Hassan Mohy-ud-Din

Assistant Professor of Electrical Engineering,
Director ATP (**A**lgorithms in **T**heory and **P**ractice) Lab
Syed Babar Ali School of Science and Engineering, LUMS, Pakistan

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Research Interests

My research is at the intersection of applied mathematics and clinical imaging. I exploit tools in machine learning, optimization, statistics, and information theory to develop novel algorithms for clinical and translational imaging. I study fundamental properties of algorithms, its computational virtues, limitations, and challenges, and its efficacy in completing a clinical task in question. I have done extensive research in multimodality imaging including PET/CT, SPECT/CT, PET/MR, Low-dose CT, and multiparametric MRI and developed computational pipelines for brain imaging, cardiac imaging, abdominal imaging, and whole-body imaging.

Education

Ph.D. in Electrical and Computer Engineering **Sep 2009 – Mar 2015**
Johns Hopkins University, Baltimore, MD, USA

Thesis: *Motion Correction and Pharmacokinetic Analysis in Dynamic Positron Emission Tomography*
Committee: Arman Rahmim (Radiology), John Goutsias (ECE), Sridevi V. Sarma (BME), Howard L. Weinert (ECE), and Amy Foster (ECE)

2014 Bradley-Alavi Fellowship from the Society of Nuclear Medicine and Molecular Imaging, USA
2014 SIAM Student Award in Imaging Science from the Society of Industrial and Applied Mathematics, USA
PhD Fellowship from Johns Hopkins University, USA (2009 – 15)
Department Representative (Nominated), Johns Hopkins University, USA
Executive Member, Hopkins Imaging Initiative, Johns Hopkins University, USA

MA in Applied Mathematics and Statistics **Sep 2012 – Dec 2014**
Johns Hopkins University, Baltimore, MD, USA

Thesis: *Minimizing Nonconvex Quadratic Functions Subject to Bound Constraints*
Advisor: Daniel P. Robinson
Software: Non-convex solver for bound-constrained QP problems (NC-BCQP)

MSE in Electrical and Computer Engineering **Sep 2009 – May 2011**
Johns Hopkins University, Baltimore, MD, USA

Specialization: *Optimization, Information Theory, and Medical Imaging*

BS in Electrical and Electronics Engineering **Sep 2002 – May 2006**
Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Topi, Pakistan

Specialization: *Digital Signal Processing, Digital Communications, and Applied Mathematics*

Deans Honor Roll, Top 5% out of 200 students
Best Speaker

Professional Experience

Director, Algorithms in Theory and Practice (ATP) Lab **Jun 2018 – To Date**
Syed Babar Ali School of Science and Engineering, LUMS, Lahore, Pakistan

Assistant Professor of Electrical Engineering **Jan 2018 – To Date**
Syed Babar Ali School of Science and Engineering, LUMS, Lahore, Pakistan

Clinical Research Scientist **Mar 2017 – Dec 2017**
Shaukat Khanum Memorial Cancer Hospital & Research Center, Lahore, Pakistan

Postdoctoral Associate **Apr 2015 – Feb 2017**
Department of Radiology and Biomedical Imaging, Yale School of Medicine, CT, USA

Instructor, Experimental Physics Laboratory, and Development Engineer **Sep 2008 – Aug 2009**
Syed Babar Ali School of Science and Engineering, LUMS, Lahore, Pakistan

Lecturer in Mechatronics and Control Engineering **Sep 2006 – Nov 2008**
University of Engineering and Technology, Lahore, Pakistan

Research Funding and Grants

Note: Grant amount of successful proposals is mentioned in the national currency PKR (Pakistani Rupee). A grant amount of PKR 20 million is a large amount and can fund a sizeable research lab (i.e., human resource) for multiple years.

Successful Proposals

Organization : Higher Education Commission, Pakistan
Title : Establishment of **A**lgorithms in **T**heory and **P**ractice (ATP) Lab
Role : Principal Investigator (PI)
Award : PKR 20 million
Duration : 2018 – To Date

Organization : Higher Education Commission, Pakistan
Title : Establishment of National Center in Big Data and Cloud Computing
Role : Co-Principal Investigator (Co-PI)
Collaborators : Dr. Naveed Arshad (PI), Dr. Ihsan Ayyub Qazi (Co-PI), Dr. Imdad Ullah Khan (Co-PI), Dr. Suleman Shahid (Co-PI)
Award : PKR 1,534 million
Duration : 2018 – To Date

Organization : Higher Education Commission, Pakistan
Title : Sustainable Energy Informatics Lab
Role : Co-Principal Investigator (Co-PI)
Collaborators : Dr. Fiaz Ahmad Chaudhry (PI), Dr. Naveed Arshad (Co-PI), Dr. Imdad Ullah Khan (Co-PI), Dr. Suleman Shahid (Co-PI)
Award : PKR 61 million
Duration : 2018 – To Date

Organization : Higher Education Commission, Pakistan
Title : (Co)Homology of spaces and its applications in Topological Data Analysis
Role : Co-Principal Investigator (Co-PI)
Collaborator : Dr. Haniya Azam (PI)
Award : PKR 10 million (NRPU Grant)
Duration : 2023 – To Date

Organization : Bill and Melinda Gates Foundation, USA
Title : Awaaz-e-Sehat: Empowering Maternal Healthcare with Voice-Enabled EMR
Role : Co-Principal Investigator (Co-PI)
Collaborators : Dr. Maryam Mustafa (PI), Dr. Beena Ahmed (Co-PI)
Award : PKR 28 million
Duration : Sep 2023 – Dec 2023

Organization : Shahid Hussain Foundation
Title : Radiomics guided prediction of multivessel cardiac disease in 3D echocardiography
Role : Principal Investigator
Collaborator : Dr. Kamran Babar Ali (Co-PI)
Award : PKR 1 million
Duration : 2019 – 2020
Remarks : Unfortunately, the grant could not be availed due to the onset of Covid-19 pandemic and the departure of lead cardiologist and Co-PI (Dr. Kamran) from Shalamar Hospital.

Organization : LUMS Faculty Initiative Fund
Title : Volumetric Analysis of Hepatic Lesions with Triphasic CT Imaging
Role : Principal Investigator (PI)
Award : PKR 1 million
Duration : 2018 – 2019

Organization : LUMS Startup Grant
Title : Research Infrastructure and Research Activities
Award : PKR 1.6 million
Duration : 2018 – To Date

Unsuccessful Proposals

Remark: A reader might be puzzled to read that most of my unsuccessful proposals are on brain tumor characterization. This is not stubbornness but a deep passion for the project which promises to (A) conduct the first prospective study in Pakistan which evaluates radiogenomics framework for brain tumor characterization, (B) install a completely noninvasive and free of (patient) cost imaging pipeline for robust and accurate diagnosis of brain gliomas, and (C) make a large cohort of fully annotated multi-modality datasets freely available for research and innovation. The project **carries enormous importance** and requires at least PKR 50 million of (multi-institutional) funding which is only offered by the big grants. ATP Lab has already published several papers using multimodality datasets available from TCIA and TCGA platforms, representing the patient demographic in USA.

Organization : U.S. Embassy Islamabad, Public Affairs Section
Title : Empowering Girls through STEM Learning
Role : Co-Principal Investigator (Co-PI)
Collaborator : Centre for Business and Society, LUMS (PI)
Award : USD 125,000
Year : 2022

Organization : Google Research Award
Title : Radiogenomic Toolkit for Complete Brain Tumor Characterization
Role : Principal Investigator (PI)
Award : USD 60,000
Year : 2022

Organization : Ignite National Technology Fund
Title : An Imaging Toolkit for Complete Brain Tumor Characterization
Role : Principal Investigator (PI)
Collaborators : Dr. Ulas Bagci (Co-PI), Shaukat Khanum Memorial Cancer Hospital and Research Center, Softech Systems
Award : PKR 100 million
Year : 2022
Stage : second round

Organization : Einstein Early Career Prize
Title : An Imaging Toolkit for Complete Brain Tumor Characterization
Role : Principal Investigator (PI)
Award : EUR 100,000
Year : 2021

Organization : Higher Education Commission, Pakistan
Title : Brain Tumor Characterization with Radiogenomics and Deep Learning
Role : Principal Investigator (PI)
Collaborators : Dr. Haniya Azam (Co-PI), Dr. Ulas Bagci (Co-PI), Shaukat Khanum Memorial Cancer Hospital and Research Center
Award : PKR 65 million
Year : 2021
Stage : second round

Publications

Summary: My publications have collected 302 **citations** (and counting) with an ***h*-index** of 9 and an ***i*10-index** of 9 (according to Google Scholar). Publications from LUMS have been cited 116 times (and counting). J1 to J8 journal papers were published before joining LUMS.

