Muzammil Behzad — Google Scholar

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Contact Information

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Research Interests

Signal and Image Processing, Machine Learning, Computer Vision, Deep Learning

Education

Exchange Student (Fully-funded) — **Feb. 2019 - Present**
Brown University, Providence, U.S.A.
- Exchange Student in Semester Program: *Computer Vision*
- Hosted by Institute for Computational and Experimental Research in Mathematics

Ph.D. in Technology (Fully-funded) — **Sep. 2018 - Present**
University of Oulu, Oulu, Finland.
- CGPA: **5.00**/5.00
- Thesis Topic: *Micro-Expression Recognition for 4-Dimensional Data*
- Advisor: Prof. Guoying Zhao (Ph.D., Chinese Academy of Sciences, China)
- Courses: Affective Computing, Machine Learning, Deep Learning, Human Computer Interaction, Machine Vision.

M.S. in Electrical Engineering (Fully-funded) — **Sep. 2014 - Jan. 2017**
King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia.
- CGPA: **3.821**/4.00
- Thesis Topic: *Compressed Sensing Based Image Denoising* (available online)
- Advisor: Prof. Tareq Y. Al-Naffouri (Ph.D., Stanford University, U.S.)
- Courses: Stochastic Processes, Digital Signal Processing, Image Processing, Digital Communications I, Digital Communications II, Adaptive Filtering and Applications.

B.S. in Electrical Engineering (Partially-funded) — **Sep. 2009 - Aug. 2013**
COMSATS University Islamabad (CUI), Islamabad, Pakistan.
- CGPA: **3.87**/4.00 (**90.53%**), Distinction - Double Medalist, Valedictorian
- Final Year Project: *GPS & GSM Based Vehicle Tracking System* (available online)
- Advisor: Prof. Mahmood Ashraf Khan (Ph.D., Aston University, U.K.)
- Major: Wireless Communications and Embedded Systems

Professional Experience (5+ Years)

Research Scholar — **Feb. 2019 - Present**
Brown University, Providence, U.S.A.
- Participating in the *Computer Vision* program hosted by Institute for Computational and Experimental Research in Mathematics.

Scientific Researcher — **Sep. 2018 - Present**
University of Oulu, Oulu, Finland.
- Working in the Center for Machine Vision and Signal Analysis (CMVS) towards computer vision aided micro-expression analysis in the real world (MEiR).

Full-time Researcher — **May 2018 - Aug. 2018**
Pukyong National University, Busan, South Korea.
- Worked on real-time image processing and computer vision applications.

Research Associate (On Leave) — **Sep. 2013 - May 2018**
COMSATS University Islamabad (CUI), Islamabad, Pakistan.
- Undergraduate projects' supervision, BSCS and BSSE projects' coordination, research work and teaching: Digital Image Processing, Computer Graphics, Object Oriented Programming, Introduction to Computer Programming.

Visiting Research Scholar **Summers of 2015 & 2016**
King Abdullah University of Science and Technology, Thuwal, Saudi Arabia.
- MS thesis research work - visiting research group of Prof. Tareq Y. Al-Naffouri

Graduate Teaching Assistant **Jan. 2015 - Jan. 2016**
King Fahd Univ. of Petr. and Min. (KFUPM), Dhahran, Saudi Arabia.
- Stochastic Processes - Spring 2015 and Digital Communications I - Fall 2015.

Research and Project Intern **Jun. 2012 - Jun. 2013**
Centre for Advance Studies in Telecommunication, Islamabad, Pakistan.
- Worked on: Final Year Project, GPS & GSM Based Embedded Systems, PCB, Hardware and Circuit Designing, Thesis and Research Work.

Network Intern **Jul. 2011 - Sep. 2011**
National Telecom Corporation (NTC), Islamabad, Pakistan.
- Worked on: Networking Project, Routing Protocols, C/C++ Programming, Practical Implementation on Simulation Software.

