Md Abul Hayat

Contact Information	3217 Bell Engineering Center 800 W Dickson St, Fayetteville, AR 72701, USA	mahayat@uark.edu https://mahayat.github.io/

Research Interest Biomedical Signal Processing, Statistical Learning, Deep Learning, Bayesian Statistics

Education

PhD Student, Electrical Engineering — Expected: May 2023
University of Arkansas, Fayetteville, AR
- Supervisor: Jingxian Wu, PhD

Master of Science, Statistics & Analytics — May 2021
University of Arkansas, Fayetteville, AR

Bachelor of Science, Electrical & Electronic Engineering — September 2015
Bangladesh University of Engineering & Technology (BUET)
Dhaka, Bangladesh

Experience

Applied Scientist Intern — May 2021 - August 2021
Amazon Web Services (AWS), Seattle, WA
- Worked on unsupervised anomaly detection algorithm for univariate time series.
- Mentor: Ketan Vijayvargiya

Summer Intern — May 2020 - August 2020
Lawrence Berkeley National Laboratory, Berkeley, CA
- Lead developer of contrastive self-supervised representation learning for galactic images. This approach outperforms state-of-the-art on several relevant tasks.
- Dataset size: 300 GB, Model: Momentum Contrast for Unsupervised Visual Representation Learning (MoCo), Framework: PyTorch.
- Mentor: Mustafa Mustafa, PhD

Summer Intern — June 2019 - August 2019
Nokia Bell Labs, Murray Hill, NJ
- Implemented U-Net and DenseNet based deep learning segmentation algorithms for OCT images.
- Mentor: Atefeh Mohajeri, PhD

Graduate Assistant — August 2017 - Present
University of Arkansas, Fayetteville, AR
- Analysis of peripheral venous pressure (PVP) signals under different clinical conditions using deep and statistical learning.
- Proposed a Integral pulse frequency modulation (IPFM) based modeling of arterial and venous pressure signals to estimate respiratory rate and heart rate variability.
- Developed a Kalman filter and hidden Markov model based unsupervised anomaly detection algorithm for PVP signals.
- Applied classical dimension reduction techniques (PCA, Kernel-PCA), regression techniques (GLMs with LASSO, Elastic net regularization), and classification algorithms (k-means, KNN, SVM) in MATLAB and Python.

- Developed a Gaussian mixture model (GMM) based Bayesian unsupervised algorithm for rice panicle detection using Markov chain Monte Carlo (MCMC) techniques.
- Partially funded by the US National Science Foundation (NSF) under award number ECCS-1711087.

System Engineer October 2015 - August 2017
Grameenphone, Dhaka, Bangladesh

- Grameenphone, part of the Norwegian Telenor Group, is the largest telecommunications operator in Bangladesh.
- Worked with more than 400 BTS/nodeBs of Huawei. Planned and implemented radio diversity techniques.
- Analyzed and solved performance issues like IPPM loss and Ping packet loss, MPD degradation and TCH congestion.
- Implemented different radio aggregation techniques on wireless backhaul devices.

Computer Skills

Programming Languages: Python, MATLAB, R, C++, C, SQL
Machine Learning Frameworks: PyTorch, GluonTS, TensorFlow-Keras
Others: Bash, Git, LaTeX, High Performance Computing (HPC)

Publications

[J5] M. A. Hayat*, George Stein*, et. al., "Self-Supervised Representation Learning for Astronomical Images," The Astrophysical Journal Letters, December 2020 [link] [arXiv] [Media] [github] [project website] [YouTube] {* equal contribution first authors}. **[IF: 7.413]**

[J4] M. A. Hayat, Jingxian Wu, et.al., "Unsupervised Anomaly Detection in Peripheral Venous Pressure Signals with Hidden Markov Models," Biomedical Signal Processing & Control, September 2020 [link] [github]. **[IF: 3.321]**

