Asadullah Hill Galib

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As an AI Research Scientist with a Ph.D. in Computer Science, I bring a robust background in Software Engineering and a proven record of success in multidisciplinary research collaboration. (Link: Explore my work in Machine Learning and AI)

Education

Ph.D. in **Computer Science** *August 2020 - July 2024*
Michigan State University, MI, USA
Advisor: Pang-Ning Tan; Dissertation: Predictive and Generative Modeling of Time Series Extremes [Details]

M.Sc. in **Software Engineering** *January 2019 - December 2020*
University of Dhaka, Dhaka, Bangladesh
Thesis: Significant Features Analysis For Android Malware Detection Using Machine Learning Techniques [Manuscript][Code]

B.Sc. in **Software Engineering** *November 2014 - December 2018*
University of Dhaka, Dhaka, Bangladesh

Experience

AI Research Scientist, *TSMC Technology, Inc.* *November 2024 - Present*
- Designing and developing advanced AI-driven analytics to enhance critical business intelligence applications at the Artificial Intelligence for Business Intelligence Research (AI4BIR) Center, TSMC.

Researcher (Internship), *Frontier Development Lab (FDL) 2022 by NASA and the SETI Institute* *June 2022 - August 2022*
- Created the first machine learning-ready dataset and statistical tool comprising spatiotemporally varying seismic precursors.
- Built machine learning models for forecasting and detecting earthquakes from heterogeneous multivariate time series data.
- Research outcomes: 3 AGU abstracts, 2 papers, 1 technical memo, and 1 NASA NTR.

Graduate Research Assistant, *Michigan State University (CSE)* *January 2022 - Present*
- Developing novel deep learning algorithms addressing extreme events within spatio-temporal and time series data.

Graduate Teaching Assistant, *Michigan State University (CSE)* *August 2020 - December 2021*
- Lead classes and labs of 260+ students in *CSE 102: Algorithmic Thinking and Programming (Python)*

Software Engineer & Executive Assistant (Internship), *Brain Station 23* *January 2018 - June 2018*
- Developed from scratch and maintained a web application and a mobile application, using Laravel Framework, PHP, MySQL, React-Native, Redux-Saga, Android Studio, Postman, and proper version-controlling (Git, SourceTree).

Technical Skills (* Proficient)

AI/ML Skills*: Generative AI, Representation Learning, Forecasting, Timeseries/Spatiotemporal ML, Adversarial ML, Large Language Models (LLMs), NLP, OpenAI API, Interpretable/Explainable AI, Reinforcement Learning, Cloud Computing, MLOps

AI/ML Tools: PyTorch*, Lightning*, Captum*, SK-learn*, Pandas*, NumPy*, Matplotlib*, Anaconda*, MATLAB, Keras

CS Skills: Python*, Java, C*, PHP, JavaScript, Android*, GCP*, Docker, Selenium, SQL, React Native, Laravel, Agile, SRS*

Selected Publications(* Equal contribution) (Full list)

Authored **11** papers in top-tier CS conferences (**NeurIPS (twice), KDD (twice), IJCAI (twice), ICDM**). Selected ones:

- **Galib, A. H.**, Tan, P. N. & Luo, L. (2024, Dec.). FIDE: Frequency-Inflated Conditional Diffusion Model for Extreme-Aware Time Series Generation. In Proc. of the 38th Annual Conference on Neural Information Processing Systems, **NeurIPS 2024**.
- Deng, Y., **Galib, A. H.**, Tan, P. N., & Luo, L. (2024, Aug.). Unraveling Block Maxima Forecasting Models with Counterfactual Explanation. In Proceedings of the 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, **KDD 2024**.
- **Galib, A. H.**, Tan, P. N. & Luo, L. (2023, Dec.). SimEXT: Self-supervised Representation Learning for Extreme Values in Time Series. In Proc. of the 23rd IEEE International Conference on Data Mining, **ICDM 2023** (pp. 1031-1036), IEEE.
- **Galib, A. H.**, McDonald, A., Tan, P. N. & Luo, L. (2023, Aug.). Self-Recover: Forecasting Block Maxima in Time Series from Predictors with Disparate Temporal Coverage using Self-Supervised Learning. In Proceedings of the Thirty-Second International Joint Conference on Artificial Intelligence, **IJCAI 2023** (pp. 3723-3731).
- Wilson, T., McDonald, A., **Galib, A. H.**, Luo, L., & Tan, P. N. (2022, Aug.). Beyond Point Prediction: Capturing Zero-Inflated & Heavy-Tailed Spatiotemporal Data with Deep Extreme Mixture Models. In Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, KDD 2022 (pp. 2020-2028).