Legend: [U] undergraduate student (BA, BS, BSE), [G] graduate student (MA, MS, MSE), [D] doctoral student (PhD, DPhil), [R] research assistant or associate (RA), [C] collaborator, [L] project leader, rounded-off impact factor at the time of submission/acceptance (IF).

Books/Monographs/Lecture Notes

B4 **Hassan Mohy-ud-Din**, Inference and Learning from Data: personal notes and exposition. (in writing)

B3 **Hassan Mohy-ud-Din**, Measure Theory, Probability Theory, and Statistical Inference. (in writing)

B2 Seyed Mostafa Kia[L] and **Hassan Mohy-ud-Din[L]**, Machine Learning in Clinical Neuroimaging and Radiogenomics in Neuro-oncology, Lecture Notes in Computer Science, Vol 12449, 978-3-030-66843-3, Springer, 2021. [Weblink]

B1 **Hassan Mohy-ud-Din[L]** and Saima Rathore[C], Radiomics and Radiogenomics in Neuro-oncology, Lecture Notes in Computer Science, Vol 11991, ISBN 978-3-030-40123-8, Springer, 2020. [Weblink]

Journal Papers

J20 Shujah ur Rehman[G,R] and **Hassan Mohy-ud-Din[L]**, Semi-supervised Medical Image Segmentation using Bootstrapped Uncertainty Estimates, Medical Image Analysis, 2024. [IF 11] (in writing)

J19 Shujah ur Rehman[G,R], Ahmed Shafqat[U], and **Hassan Mohy-ud-Din[L]**, Do state-of-the-art semi-supervised segmentation methods yield robust clinical measures?, Journal of the American College of Cardiology, 2024. [IF 24] (in submission)

J18 Shujah ur Rehman[G,R], Ahmed Waheed[G], and **Hassan Mohy-ud-Din[L]**, Semi-supervised Medical Image Segmentation with Strong Denoising Autoencoders, Medical Image Analysis, 2024. [IF 11] (in writing)

J17 Maria Nadeem[G,R], Asma Shaheen[D], Muhammad Faizyab Ali Chaudhary[R], and **Hassan Mohy-ud-Din[L]**, Towards robust and generalizable radio(gen)omics predictive models for brain tumor characterization, American Journal of Neuroradiology, 2024. [IF 3] [ArXiv] (revision req.)

J16 Sana Jabbar[D], Syed Talha Bukhari[G,R], and **Hassan Mohy-ud-Din[L]**, Advancing Cardiac Segmentation Networks for Cross-domain Generalization: A Multi-center, Multi-vendor Study, Frontiers in Cardiovascular Medicine, 2024. [IF 3] [ArXiv] (revision req.)

J15 Maximilian Zenk, …, **Hassan Mohy-ud-Din[C]**, …, Klaus Maier-Hein[L], and Spyridon Bakas[L], The Federated Tumor Segmentation (FeTS) Challenge: Towards Fair Decentralized Benchmarking of Healthcare AI Algorithms, Nature Communications. [IF 15] (consortium) (under review)

J14 Carlos Martín-Isla[L], …, Sana Jabbar[D], …, **Hassan Mohy-ud-Din[C]**, …, and Karim Lekadir, Deep learning segmentation of the right ventricle in cardiac MRI: the M&Ms challenge, IEEE Journal of Biomedical and Health Informatics, Vol 27, Issue 7, 2023. [IF 7] [Weblink] (consortium)

J13 Matthias Eisenmann[L], …, **Hassan Mohy-ud-Din[C]**, …, and Patryk Filipiak, Biomedical image analysis competitions: The state of current participation practice, arXiv preprint arXiv:2212.08568, 2022. [arXiv] (consortium)

J12 Asma Shaheen[D], Syed Talha Bukhari[G,R], Maria Nadeem[G,R], Stefano Burigat[C], Ulas Bagci[C], and **Hassan Mohy-ud-Din[L]**, Overall Survival Prediction of Glioma Patients with Multiregional Radiomics, Frontiers in Neuroscience, Vol 16, Article 911065, 2022. [IF 5] [Weblink]

J11 Maria Tammor[D], Irfan Younas[C], and **Hassan Mohy-ud-Din[L]**, Two-stage active contour model for robust left ventricle segmentation in cardiac MRI, Multimedia Tools and Applications, Vol 80, 2021. [IF 3] [Weblink]

J10 Syed Talha Bukhari[G,R] and **Hassan Mohy-ud-Din[L]**, A systematic evaluation of learning rate policies in training CNNs for brain tumor segmentation, Physics in Medicine and Biology, Vol 66, Issue 10, 2021. [IF 4] [Weblink]

J9 Lijun Lu, Xiaomian Ma, **Hassan Mohy-ud-Din[C]**, Jianhua Ma, Qianjin Feng, Arman Rahmim, and Wufan Chen[L], Enhancement of dynamic myocardial perfusion PET images based on Low-rank plus Sparse Decomposition, Computer Methods and Programs in Biomedicine, Vol 154, 2018. [IF 5] [Weblink]

J8 Jing Wu, Hui Liu, Taraneh H. Zonouz, Veronica M. Sandoval, **Hassan Mohy-ud-Din[C]**, Rachel Lampert, Albert J. Sinusas, Chi Liu, and Yi-Hwa Liu[L], A novel blind deconvolution method incorporated with anatomical-based filtering for partial volume correction: validations with ^{123}I-mIBG cardiac SPECT/CT, Medical Physics, Vol 44, Issue 12, 2017. [IF 3] [Weblink]

J7 **Hassan Mohy-ud-Din[L]**, Nabil E. Boutagy, John C. Stendahl, Zhen W. Zhuang, Albert J. Sinusas, and Chi Liu, Quantification of intra-myocardial blood volume with ^{99m}Tc-RBC SPECT-CT imaging – A Preclinical Study, Journal of Nuclear Cardiology, Vol 25, Issue 6, 2018. [IF 6] [Weblink] [Spotlight] [Cover Story]

J6 Saeed Ashrafinia, **Hassan Mohy-ud-Din[C]**, Nicolas A. Karakatsanis, Abhinav K. Jha, Michael Casey, Dan J. Kadrmas, and Arman Rahmim, Generalized PSF-Modelling for Optimized Quantitation in PET Imaging, Physics in Medicine and Biology, Vol 62, Issue 12, 2017. [IF 3] [Weblink]

J5 Qingyi Liu, **Hassan Mohy-ud-Din[L]**, Nabil E. Boutagy, Mingyan Jiang, John C. Stendahl, Albert J. Sinusas, and Chi Liu, Fully automatic multi-atlas segmentation of CTA for partial volume correction in cardiac SPECT/CT, Physics in Medicine and Biology, Vol 62, Issue 10, 2017. [IF 3] [Weblink]

J4 **Hassan Mohy-ud-Din[D]** and Daniel P. Robinson[L], A Solver for Nonconvex Bound-constrained Quadratic [IF 4] [Weblink]

Optimization, SIAM Journal on Optimization, Vol 25, Issue 4, 2015.