Awards and Achievements

Fully-funded Exchange Semester at Brown University Feb. 2019 - Present
Fully-funded Ph.D. Studies at University of Oulu Sep. 2018 - Present
Fully-funded M.S. Electrical Engineering at KFUPM Sep. 2014 - Jan. 2017
Employee of the Year & **Best Supervised Project** Award in CUI 2014
Valedictorian - Honor of Convocation Graduation Speech in CUI 2013
Institute Silver Medal Award in B.S. Electrical Engineering 2013
Campus Silver Medal Award in B.S. Electrical Engineering 2013
Laptop awarded by Gov. of Pakistan for holding the top Position in B.S. 2013
Runner Up in National Level Line Tracking Robotics Competition ROBIAN'12 2012
1st Position in Inter-Departmental Debate/Declamation Competition 2012
Talent Award for Batch Position holder by SAFE (NGO) at CUI 2010
Prize Money Merit-Scholarships by CUI During B.S. Study 2009 - 2013

Technical Skills

Computer Programming
- C/C++, MATLAB, Python 2.7/3.5 (scikit-image/learn, OpenCV, DLib, TensorFlow, TensorBoard), R, HTML, Assembly

Computer Networking (CCNA-Certification)
- IP Addressing, OSI/TCP Model, Routing, Switching, Subnetting, Supernetting, Routing Protocols, Network Programming, Socket Programming, TCP Handshaking

Operating Systems, IDEs and Applications
- Windows, Linux, LaTeX(Miktex, WinEdt, TeXStudio), Anaconda, Spyder, Jupyter Notebook, Proteus, Packet Tracer, CodeVisionAVR, MS Visual Studio, MS Office

Management and Trainings Experience

Represented Pakistan in **Festival of Cultures** in University of Oulu, Finland 2018
Attended Speedup Your Literature (IRIS.AI) in University of Oulu, Finland 2018
Attended IEEE International Conference on Consumer Electronics, South Korea 2018
Pioneer Team Member, **CUI Hybrid Learning Pioneered for Pakistan** 2017-18
Attended & Presented Research Paper at 32nd IEEE AINA conference, Poland 2018
Delivered Many Presentations on **CUI's Hybrid Learning Model** 2017-18
Represented CUI in Frontiers of Information Technology Conference 2013 & 2017
Indoor Positioning and Navigation Workshop, **KAUST Enrichment Program** 2017
Attended **iPakistan**: Innovative Forum for Computer Scientists by CUI 2016
Organized and Captained Multinational KFUPM Premier League (Cricket) 2016
Represented Pakistan in **Festival of Cultures** in KFUPM, Saudi Arabia 2015
Participated and Represented CUI in 3^{rd} **Pak-China Business Forum** 2014
Organized All-Pakistan Robotics Competition 'ROBIAN' Twice at CUI 2012 & 2013
Organized CUI's 46^{th} **Graduation Convocation** as Usher 2012
Organized Inter & Intra-University Debate/Declamation Contests at CUI 2012
Attended Workshop on Robotic Designing in CUI 2012

Certifications

- CCNA Discovery, Security, and IT Essentials *from* CISCO Regional Academy 2012
- Machine Learning *from* Stanford University via Coursera 2018

Professional Membership

Student Member, Institute for Electrical & Electronics Engineers (IEEE) since 2016
Member, Society for Industrial and Applied Mathematics (SIAM) since 2015
Lifetime Member, Pakistan Engineering Council (PEC) since 2013

Personal Skills

- Languages: English (Expert), Urdu (Expert), Pushtu (Expert), Arabic (Beginner)
- Strong technical writing, formal reporting, communication, and presentation skills
- Quick learner, dedicated, highly motivated, enthusiastic, confident and team player

Voluntary Services

Volunteer in **Voluntary Work Unit** on KFUPM Volunteer's Day, Saudi Arabia 2015
Volunteer in **Pakistan Hajj Volunteer Group (PHVG)**, Saudi Arabia 2014

Academic Projects

AlexNet based Face Recognition on Self-Generated Live Webcam Dataset
MATLAB2018b, Fine-tuning AlexNet's (5 Convolutional and 10 FC Layers Trained on ImageNet Dataet of 1000 Classes with 227x227 Images), Retraining FC Layers with 10 Subjects (1000 M/F Samples Each), Input Image Pre-processed for Face Detection via Viola–Jones Detector , Live Demo of Recognition System

