Khondoker Murad Hossain

Email: hossain10@umbc.edu
Linkedin: in/khondokerhossain/
Mobile:+1 667-895-1569
Github: github.com/kmhoss

Education

- **University of Maryland Baltimore County** — Baltimore, US
  PhD in Electrical Engineering — *May 2024*
  Courses: *Intro to Machine Learning, Intro to Data Science, Probability and Random Process, Convex Optimization, Optimization Algorithms, Advance Topics in Signal Processing, Detection and Estimation Theory*
- **University of Maryland Baltimore County** — Baltimore, US
  MS in Electrical Engineering — *August 2021*
- **University of Dhaka** — Dhaka, Bangladesh
  BS in Electrical and Electronic Engineering — *December 2015*

Skills Summary

- **Languages**: Python, MATLAB, SQL
- **Frameworks**: HuggingFace, Pytorch, Pytorch Geometric, Networkx, Deep Graph Library, Scikit, Tensorflow, Pandas
- **Tools**: GIT, MySQL, Amazon Bedrock, Microsoft Azure
- **Platforms**: Linux, Windows
- **Soft Skills**: Leadership, Event Management, Writing, Public Speaking, Time Management

Experience

- **General Electric (GE) Aerospace Research**
  Research Scientist, AI and Machine Learning — *May 2024 - Present*
  - **Building the GE Aerospace-specific Language Model using different RAG architectures.**
  - **Deploy the LLM on a variety of used cases for GE Aerospace and Airline Customers of GE Aerospace.**
  - **Time-series Foundation Models for anomaly detection, forecasting, and missing value imputation.**

- **General Electric (GE) Aerospace Research**
  AI/Machine Learning Intern — *May 2023 - August 2023*
  - **Worked on building foundation model for GE Aerospace from scratch.**
  - **Used time series data from flights to build the model for downstream task like anomaly detection and forecasting.**

- **University of Maryland Baltimore County**
  Graduate Research Assistant — *May 2019 - May 2024*
  - **Worked on backdoor detection in Artificial Intelligence.**
  - **Analyzed dynamic brain connectivity using matrix and tensor factorization.**
  - **Explored deep learning techniques for EEG-driven brain-computer interface applications.**
  - **Designed multi agent Reinforcement Learning applications using Graph Neural Network.**

Projects

- **Foundation Model for GE Aerospace (Generative Models, Time Series Data)**: Worked on building the first ever foundation model for GE Aerospace using Variational Autoencoder, Transformer, and 1-D CNN from scratch. Tech: Pytorch, Scikit, Pandas, GitHUB. (May 2023 - August 2023)
- **Funded by IARPA; Trojan Attack Detection in Deep Neural Networks (Computer Vision, NLP, Graph Convolutional Network, Knowledge Distillation, Backdoor Attack)**: Building novel detection pipelines for detecting the backdoor attacks on Deep Learning models. Applying the detection algorithms to remove the trojans from both CNN and RNN pre-trained models (ResNET,Inception, GoogleNET, VGG, R-CNN, LSTM, GRU, BERT, GPT-2). Tech: Pytorch, Pytorch Geometric, Networkx, Deep Graph Library, Git. (May 2021 - May 2024)
- **Funded by NSF and NIH; Multivariate data-driven solutions for dynamic brain connectivity (fMRI data, Computer Vision, Tensor Decomposition)**: Developed and tested multivariate data-driven methods(ICA, IVA) to estimate the changes of interest in functional magnetic resonance (fMRI) data in a robust manner. Tech: Python, Pytorch, Tensorlab, OpenCV. (December 2018 - December 2020)
- **Deep Learning Approaches for EEG-based Brain-Computer Interfaces and Parkinson's Disease Detection**: Reviewed and assessed deep learning-based approaches in EEG-based brain-computer interfaces, contributing to advancements in neurorehabilitation and brain injury treatments. (January 2022 - March 2023)

Publications

- A. Peshave, **K.M. Hossain**, J. Kubricht, N. Ranjani, Z. Burpee, A. Agarwal 'Evaluating Large Language Models (LLMs) for Interval and Arithmetic Operations', AAAI 2025-in review.
- **K.M. Hossain**, A. Vartak, T. Oates,'DeBUGCN - Detecting Backdoors in CNNs Using Graph Convolution Network', (AAAI 2025 - in review).
- **K.M. Hossain**, T. Oates ,'Single Model Trojan Detection using Knowledge Distillation', WACV 2025-in Review.
- **K.M. Hossain**, T. Oates ,'TEN-GUARD: Tensor Decomposition for Backdoor Attack Detection in Deep Neural Networks', IEEE ICASSP 2024, Seoul, Korea.
- **K.M. Hossain**, T. Oates ,'Advancing Security in AI Systems: A Novel Approach to Detecting Backdoors in Deep Neural Networks', IEEE International Conference on Communications (ICC) 2024, Denver, USA.
- **K.M. Hossain**, S. Hossain, M.A. Islam, A. Nijholt, M.A.R. Ahad,'Status of Deep Learning for EEG-based Brain-Computer Interface Applications', Frontiers in Computational Neuroscience, 2023.
- **K.M. Hossain**, T. Oates ,'Backdoor Attack Detection in Computer Vision by applying Matrix Factorization on the the Weights of the Networks', SafeAI at AAAI 2023, Washington DC.
- **K.M. Hossain**, S. Bhinge, Q. Long, V.D. Calhoun, T. Adali, 'Data-driven spatio-temporal dynamic brain connectivity analysis using fALFF: Application to sensorimotor task data', IEEE Annual Conference on Information Sciences and Systems (CISS), 2022.
- E. Acar, M. Roald, **K.M. Hossain**, V.D. Calhoun, T. Adali,'Tracing Evolving Networks using Tensor Factorizations vs. ICA-based Approaches', Frontiers in Neuroscience, 2022.
- M.A. Islam, Z. Mazumder, A. Hussein, **K.M. Hossain**,'A Review of Machine Learning and Deep Learning Algorithms for Parkinson's Disease Detection using Handwriting and Voice Datasets', Heliyon, 2024.
- S. Islam, R. Reza, M.M. Hasan, N.D. Mishu, **K.M. Hossain**, M Z.H. Mahmood,'Effects of Various Filter Parameters on the Myocardial Perfusion with Polar Plot Image', IEEE Transactions on Biomedical Engineering.(Vol-4,2016).

Honors and Awards

Champion at Human Guided Reinforcement Learning Hackathon, Columbia University, NY - August, 2022; Arranged by Army Research Laboratory.
Author of IARPA grant proposals which have been funded later; From July 2022-December 2024.
Runner's Up in Programming Competition at the University of Dhaka - February, 2013

Media Attention

Featured in UMBC news for Hackathon Champion at Columbia University, August, 2022.

Featured in UMBC CSEE Departmental Annual Achievement poster for 2022.

Reviewer Experience

Thirty-Seventh AAAI Conference on Artificial Intelligence, 2023.
IEEE ICASSP 2023, 2024: IEEE International Conference on Acoustics, Speech, and Signal Processing.
IEEE IJCNN 2023, 2024: IEEE International Joint Conference on Neural Networks.