J3 **Hassan Mohy-ud-Din**[C,L], Martin A. Lodge, and Arman Rahmim, Quantitative myocardial perfusion PET parametric imaging at the voxel-level, Physics in Medicine and Biology, Vol. 60, Issue 15, 2015. [IF 3] [Weblink]

J2 **Hassan Mohy-ud-Din**[D,L], Nicolas A. Karakatsanis, William Willis, Dean F. Wong, and Arman Rahmim, Intra-frame Motion Compensation in Multi-frame Brain PET Imaging, Frontiers in Biomedical Technologies, Vol 2, Issue 2, 2015. [Weblink]

J1 Arman Rahmim[L], Jing Tang, and **Hassan Mohy-ud-Din**[C], Direct 4D parametric imaging in dynamic myocardial perfusion PET, Frontiers in Biomedical Technologies, Vol 1, Issue 1, 2013. [Weblink]

Conference Papers and Abstracts

C25 Syed Talha Bukhari[G,R] and **Hassan Mohy-ud-Din**[L], E_1D_3 U-Net for Brain Tumor Segmentation: Submission to the RSNA-ASNR-MICCAI BraTS 2021 challenge, International MICCAI BrainLesion Workshop, MICCAI Conference, 2021. [Weblink] (online Covid-19)

C24 Sana Jabbar[D], Syed Talha Bukhari[G,R], and **Hassan Mohy-ud-Din**[L], Multi-view SA-LA Net: A framework for simultaneous segmentation of RV on multi-view cardiac MR Images, 12th Workshop on Statistical Atlases and Computational Modelling of the Heart, MICCAI Conference, 2021. [Weblink] (online Covid-19)

C23 Asma Shaheen[D], Stefano Burigat[C], Ulas Bagci[C], and **Hassan Mohy-ud-Din**[L], Overall survival prediction in gliomas using region-specific radiomic features, Second International RNO-AI Workshop, MICCAI Conference 2020. [Weblink] (online Covid-19)

C22 Syed M. Anwar, Tooba Altaf, Khola Rafique, Harish R. Prakash, **Hassan Mohy-ud-Din**[C], and Ulas Bagci, A Survey on Recent Advancements for AI Enabled Radiomics in Neuro-Oncology, First International RNO-AI Workshop, MICCAI Conference, Shenzhen, China, 2019. [Weblink]

C21 **Hassan Mohy-ud-Din**, Resampling Strategies in Medical Imaging, SIAM conference in Imaging Science, Bologna, Italy, 2018. Oral Presentation

C20 **Hassan Mohy-ud-Din**, Resampling Strategies in PET and SPECT Imaging, 16th Shaukat Khanum Cancer Symposium, Lahore, Pakistan, 2017. Oral Presentation

C19 Jing Wu, Hui Liu, **Hassan Mohy-ud-Din**[C], Stephanie L. Thorn, Mitchel R. Stacy, Taraneh H. Zonouz, Chi Liu, Albert J. Sinusas, Rachel J. Lampert, and Yi-Hwa Liu, A blind deconvolution method incorporated with anatomical-based filtering for partial volume correction: validations with ^{123}I-mIBG cardiac SPECT/CT imaging, SNMMI meeting, San Diego, CA, USA, 2016. [Weblink] Oral Presentation

C18 Saeed Ashrafinia, Esther M. Gonzalez, **Hassan Mohy-ud-Din**[C], Abhinav K. Jha, Rathan Subramaniam, and Arman Rahmim, Adaptive PSF modeling for enhanced heterogeneity quantification in oncologic PET Imaging, SNMMI meeting, San Diego, CA, USA, 2016. [Weblink] Oral Presentation

C17 Saeed Ashrafinia, **Hassan Mohy-ud-Din**[C], Nicolas A. Karakatsanis, Michael A. Casey, Martin A. Lodge, and Arman Rahmim, PSF overestimation improves PET Image SUV Quantification, SNMMI meeting, San Diego, CA, USA, 2016. [Weblink]

C16 Saeed Ashrafinia, **Hassan Mohy-ud-Din**[C], Nicolas A. Karakatsanis, and Arman Rahmim, Inexact Image Deblurring for Improved Quantification in PET, Hopkins Imaging Initiative meeting, Baltimore, MD, 2015. Oral Presentation

C15 **Hassan Mohy-ud-Din**[D] and Daniel P. Robinson, A Solver for Nonconvex Bound-constrained Quadratic Optimization, The International Symposium on Optimization, Pittsburgh, PA, USA, 2015. Oral Presentation

C14 **Hassan Mohy-ud-Din**[D,L], Martin A. Lodge, and Arman Rahmim, Quantitative myocardial perfusion PET parametric imaging at the voxel-level, SNMMI meeting, Baltimore, MD, USA, 2015. [Weblink]

C13 Lijun Lu, Xiaomian Ma, **Hassan Mohy-ud-Din**[C], Jianhua Ma, Yangqiu Feng, Arman Rahmim, Qianjin Feng, and Wufan Chen, Low-rank plus Sparse decomposition based Dynamic Myocardial Perfusion PET image restoration, SNMMI meeting, Baltimore, MD, USA, 2015. [Weblink] Top 10 Posters

C12 Saeed Ashrafinia, **Hassan Mohy-ud-Din**[C], Nicolas A. Karakatsanis, Dan Kadrmas, and Arman Rahmim, Enhanced Quantitative PET Imaging Utilizing Adaptive Partial Resolution Modeling, SNMMI meeting, St. Louis, Missouri, USA, 2014 [Weblink] Oral Presentation

C11 Arman Rahmim, **Hassan Mohy-ud-Din**[C], and Thomas Schindler, Base-to-Apex Gradient Abnormality Detection Task Performance in Myocardial Perfusion PET Imaging, SNMMI meeting, St. Louis, Missouri, USA, 2014. [Weblink] Oral Presentation

C10 **Hassan Mohy-ud-Din**[D,L], Nicolas A. Karakatsanis, Martin A. Lodge, Jing Tang, and Arman Rahmim, Parametric myocardial perfusion PET imaging using Physiological Clustering, SPIE conference on Medical Imaging, San Diego, CA, USA, 2014. [Weblink] Oral Presentation

C9 Saeed Ashrafinia, Nicolas A. Karakatsanis, **Hassan Mohy-ud-Din**[C], and Arman Rahmim, Towards continualized task-based resolution modeling in PET imaging, SPIE conference on Medical Imaging, San [Weblink] Oral Presentation

Diego, CA, USA, 2014.

C8 **Hassan Mohy-ud-Din**[D], Nicolas A. Karakatsanis, Jim S. Goddard, Justin Baba, William Willis, Abdel K. Tahari, Dean F. Wong, and Arman Rahmim, Generalized dynamic PET Inter-Frame and Intra-Frame motion correction: Phantom and Human validation studies, IEEE Nuclear Science Symposium and Medical Imaging Conference, Anaheim, CA, USA, 2012. [Weblink]

C7 Nicolas A. Karakatsanis, Martin A. Lodge, **Hassan Mohy-ud-Din**[C], Abdel K. Tahari, Yun Zhou, Richard L. Wahl, and Arman Rahmim, Enhanced whole-body parametric PET imaging using statistical ridge-regression methods and correlation-coefficient filtering, IEEE Nuclear Science Symposium and Medical Imaging Conference, Anaheim, CA, USA, 2012. [Weblink]

C6 **Hassan Mohy-ud-Din**[D], Nicolas A. Karakatsanis, Julie C. Price, Yun Zhou, Susan M. Resnick, Christopher J. Endres, Dean F. Wong and Arman Rahmim, Investigation of noise-induced correlations in dual-biomarker parametric imaging from dynamic [^{11}C] PiB PET, International Symposium on Functional Neuroreceptor Mapping of the Living Brain, Baltimore, MD, USA, 2012. [Weblink]

C5 Christopher J. Endres, Yun Zhou, **Hassan Mohy-ud-Din**[C], and Arman Rahmim, PET Model: An SPM toolkit for parametric modeling of Dynamic PET data, International Symposium on Functional Neuroreceptor Mapping of the Living Brain, Baltimore, MD, USA, 2012. [Weblink]

C4 **Hassan Mohy-ud-Din**[D], Nicolas A. Karakatsanis, Muhammad R. Ay, Christopher J. Endres, Dean F. Wong and Arman Rahmim, Generalized Inter-Frame and Intra-Frame Motion Correction in Dynamic PET Imaging – A Simulation Study, IEEE Nuclear Science Symposium and Medical Imaging Conference, Valencia, Spain, 2011. [Weblink]

