Sohail H. Naqvi, 5
 S.M. Turab Hussain, 65
 Saad Azmat, 34, 37, 38
 Sadaf Ahmad, 78
 Sadia Ashraf, 90
 Sadia Hamera, 91, 92
 Safee Ullah Chaudhary, 92, 93, 94, 146
 SAHSOL, 11, 17, 18, 20, 174, 175, 176, 177
 Salman Noshear Arshad, 112, 113, 146
 Sameer Ahmad, 94
 Samina Quratulain, 39
 SBASSE, 18, 20, 83, 84, 86, 88, 90, 91, 92, 95, 96, 97, 100, 101, 102, 104, 105, 107, 109, 111, 112, 115, 116, 117, 120, 122, 125, 126, 129, 131, 133, 136, 139, 141, 142, 144, 146, 147, 149, 150, 151, 154, 155, 157, 159, 160, 161, 163, 165, 166, 168, 171
 SDSB, 11, 13, 18, 20, 24, 25, 26, 28, 29, 30, 31, 33, 34, 35, 36, 37, 39, 40, 41, 43, 44, 45
 Shabbir Ahmad, 52
 Shafaat Rabani, 89
 Shafay Shamail, 6, 20, 118, 119, 120, 121
 Shahab M. Baqai, 118
 Shahid Masud, 157, 158
 Shaikh Ahmad Hassan School of Law (SAHSOL), 11, 17
 Shalamar Medical and Dental College, 146
 Shaper Mirza, 95, 106
 Sikander Ahmed Shah, 175, 176
 Simon Quinn, 59
 Social Enterprise Development Centre (SEDC), 13
 Society for Advancement of Higher Education (SAHE), 9, 126
 Softech Systems, 121
 Sohaib Ahmad Khan, 118, 127, 131
 Sohail Asif Qureshi, 89, 105
 SONY, 9, 161, 162
 South Asia Center for Policy Studies (SACEPS), 9, 57
 South Asia Network of Economic Research Institutes (SANEI), 9, 65
 Spenta Kaklia, 60
 State Bank of Pakistan (SBP), 9, 38
 Strategic Sectors Research Centre (SSRC), 13
 Suleman Dawood School of Business (SDSB), 11, 13
 Suleman Shahid, 127, 128
 Sultan Sial, 165
 Syed Affan Ahmed, 130
 Syed Ali Hasanain, 66
 Syed Azer Reza, 20, 159, 171
 Syed Babar Ali Foundation, 57
 Syed Babar Ali School of Science and Engineering (SBASSE), 11, 15
 Syed M. Hassan, 60
 Syed Mubashir Ali, 40
 Syed Muhammad Azeem, 20
 Syed Muhammad Hussain, 20, 49, 51, 52, 53
 Syed Shahzad ul Hussain, 90, 97, 98
 Syed Zahoor Hassan, 41, 42
 Syeda Kahkeshan Hijazi, 96
 Tariq Mahmood Jadoon, 127, 130, 147
 Techlogix, 9, 151
 Technology, 10, 92, 93, 94, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 129, 130, 141, 144, 145, 146, 150, 154, 155, 156, 157, 158, 159, 161, 162, 168, 169, 171
 Technology for People Initiative (TPI), 15
 Telecommunications, 10, 44, 146, 149, 163
 Tetra Pak, 9, 50
 The Global Fund to End Slavery, 9, 60
 Thomas Peters, 97
 Trade, 10, 59, 65, 74
 U.S Agency for International Development (USAID), 9, 131
 U.S Agency for International Development USAID, 73, 134
 U.S. Agency for International Development (USAID) Ambassador's Fund Program, 9
 UET, Peshawar, 9, 106
 Umm Al Qura University, 145
 UN Women, 9, 61
 United Nations International Children's Emergency Fund (UNICEF), 9, 52
 United Nations International Children's Emergency Fund (UNICEF), 50
 United Nations University (UNU), 9, 64



United States Institute of Peace (USIP), 9, 77, 127
University College London, 54, 69
University in Perugia, 31
University of Agriculture Faisalabad (UAF), 86
University of Brescia, 32
University of California, San Diego, 9, 66
University of Edinburgh, UK, 101
University of Engineering and Technology, Lahore, 149, 151
University of Offenburg, 157, 158
University of Queensland, 9, 52
University of Queensland, Australian Centre for International Agricultural
Research (ACIAR), 9, 52
University of Sheffield, 36
University of Siegen, 139, 140
University of Siegen, Germany, 140
University Research Council (URC)
URC, 18
URC, 18, 19, 20
USAID, 9, 33, 105, 131
Uzair Kayani, 20, 175, 176

Vern Paxson, 163
Waqar Zaidi, 79
Waqas Majeed, 160
Wasif Tanveer Khan, 161, 162
Water, 10, 112, 113, 137
World Bank, 9, 41
World Wide Fund (WWF), 9
Yasir Khan, 66
Zaffar Sajjad, 160
Zaghum Umar, 43
Zahid Bashir, 146
Zain ul Abdin Khawaja, 44
Zakir Ullah, 98
Zameen Media (Pvt) Ltd., 9, 34
Zarai Taraqiati Bank Limited (ZTBL), 9, 42
Zartash Afzal Uzmi, 27, 122, 123, 163
Zehra Waheed, 40, 45
Zeus Consulting, 73
Zeus Consulting., 73
Zubair Abbasi, 177, 178

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