Md Abul Hayat

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Research Interest

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

Education

- **University of Arkansas** — Fayetteville, AR
  PhD Candidate, Electrical Engineering — *Expected: May 2023*
- **University of Arkansas** — Fayetteville, AR
  Master of Science, Statistics & Analytics — *May 2021*
- **Bangladesh University of Engineering & Technology (BUET)** — Dhaka, Bangladesh
  Bachelor of Science, Electrical & Electronic Engineering — *September 2015*

Experience

- **Amazon Web Services** — Seattle, WA
  Applied Scientist Intern — *May 2021 - August 2021*
  - Worked on unsupervised anomaly detection algorithm for univariate time series using GluonTS.
- **Lawrence Berkeley National Laboratory** — Berkeley, CA
  Summer Intern — *May 2020 - August 2020*
  - Lead developer of contrastive self-supervised representation learning for galactic images. This approach outperformed state-of-the-art on several relevant tasks. [see publications]
  - Dataset size: 300 GB, Model: Momentum Contrast for Unsupervised Visual Representation Learning (MoCo), Framework: PyTorch, Mentor: Mustafa Mustafa, PhD
- **Nokia Bell Labs** — Murray Hill, NJ
  Summer Intern — *June 2019 - August 2019*
  - Implemented U-Net and DenseNet based deep learning segmentation algorithms for OCT images using Keras.
- **University of Arkansas** — Fayetteville, AR
  Graduate Assistant — *August 2017 - Present*
  - Analysis of peripheral venous pressure (PVP) signals under different clinical conditions using statistical and machine learning techniques.
  - Proposed an integral pulse frequency modulation based modeling of arterial and venous pressure signals to extract respiratory rate and heart rate variability.
  - Developed a Kalman filter and hidden Markov model based unsupervised anomaly detection algorithm for PVP signals.
  - Developed a Gaussian mixture model (GMM) based Bayesian unsupervised algorithm for rice panicle detection using Markov chain Monte Carlo (MCMC) techniques.
  - 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.
- **Grameenphone** — Dhaka, Bangladesh
  System Engineer — *October 2015 - August 2017*
  - 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. Implemented radio aggregation techniques on wireless backhaul devices.

Technical Skills

- **Languages**: Python, MATLAB, R, SQL, C++, C
- **ML Frameworks**: PyTorch, GluonTS, TensorFlow-Keras, Jupyter
- **Others**: Git, LaTeX, Bash, Slurm, High Performance Computing (HPC)

Selected Publications [Google Scholar Link]

- **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 contributions} **[IF: 7.413]**
- **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. [link] [arXiv] [poster]
- **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]**
- **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]**
- 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]**
- 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]

Grants & Scholarships

- Graduate student ambassador (EE), University of Arkansas — August 2022
- Summer research graduate assistantship, University of Arkansas — May 2022
- Porter W. Stone scholarship, University of Arkansas — May 2022
- Bangladesh-Sweden trust fund travel grant, Govt. of the People's Republic of Bangladesh — February 2019
- Doctoral student travel grant, University of Arkansas — March 2018
- Full undergraduate tuition-waiver with scholarship, Govt. of the People's Republic of Bangladesh — May 2010

Awards & Honours

- Runner-up, 'Cadence India Xtensa Design Contest - Adaptive Beamforming with Microphone Array' [certificate] — 2015
- 11th, National Undergraduate Mathematics Olympiad (Dhaka chapter) — 2013
- Second runner-up, Bangladesh Mathematical Olympiad (Rajshahi chapter) — 2006, 2008

Teaching Experience

- ELEG 3124 (Systems & Signals) — Fall 2022, 2021, 2020, 2019
- ELEG 3214 (Electronics I) — Spring 2020

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

Membership

IEEE, SIAM, American Statistical Association