C3 **Hassan Mohy-ud-Din**[D], Jing Tang, Dean F. Wong, and Arman Rahmim, Comparison of ordered subset implementations for EM, preconditioned steepest ascent and conjugate gradient optimization tasks in PET Image Reconstruction, SNMMI meeting, San Antonio, Texas, USA, 2011. [Weblink]

C2 Arman Rahmim, Jing Tang, **Hassan Mohy-ud-Din**[C], Muhammad R. Ary, and Muhammad A. Lodge, Use of optimization transfer for enhanced myocardial perfusion PET direct 4-D parametric imaging, SNMMI meeting, San Antonio, Texas, USA, 2011. [Weblink] Oral Presentation

C1 **Hassan Mohy-ud-Din**[R] and Abubakr Muhammad, Detecting Narrow Passages in Configuration Spaces via Spectra of Probabilistic Roadmaps, ACM Symposium On Applied Computing, Sierre, Switzerland, 2010. [Weblink] Oral Presentation

Dissertations

D2 **Hassan Mohy-ud-Din**[D], Motion Correction and Pharmacokinetic Analysis in Dynamic Positron Emission Tomography, PhD Electrical and Computer Engineering, Johns Hopkins University, MD, USA, 2015. [Weblink]

D1 **Hassan Mohy-ud-Din**[D], Minimizing Nonconvex Quadratic Functions Subject to Bound Constraints, MA Applied Mathematics and Statistics, Johns Hopkins University, MD, USA, 2014. [Weblink]

Professional Services

I have been an **organizer** (or **co-organizer**) of numerous scientific and scholastic activities, initiatives, and programs both nationally and internationally. *For details, read the blocks titled* Workshops, Conferences, Symposia, and Summer Schools *and* Featured Talks, Guest Lectures, and Discussion Forums.

Editorial Board of Artificial Intelligence in Radiology under Frontiers in Radiology.

I have **reviewed hundreds of papers** submitted to prestigious journals and conferences listed below.

Clinical Cancer Research	Medical Image Analysis	Neuro-oncology Advances
Medical Physics	Neuroimage	IEEE Transactions on Image Processing
IEEE Transactions on Medical Imaging	Computerized Medical Imaging and Graphics	IEEE Journal of Biomedical and Health Informatics
Computers in Biology and Medicine	Physics in Medicine and Biology	Frontiers in Computational Neuroscience
IEEE Signal Processing Letters	Physica Medica	Neural Processing Letters
Inverse Problems	Journal of Scientific Computing	Frontiers in Biomedical Technology
World Molecular Imaging Conference	MICCAI Conference	ISBI Conference
IEEE Transactions on Radiation and Plasma Medical Sciences		IEEE Engineering in Medicine and Biology
International Conference on Biomedical Engineering and Biotechnology		IEEE Nuclear Science Symposium and Medical Imaging

Member IEEE and SIAM societies.

Reviewer grant/award proposals for LUMS Faculty Initiative Fund and Syed Babar Ali Research Awards for PhD students at LUMS.

Member of the panel of judges for 2019 UK Alumni Awards by the British Council Pakistan.

External Examiner for Senior Year Projects and MS/PhD Thesis at the University of Engineering and Technology Lahore, Pakistan.

Department and University Services

Note: The list below includes committees/forums I am a member of (or used to be) at LUMS.

- Member Undergraduate Curriculum Committee and Graduate Program Committee.
- Member taskforce for a prospective undergraduate program on Artificial Intelligence.
- Convenor taskforce for a graduate program on Artificial Intelligence. MS in Artificial Intelligence is launched in 2024.
- Member taskforce on Clinical Innovations.
- Member of Student Activities and Outreach Programs.
- Organizer EE Seminar Series at the Department of Electrical Engineering.
- Founder and Director, **A**lgorithms in **T**heory and **P**ractice Lab (ATP Lab).
- Executive Faculty Member of the National Center on Big Data and Cloud Computing.
- Research Fellow of Mahbub-ul-Haq Research Centre.
- Referee for Student Graduate Applications.
  I have written up to 100 recommendation letters for graduate applications
- Evaluator for Senior Year Projects, MS Thesis (Proposal) Defense, and PhD Thesis (Proposal) Defense in the School of Science and Engineering and the School of Business.
- Examiner for Doctoral Qualiying Exams.
- Coordinating (and designing) admissions tests for three graduate programs: MS in Electrical Engineering, MS in Digital and Embedded Systems, and MS in Power Engineering and Smart Grids.
- Member of a panel that helped the SSE admissions with the File Review process of the SSE Undergraduate and Graduate admissions.
- Conducted sessions, talks, lectures for Centre for Continuing Education Studies, Research Internships in Science and Engineering, and Undergraduate/Graduate Orientation.
- Leading Journal Club on Topological Data Analysis in collaboration with Professor Haniya Azam (Department of Mathematics) and Professor Danish Ali (Department of Mathematical Sciences, Institute of Business Administration, Karachi, Pakistan).
  Participants include graduate students, doctoral students, research assistants/associates, and faculty. We have discussed more than 50 papers on Topological Data Analysis in great detail. Topological Data Analysis is an advanced subject with a strong mathematical component (theory) and a rich computational component (algorithms). Key papers in Topological Data Analysis are 30 – 60 pages long.
- Leading Journal Club on Computational Imaging in the ATP Lab.
  Participants include graduate students, doctoral students, and research assistants/associates. My students and I have read 300+ research papers on machine learning, deep learning, medical imaging, image restoration, inverse problems, optimization, applied statistics, and information theory in great detail.
- ATP Lab practices "Aesthetic Computer Programming" in coding computational algorithms in Python.
  Students at ATP Lab learn to codify algorithms aesthetically – minimizing/removing unused, ill-defined, lengthy codes in favor of compact, readable, self-explainable, user-friendly, and ready-to-use programs. Students also learn to punctuate codes/programs with safeguard statements/commands which automatically inspect mistakes, omissions, oversights, and accuracy of (an expected) response or outcome.
- I personally inspect and validate, in great detail, every code/program published out of ATP Lab.
  My students and I take enormous pride in publishing a well-furnished product which is trustworthy and generates reproducible results. Science and Engineering is a social endeavor and, hence, demands complete commitment and integrity.

Notable Experiences, Achievements, Honors, and Awards

Note: The list below is in reverse chronological order.

I have travelled widely; several times for scholastic pursuits: **India** (New Delhi), **Canada** (University of British Columbia, Vancouver), **USA** (Florida, New Mexico, Boston, California, Pennsylvania, New York, Massachusetts), **France** (Ecole Centrale de Paris, Paris), **Hong Kong** (Hong Kong Baptist University), **UAE** (Dubai, Abu Dhabi), **Saudia Arabia** (Jeddah, Makkah, Medinah).

2019 Charles Wallace Fellowship, British Council Pakistan (postponed due to Covid-19).

Journal paper (**J7**) was **featured as a news article** in Medical Physics Web by Dr. Tami Freeman.

Travel Award (CAD $750), The Fields Institute for Research in Mathematical Sciences, Toronto, Canada.

Award ($300), 2016 SIAM conference on Imaging Science, Albuquerque, New Mexico, USA.

Top 10 posters in Cardiovascular Basic Science track at the 2015 SNMMI meeting, Baltimore, MD, USA (conference paper **C13**).

Travel Grant for Computational and Analytical Aspects of Image Reconstruction, ICERM, Brown University, Providence, RI, USA, July 13 – 17, 2015 (declined due to a clash with 2015 ISMP meeting).

2014 Bradley-Alavi Fellowship from Society of Nuclear Medicine and Molecular Imaging (SNMMI). [Weblink]

2014 and 2016 Gordon Research Conference on Imaging Science, Stonehill College, Easton, Massachusetts, USA (funded 50%).

SIAM Student Travel Award, 2014 SIAM conference on Imaging Science, Hong Kong.

2012 Trainee Award to attend the 2012, IEEE Medical Imaging Conference, Anaheim, CA, USA.

Selected to attend **BioMediA Summer School, Modalities, Methodologies and Clinical Research**, Ecole Centrale de Paris, July 9 – 13, 2012, Paris, France.