Fine-Tuning ResNet on CIFAR10 Dataset
Python 3.5 (mainly using TensorFlow, TensorBoard, Keras, in Spyder), Collecting CIFAR10 Dataset (60,000 32x32 images in 10 classes, 6000 Images/Class), Pre-trained Model ResNet-50 v3-fp32, Fine Tuning of ResNet's Final-layer (Training/ Testing/CrossEntropy Accuracy of 87.05%/86.75%/0.43, 38.92%/34.65%/1.48 and 16.40/15.84%/1.99 at 10,000, 1,000 and 100 steps, respectively)

Deep Learning Classification on Fashion MNIST dataset
Python 3.5 (mainly using TensorFlow, TensorBoard, Keras, in Spyder), Collecting Fashion MNIST Dataset (70,000 28x28 Images in 10 Classes), Exploring and Pre-processing the Data, Training a Neural Network Model (Layers: Input = 28*28, Hidden = 128, Output = 10, Parameters: 5 Epochs, Training Size = 60,000), Visualizing over TensorBoard (Training Accu. = 89.03%, Testing Accu. = 87.06%)

Multi-modal Expressions Recognition System
Python 2.7 (mainly using SciPy, NumPy, Matplotlib, sklearn, skimage in Jupyter Notebook), Feature-level Method to Combine Facial and Speech features (Happy and Sad Emotions), Feature Fusion for Linear SVM Classifier via Principal Component Analysis (Accu. = 98.21%) and Canonical Correlation Analysis (Accu. = 92.31%)

Expressions Recognition from Speech Signals
Python 2.7 (mainly using SciPy and NumPy in Jupyter Notebook), Extracting Prosodic and Mel-Frequency Cepstral Coefficients Features from Speech Dataset (10 speakers with Happy and Sad Emotions), Classifiers: SVM with Polynomial Kernel (Accu. = 86.21%), Random Forest (Accu. = 88.31%) and Neural Network having 3 Hidden Layers of 50 Units Each with 20,000 Iterations (Accu. = 90.35%)

Facial Expressions Recognition from eNTERFACE Dataset
Python 2.7 (mainly using scikit-image, DLib in Jupyter Notebook), Faces Detection, Pre-processing and Registration on eNTERFACE Dataset (Happy and Sad Emotions), LBP Features for SVM Classifier (Accuracy = 72.25%)

Real-Time Fast Video Deraining
Programming in MATLAB, Exploiting Temporal Information, Video Frames, Extracting and Grouping Patches, Code Optimization for Faster Processing

Compressed Sensing based Image Denoising - M.S. Thesis Project
Compressed Sensing, Image and Signal Processing, Extracting and Grouping Patches, MATLABProgramming, Thesis/Research Papers, Simulations

GPS and GSM Based Vehicle Tracking System - B.S. Final Year Project
Wireless Communication, GPS & GSM, Embedded Systems, C/C++ Programming, Networking, PCB and Circuit Designing, Thesis/Research Papers, Simulations

Client-Server Architecture on Linux OS

C/C++ Programming, Linux Network Programming, Socket Programming, File Transferring, OSI/TCP Model, Local-Host Client-Server Communication

RFID Based Remote Authentication System
Embedded Systems, C/C++ Programming, Microcontroller ATmega16

Line Tracking Autonomous Robot
Embedded Systems, Assembly and C++ Programming, Microcontroller, Sensors

Routing Protocols RIP/IGRP/EIGRP/OSPF Implementation
Routing, Network Programming, IP Addressing, Subnetting, Routing Protocols

Binary Clock and Kitchen Timer
Programming, Embedded Systems, PCB Designing, Digital Logic Design

C/C++ Programming Projects on Windows/Linux OS
Client-Server Server, Authentication System, Student/Faculty Management System

Publications

J2 **M. Behzad**, et. al., "Performance Optimization in IoT-based Next-Generation Wireless Sensor Networks", *Transactions on Computational Collective Intelligence*, 2019 [Accepted].

J1 **M. Behzad**, M. S. Javaid, M. A. Paracha and S. Khan, "Distributed PCA and Consensus Based Energy Efficient Routing Protocol for WSNs", *Journal of Information Science & Engg.*, Vol. 33 Issue 5, p1267-1283, 2017 [IF = 0.468].

