

Asadullah Hill Galib

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As an AI Research Scientist with a Ph.D. in Computer Science, I offer a strong background in Software Engineering coupled with a proven track record of multi-disciplinary 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

- Developing advanced AI-driven analytical techniques to support critical business intelligence applications at the Artificial Intelligence for Business Intelligence (AI4BI) Center

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 conferences including **NeurIPS (twice)**, **KDD (twice)**, **IJCAI (twice)**, **ICDM**. Selected ones:

- FIDE (NeurIPS 2024):** A conditional diffusion model-based approach that enhances time series generation by preserving extreme values through a novel high-frequency inflation strategy and integration of the Generalized Extreme Value distribution.
- DiffusionCF (KDD 2024):** An explainable AI framework using counterfactual explanations and conditional diffusion to generate informative, realistic, and close counterfactual instances for explaining forecasts of time series extremes.
- SimEXT (ICDM 2023):** A representation learning framework for time series extremes that enhances representation learning performance by 1.1%-8.2% and improves the downstream prediction performance by **1.7%-11.6%**. [[Manuscript](#)]
- Self-Recover (IJCAI 2023):** A novel self-supervised learning framework for data fusion and imputation in time series data, boosting forecasting performance by **2.5%-10.5%**. [[Manuscript](#)]
- DeepExtrema (IJCAI 2022):** A novel framework for forecasting time series extremes with uncertainty estimations that integrates extreme value theory with deep learning techniques, significantly enhancing forecasting performance by **6.5%-16%**. [[Manuscript](#)]
- 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 2022** Conference on Knowledge Discovery and Data Mining (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.