Executive Member Hopkins Imaging Initiative (2011 – 12).

Department Representative (nominated), Graduate Representative Organization, Johns Hopkins University, USA (2011 – 13).

Analytic and Geometric Methods in Medical Imaging, Isaac Newton Institute for Mathematical Sciences, Cambridge University, UK (fully funded program).

Invited to the **2011 Gene Golub SIAM Summer School**, University of British Columbia, Vancouver, Canada (fully funded program).

PhD Fellowship from Johns Hopkins University, MD, USA (2009 – 2015).

Awarded **Fulbright Scholarship** for PhD in Mathematical Signal Processing (declined).

Nominated for **Quaid-e-Azam Gold Medal**, Ghulam Ishaq Khan Institute of Engineering Sciences and Technology (GIKI), Topi, Pakistan (Top 5% out of 200 students).

Recipient of **Deans Honor Roll** (four times), Ghulam Ishaq Khan Institute of Engineering Sciences and Technology (GIKI), Topi, Pakistan.

Vice President and Executive Member of seven societies, Ghulam Ishaq Khan Institute of Engineering Sciences and Technology (GIKI), Topi, Pakistan.

Won Intra-GIKI Badminton Tournament, Debating Competition and Batch Trophy, 2005.

2nd in all-Punjab poetry competition.

Mentorship and Student Supervision

Note: I have published journal papers with (almost) all of my graduate students and doctoral students. Graduate students, reading for an MS degree, have published journal papers under my direct supervision. Doctoral students, where I am officially a co-supervisor, have ONLY published journal papers under my direct supervision. These students were/are visiting students in the ATP Lab at LUMS. On collaborative publications, each student co-author has contributed distinctly and significantly to the overall project.

Doctoral Students (PhD, DPhil)

Student	Title of Dissertation	(Official) Role and Remarks
Dr. Maria Tamoor Computer Science, FAST Lahore, Pakistan (Graduated, 2018 – 21)	An Optimized Deformable Model for Automated Cardiovascular Segmentation from Magnetic Resonance Images	Co-Supervisor They key journal paper, which forms the basis of the dissertation, was published under my direct supervision. See **J11** in the block titled Publications. *Official letter of co-supervisor status can be shared upon request.*
Dr. Asma Shaheen Computer Science, Univ. of Udine, Italy (Graduated, 2019 – 22)	Computer-aided analysis of Complex Neurological Data for Age-based Classification of Upper Limbs Motor Performance and Radiomics-based Survival Prediction of Brain Tumors	Co-Supervisor Key papers, which form the basis of the dissertation, were published under my direct supervision. See **C23, J12,** and **J17** in the block titled Publications. *Official letter of co-supervisor status can be shared upon request.*
Sana Jabbar Electrical Engineering, LUMS, Pakistan (Ongoing, 2018 – To Date)	Deep Image Segmentation Models in Medical Imaging and Remote Sensing (*tentative title*)	Primary Supervisor Sana is writing her PhD Thesis. Her thesis defense will be scheduled in a few months' time. Sana is co-supervised with Professor Murtaza Taj. Sana has published several papers under my direct supervision. See **C24, J14,** and **J16** in the block titled Publications.
Ameer Hamza Mathematics, LUMS, Pakistan (Ongoing, 2021 – To Date)	Topological Regularization in Deep Segmentation Models (*tentative title*)	Joint Supervision Ameer is a student in the Department of Mathematics, LUMS. He has successfully defended his PhD proposal. Ameer is working under my principal supervision on developing topology informed segmentation methods. Ameer is jointly supervised with Professor Haniya Azam. Ameer came to LUMS with a training in pure mathematics and had to work extremely hard, for extended duration, to learn computer programming, machine learning, deep learning, and image processing. Ameer will publish initial papers by the end of 2024.
Dr. Manal Munir Choudhary Business Management, LUMS, Pakistan (Graduated, 2015 – 2021)	Empirical Examination Of Antecedents And Consequences Of Managing Risks And Developing Resilience In Supply Chains	Member PhD Thesis Defense Committee Manal was supervised by Professor Shakeel Jajja, Suleman Dawood School of Business, LUMS, Pakistan
Dr. Syeda Ayesha Wadood Business Management, LUMS, Pakistan (Graduated, 2016 – 2022)	The Resource Based Enablers and Performance Related Consequences of Social Sustainability in Supply Chains of Developing Countries	Member PhD Thesis Defense Committee Ayesha was supervised by Professor Shakeel Jajja, Suleman Dawood School of Business, LUMS, Pakistan
Dr. Gul Hameed Khan Electrical Engineering, LUMS, Pakistan (Graduated, 2018 – 2023)	A Shallow Sparse Autoencoder Framework for Epileptic EEG Analysis	Member PhD Thesis Proposal Defense Committee Gul was supervised by Professor Nadeem A. Khan, Department of Electrical Engineering, LUMS, Pakistan

Graduate Students (MSE, MA)

Student	Title of Dissertation	(Official) Role and Remarks
Syed Talha Bukhari Electrical Engineering, LUMS, Pakistan (Graduated, 2018 – 20)	Impact of Learning Rate Policies on Training a U-Net for Brain Tumor Segmentation	Supervisor Talha has published several papers under my supervision. See **C24, C25, J10, J12,** and **J16** in the block titled Publications.
Maria Nadeem Mathematics, LUMS, Pakistan (Graduated, 2018 – 20)	A Comparison of Feature Selection Approaches in Radiogenomics of Brain Gliomas	Supervisor Maria published two papers under my supervision. See **J12** and **J17** in the block titled Publications.

Muqudas Rafiq Electrical Engineering, LUMS, Pakistan (Graduated, 2019 – 2021)	A Comparative Analysis of Image Denoising Techniques	Supervisor Unfortunately, Muqudas time at LUMS overlapped with the first lockdown of Covid-19 pandemic. Teaching was completely disrupted, let alone research. Hence, no publications came out of this work.
Shujah ur Rehman Electrical Engineering, LUMS, Pakistan (Graduated, 2021 – 2023)	Semi-supervised Segmentation of 3D Cardiac MRI Scans	Supervisor Shujah has three papers in the pipeline. One journal paper is in submission. Two journal papers will be submitted in a months' time. See **J18, J19,** and **J20** in the block titled Publications.
Ahmed Waheed Computer Science, LUMS, Pakistan (Ongoing, 2022 – To Date)	Medical Image Segmentation with Diffusion Models (*tentative title*)	Supervisor Ahmed will defend his MS Thesis in a few weeks. Ahmed's research has produced a journal publication which will be submitted in few weeks too. See **J18** in the block titled Publications.
Sosan Fatima Mathematics, LUMS, Pakistan (Graduated, 2021 – 2023)	An Introduction to Multiparameter Persistence	Member MS Thesis Defense Committee Sosan was supervised by Professor Haniya Azam, Department of Mathematics, LUMS, Pakistan

Research Assistants and Associates

Note: Besides hiring students from other universities in Pakistan, many undergraduate and graduate students from the School of Science at Engineering, LUMS joined my lab to pursue research in computational imaging. **The list below is not complete; only major collaborations are mentioned.**