C10 **M. Behzad**, et. al., "Layer-Adaptive Communication and Collaborative Transformed-Domain Representations to Optimize Performance in Next-Generation WSNs", *The 32nd IEEE Int. Conference on Advanced Information Networking and Applications (AINA)*, Krakow, Poland, 2018.

C9 **M. Behzad**, et. al., "Technology-Mediated Educational Model", *Int. Conf. on Professional Development in Higher Education: Trends and Practices, Prospects and Innovations*, Higher Education Commission of Pakistan, 2018.

C8 **M. Behzad**, M. Masood, T. Ballal, M. Shadaydeh and T. Al-Naffouri, "Image denoising via collaborative support-agnostic recovery", *The 42nd IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, New Orleans, USA, 2017.

C7 **M. Behzad** and Y. Ge, "Performance Optimization in Wireless Sensor Networks: A Novel Collaborative Compressed Sensing Approach", *The 31st IEEE International Conference on Advanced Information Networking and Applications (AINA)*, Tamkang University, Taipei, Taiwan, 2017.

C6 **M. Behzad**, N. Javaid, A. Sana, M. T. A. Khan, N. Saeed, Z. A. Khan, U. Qasim, "TSDDR: Threshold Sensitive Density Controlled Divide and Rule Routing Protocol for Wireless Sensor Networks", *The 9th IEEE International Conference on Broadband and Wireless Computing, Communication and Applications (BWCCA)*, Guangzhou, China, 2014.

C5 **M. Behzad**, et al., "Design and Development of a Low Cost Ubiquitous Tracking System", *The 9th International Conference on Future Networks and Communications (FNC)*, Niagara Falls, Ontario, Canada, 2014.

C4 F. Saleem, Y. Moeen, **M. Behzad**, M. A. Hasnat, Z. A. Khan, U. Qasim, N. Javaid, "IDDR: Improved Density Controlled Divide-and-Rule Scheme for Energy Efficient Routing in Wireless Sensor Networks", *The 9th International Conference on Future Networks and Communications (FNC)*, Niagara Falls, Canada, 2014.

C3 A. Umar, M. A. Hasnat, **M. Behzad**, I. Baseer, Z. A. Khan, U. Qasim, N. Javaid, "On Enhancing Network Reliability and Throughput for Critical-Range Based Applications in UWSNs", *The 9th International Conference on Future Networks and Communications (FNC)*, Niagara Falls, Ontario, Canada, 2014.

C2 M. M. Sandhu, M. Akbar, **M. Behzad**, N. Javaid, Z. A. Khan, U. Qasim, "REEC: Reliable Energy Efficient Critical data routing in wireless body area networks", *The 9th IEEE International Conference on Broadband and Wireless Computing, Communication and Applications (BWCCA)*, Guangzhou, China, 2014.

C1 M. M. Sandhu, M. Akbar, **M. Behzad**, N. Javaid, Z. A. Khan, U. Qasim, "Mobility Model for WBAN", *The 9th IEEE International Conference on Broadband and Wireless Computing, Communication and Applications (BWCCA)*, Guangzhou, China, 2014.

Submitted/ Pending Papers

J3 **M. Behzad**, "Image Denoising via Collaborative Dual-Domain Patch Filtering", *IEEE Transactions on Pattern Analysis and Machine Intelligence*, May 2018.

Conference Posters

CP1 **M. Behzad** and T. Al-Naffouri, "Minimum Distance Based Energy efficiency Using Hemisphere Zoning with Advanced Divide-and-Rule Scheme for WSNs", *in 6th Annual KFUPM Students Scientific Forum*, 2015.

Referee Services

- **Track Co-chair**, The 13th International Conference on Complex, Intelligent, and Software Intensive Systems, University of Technology Sydney, Australia 2018 - 2019
- **Reviewer**, Transactions on Computational Collective Intelligence 2018 - Present
- **Reviewer**, The 13th International Conference on Complex, Intelligent, and Software Intensive Systems, University of Technology Sydney, Australia 2018 - 2019
- **Reviewer**, IEEE Networking Letters 2018 - Present
- **Reviewer**, 1st International Conference on Advances in Signal Processing and Artificial Intelligence, Spain 2019
- **Reviewer**, The 4th International Conference on Digital Information & Communication Technology and its Applications, Thailand 2014