[J3] M. A. Hayat, Jingxian Wu, et.al., "Unsupervised Bayesian Learning for Rice Panicle Segmentation with UAV Images," Plant Methods, February 2020 [link] [github]. **[IF: 4.460]**

[J2] P. Bonasso, K. Sexton, **M. A. Hayat**, et. al., "Venous Physiology Predicts Dehydration in the Pediatric Population," Journal of Surgical Research, March 2019 [link]. **[IF: 2.187]**

[J1] P. Bonasso, K. Sexton, S. Mehl, M. Golinko, **M. A. Hayat**, et. al., "Lessons learned measuring peripheral venous pressure waveforms in an anesthetized pediatric population," Biomedical Physics & Engineering Express, February 2019 [link]. **[IF: 1.167]**

Conference

[C2] S. M. Hasan, **M. A. Hayat** and M. F. Hossain, "On the downlink SINR and outage probability of stochastic geometry based LTE cellular networks with multi-class services," 18th International Conference on Computer and Information Technology, December 2015. [link]

[C1] S. M. Hasan, M. B. Monjil, F. Mohsin, **M. A. Hayat** and A. B. M. H. Rashid, "Adaptive beamforming with a Microphone Array," 18th International Conference on Computer and Information Technology, December 2015. [link]

Poster Presentations

[P3] M. A. Hayat, et.al., "Estimating Galactic Distances From Images Using Self-supervised Representation Learning," Machine Learning and the Physical Sciences Workshop, 34th

Conference on Neural Information Processing Systems (NeurIPS), December 2020. [pdf] [arXiv] [poster]

[P2] M. A. Hayat, et.al., "Rice Panicle Segmentation from UAV Images Using Multivariate Gaussian Mixture Model," 44th Spring Lecture Series, University of Arkansas, April 2019. [poster]

[P1] M. A. Hayat, et. al., "Predicting Dehydration in Pediatric Patients with Peripheral Venous Waveforms," 15th Annual Midsouth Computational Biology & Bioinfomatics Society (MCBIOS), Mississippi State University, March 2018. [poster]

Talks

Self-Supervised Representation Learning for Astronomical Images — January 2021
NERSC Data Seminar, Berkeley Lab. [YouTube]

Thesis

Downlink OFDMA Network Analysis with Stochastic Geometry Models — September 2015
Undergraduate Thesis (Supervisor: Md. Farhad Hossain, PhD)

Article Reviews

Springer Nature Applied Sciences

Awards & Honours

- A member of BUET team in 'Xtensa Design Contest 2015' organized by Cadence India. The team secured second place in the project entitled 'Adaptive Beamforming with Microphone Array'. [certificate]
- 11th (Dhaka round), '5th National Undergraduate Mathematics Olympiad 2013' organized by Bangladesh Mathematical Society.
- 60th in BUET (top 1%) and 1937th in MBBS (top 5.4%) entrance exam of 2009-10.
- Recipient of full tuition waiver for undergraduate studies with a scholarship based on Higher Secondary Certificate (HSC) examination results of 2009-10.
- Second runner-up of Bangladesh Mathematical Olympiad (Rajshahi chapter) in 2006 and 2008.

Grants & Scholarships

Summer Research Graduate Assistantship — Summer 2022
University of Arkansas

Porter W. Stone Scholarship — May 2022
University of Arkansas

Bangladesh-Sweden Trust Fund Travel Grant — February 2019
Ministry of Finance, Govt. of the People's Republic of Bangladesh

Doctoral Student Travel Grant — March 2018
University of Arkansas

Teaching Experience

- ELEG 3124 (Systems & Signals) — Fall 2021, 2020, 2019
- ELEG 3214 (Electronics I) — Spring 2020

Membership

IEEE, SIAM, American Statistical Association

Leadership	*President, Bangladesh Student Organization* *University of Arkansas*	*June 2018 - May 2019*
	Representative (EE), Graduate-Professional Student Congress *University of Arkansas*	*July 2018 - December 2018*
More Information	*LinkedIn, Google Scholar, ORCID, GitHub, Twitter*	