Student	Research Topic	Next Destination
Danyal Saeed Electrical Engineering, FAST, Lahore, Pakistan (2018)	Multi-regional segmentation of Brain Tumor on 3D Multi-parametric MRI scans using Deep Learning	PhD Computer Science University of Illinois at Chicago, USA
Muhammad Faizyab Ali Chaudhary Electrical Engineering, UET Lahore, Pakistan (2018 – 2019)	Radiomics and Radiogenomics for Brain Tumor Characterization using 3D Multi-parametric MRI scans	PhD Biomedical Engineering Roy Craver Fellowship University of Iowa, USA
Syed Talha Bukhari Electrical Engineering, UET Lahore, Pakistan (2018 – 2021)	Learning Rate Policies and Novel Deep Architectures for Brian Tumor Segmentation on 3D Multi-parametric MRI scans	PhD Computer Science Fulbright Fellowship Purdue University, USA
Maria Nadeem Mathematics, LUMS, Pakistan (2020 – 2022)	Radiomics and Radiogenomics for Brain Tumor Characterization using 3D Multi-parametric MRI scans	10X Engineers, Pakistan
Muhammad Ahmed Electrical Engineering, LUMS, Pakistan (2023)	Large Language Models	BS Electrical Engineering LUMS, Pakistan
Shujah ur Rehman Electrical Engineering, LUMS, Pakistan (2023 – To Date)	Semi-supervised Segmentation of Medical Imaging Scans	Research Associate ATP Lab, LUMS, Pakistan
Ahmed Waheed Computer Science, LUMS, Pakistan (2022 – To Date)	Medical Image Segmentation with Diffusion Models	Research Assistant ATP Lab, LUMS, Pakistan
Sosan Fatima Mathematics, LUMS, Pakistan (2023 – To Date)	An Introduction to Multiparameter Persistence	Research Assistant ATP Lab, LUMS, Pakistan
Talha Ahmed Mathematics-Economics, LUMS, Pakistan (2023 – To Date)	Accelerated Diffusion Models for Inverse Problems	Research Assistant ATP Lab, LUMS, Pakistan
Nehal Ahmed Sheikh Mathematics-Economics, LUMS, Pakistan (2024 – To Date)	Accelerated Diffusion Models for Inverse Problems	Research Assistant ATP Lab, LUMS, Pakistan
Syed Muqeem Mahmood Electrical Engineering, LUMS, Pakistan (2024 – To Date)	Vision-Language Models in Medical Imaging	Research Associate ATP Lab, LUMS, Pakistan

Featured Talks, Guest Lectures, and Discussion Forums

2024

Invited talk on, How to Strategize your Education, Co-curricular, and Extra-curricular Activities at LUMS,
Orientation for Undergraduates, School of Science and Engineering, LUMS, Lahore, Pakistan, August 30, 2024.
Hosted by Aleena Khan and Ayesha Ikram Butt

Invited talk on Towards Robust Radiomics and Radiogenomics Predictive Models for Brain Tumor Characterization
MedAI Group, Stanford webinar, August 12, 2024.
Hosted by Dr. Nandita Bhaskar, Dr. Amara Tariq, and Dr. Avisha Das

Invited talk on In pursuit of Excellence in Science and Scholarship,
Research Internship in Science and Engineering (RISE), School of Science and Engineering, LUMS, Lahore, Pakistan, July 12, 2024.
Hosted by Professor Basit Yameen

Keynote talk on Artificial Intelligence, Healthcare, and an Elusive Dream,
8th International Conference, Shalamar Medical and Dental College, Lahore, Pakistan, April 28, 2024.
Hosted by Professor Sarah Khalid

2023

Invited talk on AI and the (Under-)Graduate Education Landscape in Pakistan,
International Centre of Excellence and Iqra University, Islamabad, Pakistan, November 29, 2023.
Hosted by Shahper Ahsan

Invited talk on AI in Surgery,
SurgiCon, Shalamar Medical and Dental College, Lahore, Pakistan, November 15, 2023.
Hosted by Dr. Talat Waseem

Invited talk on, Radiomics and Radiogenomics in Neuro-Oncology,
AI4Med, webinar coordinated by the Platform for Engineering Biology, PakGPT, and STEMx, November 4, 2023.
Hosted by Dr. Athar Osama

Invited talk on, How to Strategize your Education, Co-curricular, and Extra-curricular Activities at LUMS,
Orientation for Undergraduates, School of Science and Engineering, LUMS, Lahore, Pakistan, August 30, 2023.
Hosted by Aleena Khan and Ayesha Ikram Butt

Invited talk on, Tuning in to the Rhythms of Life: Creativity, Innovation, and Excellence,
Orientation for Undergraduates, School of Science and Engineering, LUMS, Lahore, Pakistan, August 30, 2023.
Hosted by Aleena Khan and Ayesha Ikram Butt

Invited talk on, Research and Innovation: Making Big Strides,
LUMS Science Symposium, LUMS, Lahore, Pakistan, August 8, 2023.
Hosted by Yamsheen Saqib

Invited talk on Research and Data Analytics with ChatGPT,
Shalamar Surgical Grand Rounds, Shalamar Medical and Dental College, Lahore, Pakistan, May 31, 2023.
Hosted by Dr. Talat Waseem

Invited talk on The RANO-AI Program,
National Center for Big Data and Cloud Computing, LUMS, Lahore, Pakistan, May 20, 2023.
Hosted by Dr. Naveed Arshad

Invited speaker on Panel Discussion: How Universities can Collaborate?,
Health Data for Pakistan Conference, Aga Khan University, Karachi, Pakistan, March 4, 2023.
Hosted by Dr. Zainab Samad

2022

Invited speaker on How to develop a well-formed mind,
Scarsdale International School, Lahore, Pakistan, November 4, 2022.
Hosted by Principal Romuald Delattre

Invited talk on The RANO-AI Program,
Melding Minds, School of Science and Engineering, LUMS, Lahore, Pakistan, October 30, 2022.
Hosted by Sana Samin Ahmed

Invited talk on Practicing Mathematics, Inquisitively and Intellectually,
Salam Sessions, LUMS Students Mathematics Society, Lahore, Pakistan, October 28, 2022.
Hosted by Abdullah Ahmed

Invited speaker on Conference Quality Parameters that Matter,
IEEE MICI POCO (Panel of Conference Organizers), Information Technology University, Lahore, Pakistan, October 8, 2022.
Hosted by Professor Adnan Siddique

Invited talk on Conversations on Life (زیست), Future (فردا), and Self (خودی),
Centre for Continuing Education Studies, LUMS, Lahore, Pakistan, July 28, 2022
Hosted by Dania Elahi

Invited talk on Arithmetic Operations with Numbers: The Need for Speed,
Math Circles, LUMS, Lahore, Pakistan, May 27, 2022
Hosted by Professor Imran Anwar

Invited talk on Machine Learning and Optimization in (Bio-)Medical Imaging,
Department of Electrical Engineering, University of Engineering and Technology, Lahore, Pakistan, April 6, 2022.
Hosted by Professor Adeem Aslam

Invited talk on Machine Learning and Optimization in (Bio-)Medical Imaging,
School of Electrical Engineering and Computer Science, NUST, Islamabad, Pakistan, March 17, 2022.
Hosted by Professor Wajahat Hussain

Invited talk on Machine Learning and Optimization in (Bio-)Medical Imaging,
Institute of Space Technologies, Islamabad, Pakistan, March 17, 2022.
Hosted by Professor Sadia Shakil

2021

Invited speaker on The Future of Work: How teachers and students can prepare for new jobs and skills required,
Webinar hosted by the Lahore College Women University, Pakistan and EGB4 Technologies, September 21, 2021.
Hosted by Aftab Khan

Invited speaker on Brain Tumor Characterization with Radiogenomics and Deep Learning,
Big Data in Biomedicine Seminar Series, Precision Medicine Lab and Rehman Medical Institute, Peshawar, Pakistan, September 9, 2021.
Hosted by Dr. Faisal Khan

Keynote speaker on Artificial Intelligence and Medical Imaging,
King Edward Medical University, Lahore and Mayo Hospital Lahore, Pakistan, July 6, 2021.
Hosted by Professor Suhail Sarwar

2020

Invited talk on Radiomics and Radiogenomics in Neuro-Oncology,
1st Annual Neuro-Oncology Symposium, Aga Khan University, Karachi, Pakistan, September 5, 2020.
Hosted by Professor Ather Inam

Invited talk on Radiomics and Radiogenomics in Neuro-Oncology,
Webinar on Radiomics and AI, Aga Khan University, Karachi, Pakistan, August 21, 2020.
Hosted by Dr. Muhammad Awais

Invited talk on Machine Learning and Optimization in (Bio-)Medical Imaging,
School of Electrical Engineering and Computer Science, NUST, Islamabad, Pakistan, March 4, 2020.
Hosted by Professor Wajahat Hussain

2019

Guest lecture on Quantitative (Multi-modality) Cardiac Imaging,
Center of Cardiology, Shalamar Medical and Dental College, Lahore, Pakistan, June 25, 2019.
Hosted by Dr. Kamran Babar Ali