- Cullen*, L., **Galib*, A. H.**, Smith*, A. W., Varshney*, D., Brown, E., Chi, P., ... & Svoboda, F. (2022, Dec.). Can We Forecast And Detect Earthquakes From Heterogeneous Multivariate Time Series Data? In I Can't Believe It's Not Better Workshop: Understanding Deep Learning Through Empirical Falsification. (**ICBINB@ NeurIPS 2022**).
- Cullen*, L., Smith*, A. W., **Galib*, A.H.**, Varshney*, D., Brown, E., Chi, P. J., ... & Svoboda, F. (2024, Jan.). A Global Analysis of Pre-Earthquake Ionospheric Anomalies. arXiv preprint arXiv:2401.01773.
- Cullen*, L., **Galib*, A.H.**, Smith*, A. W., Varshney*, D., Brown, E., Chi, P. J., ... & Svoboda, F. (2022, Dec.). Open-Source Data Pipelines and Statistical Tool for Studying Pre-Seismic and Post-Seismic Disturbances in the Ionosphere and Geomagnetic Field. In **AGU** Fall Meeting Abstracts (Vol. 2022, pp. IN25A-07).
- Cullen*, L., **Galib*, A.H.**, Smith, A. W., Varshney, D., Brown, E., Chi, P. J., ... & Svoboda, F. (2022, Dec.). Comprehensive Statistical Analysis of Ionospheric and Geomagnetic Signatures Before and After Earthquakes. In **AGU** Fall Meeting Abstracts (Vol. 2022, pp. NH13A-04).
- Varshney*, D., Cullen*, L., **Galib*, A.H.**, Smith, A. W., Brown, E., Chi, P. J., ... & Svoboda, F. (2022, Dec.). Multimodal Machine Learning for Earthquake Identification and Forecasting. In **AGU** Fall Meeting Abstracts (Vol. 2022, pp. INV44A-05).
- **Galib, A. H.**, & Bashyal, B. (2022, May.). On the Susceptibility and Robustness of Time Series Models through Adversarial Attack and Defense. arXiv preprint arXiv:2301.03703.
- Wilson, T., Tan P., Luo, L., & Galib, A. (2021, Dec.). Deep Learning With Extreme Value Theory for Modeling Precipitation Events. In **AGU** Fall Meeting Abstracts (Vol. 2021, pp. A15Q-07).
- **Galib, A. H.**, & Hossain, B. M. (2020, Jul.). Significant API Calls in Android Malware Detection (Using Feature Selection Techniques and Correlation-Based Feature Elimination). In Proceedings of the 32nd International Conference on Software Engineering Knowledge Engineering (**SEKE 2020**) (pp. 566-571).
- **Galib, A. H.**, & Hossain, B. M. (2019, Dec.). A Systematic Review on Hybrid Analysis using Machine Learning for Android Malware Detection. In 2019 2nd International Conference on Innovation in Engineering and Technology (**ICIET 2019**).
- **Galib, A. H.**, & Hossain, B. M. (2020, Jul.). A Review on Hybrid Analysis using Machine Learning for Android Malware Detection. In Dhaka University Journal of Applied Science and Engineering (DUJASE), Volume 5, Issue 1&2, pp. 49-55.
- Yasir, R. M., Asad, M., **Galib, A. H.**, Ganguly, K. K., & Siddik, M. S. (2019, May). GodExpo: an automated god structure detection tool for Golang. In Proceedings of the 3rd International Workshop on Refactoring (**IWOR 2019**) (pp. 47-50). IEEE.
- **Galib, A. H.**, Nahar, N., & Hossain, B. M. (2020). The Influences of Pre-birth Factors in Early Assessment of Child Mortality using Machine Learning Techniques. arXiv preprint arXiv:2011.09536.

Academic and Research Projects (Details and full list)

- **On the Susceptibility and Robustness of Time Series Models through Adversarial Attack and Defense:** The vulnerability and robustness of several time series models are investigated through adversarial attacks and defense. [Manuscript][Code]
- **Image-to-Image Translation using Conditional GAN:** It generates colored images from sketches using a generative model - Conditional GAN. It incorporates the architecture and guidelines proposed by a CVPR 2017 study (Isola et al.). [Manuscript][Code]
- **Predicting GitHub Issues Lifetime using Machine Learning and Topic Modeling (LDA):** It outperforms the previous approach with a high precision and f1- measure. It extracts distinguishable and comprehensible topics from issues. [Manuscript].
- **Pre-birth Factors in the Early Assessment of Child Mortality using Machine Learning Techniques:** It achieves an AUC score of 0.947 which outperforms the clinical standards. Also, it assesses the relative importance of the factors. [Manuscript].
- **LifeBlood:** A GPS-based blood donor finder android app that searches and sorts nearer blood donors. [Technical Report][Code]
- **Analyzing co-authorship network: Centrality Measure, Link Prediction, and Community Detection:** It analyzes a network of co-authorship relations, predicts missing links and detects community using the network modularity algorithm. [Code]
- **AutoPilot-Web:** A web-based digital transformation of BTS (Base transceiver station) management. Its purpose is to optimize and automate the existing network management system. [Code]
- **AutoPilot-Mobile:** A mobile application (iOS and Android) for the digital transformation of BTS (Base transceiver station) management. [Code]
- **Optimizing Search Space in Code Smells Detection using a Novel Metric:** Significantly reducing search space (i.e., 93% to 21%) using a novel metric called - NCPC, while maintaining the performance of code smells detection. [Manuscript].
- **Heart Disease Prediction and Factors Analysis:** It predicts heart disease effectively in terms of performance and analyzes significant factors using machine learning techniques. [Manuscript] [Code]

Leadership Activities

Organizer, First Software Industry-Academia Collaboration Session with 10 leading companies (2017), Boot Camp on technology for peace, Seminar on the fourth industrial revolution, Workshops on secured internet protocol and IT awareness for females.

Vice President & Treasurer, IIT Software Engineers' Community, University of Dhaka.
Editor & Author, Shoshikkha - A web-based knowledge platform in Bengali & English.