Invited talk on Basics of AI for a Radiology Professional with Applications,
SEHA International Radiology Conference (AI in Radiology), Abu Dhabi, United Arab Emirates, March 15, 2019.
Hosted by Dr. Manzoor Ahmed and Dr. Saeed Al Seiari

2018

Invited talk on Conversations on Deep Learning,
4th Workshop on Precision Agriculture and Forestry, LUMS, Lahore, Pakistan, October 11, 2018.
Hosted by Professor Abubakr Muhammad

Guest lecture on Quantitative Multimodality Imaging – Applications in Cardiology, Neurology, and Oncology,
Aga Khan University, Karachi, Pakistan, August 9, 2018.
Hosted by Dr. Nadeem Ahmed

Invited talk on An Introduction to Medical Imaging with Applications in Quantitative Cardiac Imaging,
FAST National University of Computer and Emerging Sciences, Lahore, Pakistan, March 19, 2018.
Hosted by Professor Ali Afzal Malik

Invited talk on Quantitative myocardial perfusion PET parametric imaging at the voxel-level,
Lahore College Women University, Pakistan, February 23, 2018.
Hosted by Professor Aqsa Shabbir

Invited talk on Quantitative myocardial perfusion PET parametric imaging at the voxel-level,
Forman Christian College Lahore, Pakistan, February 21, 2018.
Hosted by Professor Nakhat Fatima

2017

Guest lecture on Quantitative myocardial perfusion PET parametric imaging at the voxel-level,
IEEE Medical Imaging Seminar, University of Lahore, Pakistan, December 7, 2017.
Hosted by Professor Ijlal Haider

CME talk on Resampling Strategies in PET Imaging,
Shaukat Khanum Memorial Cancer Hospital and Research Center, Lahore, Pakistan, November 22, 2017.
Hosted by Dr. Humayun Bashir

Invited talk on Quantitative Multimodality Cardiac Imaging – Applications in clinical and translational research,
5th Pakistan Society of Nuclear Medicine Conference and 1st Sino-PAK Nuclear Medicine Symposium, Lahore, Pakistan, April 16, 2017.
Hosted by Dr. Humayun Bashir

Invited talk on Quantitative Multimodality Imaging – Applications in Cardiology, Neurology, and Oncology,
Shaukat Khanum Memorial Cancer Hospital and Research Center, Lahore, Pakistan, April 10, 2017.
Hosted by Dr. Humayun Bashir

2016

Seminar talk on Towards Robust Quantitative Imaging: Applications in cardiac PET and SPECT Imaging,
Johns Hopkins School of Medicine, MD, USA, December 8, 2016.
Hosted by Professor James Pekar, Professor Brian Caffo, and Professor Martin Lindquist

Seminar talk on Towards Robust Quantitative Imaging: Applications in cardiac PET and SPECT Imaging,
Syed Babar Ali School of Science and Engineering, LUMS, Pakistan, November 30, 2016.
Hosted by Professor Tariq Jadoon

Seminar talk on Towards Robust Quantitative Imaging: Applications in cardiac PET and SPECT Imaging,
Department of Radiology, University of Massachusetts Medical School, USA, November 28, 2016.

Hosted by Professor Michael A. King

Seminar talk on Quantitative PET and SPECT: Applications in Cardiac Imaging,
MGH/HST Martinos Center for Biomedical Imaging, Boston, USA, November 11, 2016.
Hosted by Professor Julie Price

Seminar talk on Robust Parametric Imaging in Cardiac PET,
Department of Applied Mathematics, Yale University, CT, USA, October 4, 2016.
Hosted by Professor Ronald Coifman

2015

Seminar talk on Quantitative myocardial perfusion PET parametric imaging at the voxel-level,
Syed Babar Ali School of Science and Engineering, LUMS, Pakistan, December 21, 2015.
Hosted by Professor Shahid Masud

Invited talk on Quantitative myocardial perfusion PET parametric imaging at the voxel-level,
Department of Molecular Imaging and Neuropathology, Columbia University, NY, USA, November 12, 2015.
Hosted by Professor Francesca Zanderigo

Invited talk on A QP Solver for Nonconvex Bound-Constrained Problem,
The International Symposium on Optimization, Pittsburgh, PA, USA, July 12-17, 2015.
Hosted by Professor Daniel P. Robinson

2014

Seminar talk on Motion Correction and Pharmacokinetic Analysis in Dynamic PET Imaging,
Ming Hsieh Department of Electrical Engineering, University of Southern California, USA, December 5, 2014.
Hosted by Professor Richard Leahy

Seminar talk on Motion Correction and Pharmacokinetic Analysis in Dynamic PET Imaging,
Department of Radiology and Biomedical Engineering, Yale School of Medicine, CT, USA, October 24, 2014.
Hosted by Professor Chi Liu

Seminar talk on Motion Correction and Pharmacokinetic Analysis in Dynamic PET Imaging,
Department of Diagnostic Radiology and Nuclear Medicine, University of Maryland School of Medicine, MD, USA, November 3, 2014.
Hosted by Professor Mark Smith

Seminar talk on Motion Correction and Pharmacokinetic Analysis in Dynamic PET Imaging,
Department of Radiology, Perelman School of Medicine, University of Pennsylvania, PA, USA, October 10, 2014.
Hosted by Professor Samuel Matej

2013

The Norbert Wiener Center Seminar Talk on Motion Correction and Pharmacokinetic Analysis in Dynamic PET Imaging,
Department of Mathematics, University of Maryland, College Park, MD, USA, November 5, 2013.
Hosted by Professor Radu Balan

Seminar talk on Quantitative myocardial perfusion PET parametric imaging at the voxel-level,
Division of Medical Imaging Physics, Johns Hopkins School of Medicine, MD, September 2013
Hosted by Professor Eric Frey

Workshops, Conferences, Symposia, and Summer Schools

BigC 2022, International Conference on Big Data and Cloud Computing,
hosted by the National Center for Big Data and Cloud Computing, LUMS, Lahore, Pakistan, Dec 23 – 24, 2022.

Math Circle on Arithmetic Operations with Numbers – The Need for Speed,
conducted by Professor Hassan Mohy-ud-Din, LUMS, Lahore, Pakistan, May 27, 2022.

It was attended by 30 students (boys and girls) from various schools in Lahore. Students represented a diversity of grades ranging from 4th standard to 10th standard. Using a Socratic approach, students learned about basic mathematical operations, numbers, and speedy computation.

Math Circle on Reconstruction of the Unknown,

conducted by Professor Hassan Mohy-ud-Din, LUMS, Lahore, Pakistan, November 26, 2021.

It was attended by 37 students (boys and girls) from various schools in Lahore. Students represented a diversity of grades ranging from 6th standard to 12th standard. Using a Socratic approach, students learned about visualization in mathematics, basic understanding of 2D matrix representation, and recovering (unknown) entries of 2D matrices.

Summer Workshop on Mathematical Introduction to Reinforcement Learning

held at, LUMS, Lahore, Pakistan, June 9 – 11, 2021.

The workshop was conducted virtually (due to Covid-19 pandemic) and featured Dr. Jonathan Sock (University of Cape Town) and Dr. Andreas Matt (Imaginary, Berlin). It was attended by 80 students.

MICCAI Workshop on 2nd Radiomics and Radiogenomics in Neuro-oncology using AI

organized on behalf of the MICCAI conference, Lima, Peru, October 4, 2020.

The session featured plenary talks by Professor Ulas Bagci (UCF, USA), Professor Jayashree Kalpathy-Cramer (MGS/Harvard, USA), and Professor Thomas Booth (KCL, UK). It was held virtually due to Covid-19 pandemic.

MICCAI Workshop on 1st Radiomics and Radiogenomics in Neuro-oncology using AI

organized on behalf of the MICCAI conference, Shenzhen, China, October 13, 2019.

The session featured plenary talks by Professor Pallavi Tiwari (Case Western, USA) and Professor Michel Bilello (UPenn, USA) and a maximum of ten oral presentations by students, postdocs, and researchers.

Tutorial on Machine Learning and Deep Learning

University of Engineering and Technology Lahore, Pakistan, November 18, 2020.

It was conducted at the Department of Mechatronics and Control Engineering in collaboration with my student, Syed Talha Bukhari. Talha presented the computational module of the tutorial. It was organized by Professor Ali Raza.

Tutorial on Machine Learning and Deep Learning

BigC 2019 conference, National Center for Big Data and Cloud Computing, LUMS, Lahore, Pakistan, Dec 19 – 21, 2019.

It was conducted in collaboration with my student, Syed Talha Bukhari. Talha presented the computational module of the tutorial. It was organized by Professor Ali Raza.

Mini symposium on Optimization Theory in Medical Imaging

organized as part of the SIAM conference in Imaging Science, Albuquerque, New Mexico, USA, May 25, 2016.

The session featured talks by Professor Mathews Jacob (Iowa University, USA), Professor Ulas Bagci (UCF, USA), Professor Laurent Younes (Johns Hopkins, USA), and Dr. Hassan Mohy-ud-Din (Yale School of Medicine, USA).

Co-organized 6th NSF/Northeast Control Workshop

Johns Hopkins University, MD, USA, April 23 – 25, 2010.

Northeast control workshop invited leading control theorists (faculty, scientists, and students) working on diverse applications. Principal organizer of the workshop was Professor Danielle C. Tarraf.

Teaching Experience

Summary: I have a university teaching experience of **15+** years. I have taught at the University of Engineering and Technology Lahore, Pakistan, Johns Hopkins University, USA, and Lahore University of Management Sciences, Pakistan. I have taught in the Departments of Electrical and Computer Engineering, Applied Mathematics and Statistics, Computer Science, Biomedical Engineering, Mechanical Engineering, and Mechatronics Engineering. My classes have also attracted students from Business studies and Economics. My courses have a strong mathematical component (rich in theory) and a significant practical component (numerical implementations). Tabulated statistics for the courses can be found at the end of the section.

Engineering Models (EE 203) — **Fall 2018, Fall 2019, Fall 2020, Fall 2021, Fall 2022, Fall 2023, Fall 2024**

Syed Babar Ali School of Science and Engineering, LUMS, Lahore, Pakistan

This undergraduate course describes both the analytical techniques for solving first order and second order differential equations as well as describes a wide range of unrelated physical phenomenon that

can be modelled through them. In addition, graphical and numerical methods for solving differential equations are introduced. Furthermore, separable partial differential equations and the associated boundary value problems are introduced including the classical Heat, Wave and Laplace's equations.

Deep Learning (EE 414/517, CS 437/5317) — **Fall 2021, Fall 2022, Fall 2023, Fall 2024**

Syed Babar Ali School of Science and Engineering, LUMS, Lahore, Pakistan

In this course, (undergraduate and graduate) students will learn the basic theory and applications of deep neural networks with a special focus on supervised and unsupervised learning with convolutional neural networks, ensemble learning, transfer learning, autoencoders, GANs, and knowledge distillation. Students will learn to train deep neural networks in PyTorch for various applications in computer vision, image processing, and medical imaging.

Convex Optimization (EE 563, MATH 325) — **Spring 2018, Spring 2019, Spring 2020, Spring 2021, Spring 2022, Spring 2023, Spring 2024**

Syed Babar Ali School of Science and Engineering, LUMS, Lahore, Pakistan

Students will be trained to recognize, model, formulate, and solve convex optimization problems. Applications will revolve around medical imaging, big data and machine learning, and statistical (parameter) estimation. The course lectures will be divided into four sections: basics of convex analysis, first-order methods, duality, and second-order methods. Implementation of optimization algorithms will be carried out in Python.

Digital Signal Processing (EE 411) — **Spring 2019, Spring 2020**

Syed Babar Ali School of Science and Engineering, LUMS, Lahore, Pakistan

This four credit-hours course included three credit-hours lectures and one credit-hour lab. Lectures covered the following topics: continuous-time and discrete-time signals and their relationship, linear time invariant (LTI) systems representation and analysis techniques in time domain, Z-transform, Fourier transforms, LTI system representation and analysis techniques in frequency domain, sampling theory and discrete-time processing of continuous-time signals, discrete Fourier transform, fast Fourier transform, structures for discrete-time systems, and introduction to digital filter design techniques. The lab provided hands-on experience of implementing digital signal processing algorithms and systems in MATLAB®.

A Hands-on Introduction to MATLAB® (EN 550.582) — **Spring 2015**

Department of Applied Mathematics and Statistics, Johns Hopkins University, MD, USA

This was an introductory course in MATLAB® programming for students in the mathematical sciences. Short tutorial lectures were followed by problem solving sessions. Topics emphasized were basic programming in MATLAB® and solutions to problems in matrix calculations, differential equations, signal and image processing, and machine learning.

Statistical Methods in Imaging (EN 550.431) — **Spring 2014**

Department of Applied Mathematics and Statistics, Johns Hopkins University, MD, USA

My responsibilities included conducting office hours for the course, grading homework and exams, and providing guidance to students in grasping the fundamentals and concepts of the course.

Image Processing and Analysis (ECE 520.414) — **Fall 2012, Fall 2013, Fall 2014**

Department of Electrical and Computer Engineering, Johns Hopkins University, MD, USA

My responsibilities included conducting recitation sessions for the course, grading the exams and providing guidance to students in grasping the fundamentals and concepts of the course. This was a pre-requisite for the course Image Processing and Analysis-II (ECE 520.415).

Energy Systems Analysis (ME 530.464/664) — **Spring 2013, Spring 2014**

Department of Mechanical Engineering, Johns Hopkins University, MD, USA

My responsibilities included conducting recitation sessions for the course, grading the exams and final project presentations and providing guidance to students in grasping the fundamentals and concepts of the course. I also gave a tutorial on MatPower, a MATLAB® package, and PowerWorld to solve optimal power flow problems.

Signals and Systems (ECE 520.214) **Spring 2011, Spring 2012**

Department of Electrical and Computer Engineering, Johns Hopkins University, MD, USA

My responsibilities included conducting recitation and tutorial sessions for the course, grading the exams and providing guidance to students in grasping the fundamentals and concepts of the course. This was a pre-requisite of the course (I instructed thrice) Digital Signal Processing for MATLAB® (ECE 520.435)

Digital Signal Processing (ECE 520.435) **Fall 2009, Fall 2010, Fall 2011**

Department of Electrical and Computer Engineering, Johns Hopkins University, MD, USA

This was a four credit-hours course. My responsibilities included teaching one credit-hour lectures on the implementation of Digital Signal Processing techniques in MATLAB®.

Introduction to Wavelets and Fourier Analysis (EN 550.484) **Spring 2010**

Department of Applied Mathematics and Statistics, Johns Hopkins University, MD, USA

My responsibilities included conducting office hours for the course, grading homework and exams, and providing guidance to students in grasping the fundamentals and concepts of the course.

Skillset and Hobbies

Note: In my research, we utilize publicly available tools but largely write our own codes from scratch (I also code extensively). We use plug-and-play codes, written by the respected scientific community, whenever possible (after some reshaping and restructuring) and appropriately cite them in our publications.

Programming : MATLAB®, Python

Application Software : LateX, Anaconda, Tensorflow, NiftyNet, MONAI, Keras, PyTorch, Microsoft Visio, Flowchart Maker

Medical Imaging Software : Carimas 2.8, PMOD, Vinci, Amide, XCAT, SPM, Seg3D, MIPAV, ITK-SNAP, MITK, ImageJ, CaPTk, BraTumIA, TotalSegmentor, dicom2nifti, dicomviewer, BioImage Suite, 3D Slicer

Toolbox : scikit-learn, Ripser, NiBabel, ANTsPy, PyRadiomics, OpenCV, MedPy, CVX, CVXPy, TorchIO, TorchCV, Albumentations, NC-BCQP, torchvision, STAPLE, GUDHI, PerSim

Hobbies : poetry and recitation, singing, literature, sports (chess, snooker, cricket, tennis, badminton, squash), movies, plays, discourse, history, philosophy, theology, oratory