Muhammed Muminul Hoque

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House no. 549/I, Moushumi R/A, DC Road, West Bakalia, Chattogram, Bangladesh

Education

Bachelor of Science in Computer Science & Engineering   GPA: 3.35/4.00
University of Dhaka, Bangladesh   (3.58 in last 60 credits)
February 2019 – March 2024

Research Experience

Research Intern – Dynamic Graph Learning for Autonomous Driving   November 2025 – Present
Under the supervision of *Professor Yanfu Zhang*
Department of Computer Science, William & Mary, Williamsburg, VA

- Co-authored *DyV2X*, a dynamic graph learning framework for V2X cooperative trajectory prediction, submitted to IROS 2026 (**2nd author**).
- Designed and evaluated a GRU history encoder augmentation across 6 CTDG architectures (TGN, TGAT, Graph-Mixer, DyGFormer, DyRep, JODIE) on the V2X-Seq-TFD dataset.
- Our model achieved minADE $= 0.952$ m, minFDE $= 1.664$ m, MR $= 24.7\%$, outperforming the V2X-Graph feature fusion baseline on all three metrics.
- Reproduced HiVT and DenseTNT baselines on a V2X cooperative dataset; conducted WOMD trajectory shape analysis for fine-grained evaluation.
- Developing a custom graph explainer for GNN-based models using attention-based and subgraph explainability methods to enhance model interpretability and trustworthiness.

Publications

Submitted

Yiran Ding, **Muhammed Muminul Hoque**, Maiqi Jiang, Yongming Qin, Sidi Lu, Yanfu Zhang
"DyV2X: Dynamic Interaction Graphs for V2X Cooperative Trajectory Prediction"
Submitted to IEEE/RSJ International Conference on Intelligent Robots and Systems **(IROS 2026)**, Pittsburgh, PA, Sept 27–Oct 1, 2026.

- Proposed a dynamic interaction graph framework that captures the temporal evolution of inter-agent interactions for V2X cooperative motion forecasting.
- Demonstrated consistent outperformance over prior methods, with particularly significant gains in safety-critical turning scenarios.

Published

E. Hossain, P. R. Saha, **M. M. Hoque**, M. S. Islam, J. Al Faruk, and M. A. Hossain,   2025
"Privacy Preserving and Secure Digital Identity Verification Mechanism: AES-Encrypted Smart NID with Two-Factor Protection Against Unauthorized Access,"
in *Proc. 4th Int. Conf. on Electrical, Computer and Communication Engineering (ECCE)*, CUET, Chattogram, Bangladesh, pp. 1–6.
doi:10.1109/ECCE64574.2025.11012996

Jonayed Al Faruk, **Muhammed Muminul Hoque**, Md. Nawaz Shorif, Susmoy Paul,   BIM 2025
Md. Bodrul Islam, Joyonto Das,
"Toward Accurate Urban Temperature Forecasting in Seoul: A Hybrid Ensemble of Bias-Corrected Machine and Deep Learning Models with Explainable AI,"
Int. Conf. on Big Data, IoT and Machine Learning (BIM 2025).

- Explored XGBoost, KNN, CNN, SVR, and Feedforward Neural Networks; applied SHAP and LIME for explainability of meteorological and topographic features.

P. R. Saha, Md. S. Islam, T. K. Saha, **M. M. Hoque**, A. Haque, E. Hossain, 2025
"Quantum-Resistant Blockchain: Enhancing Blockchain Security with ROUND5,
A Lattice-based Cryptosystem,"
IEEE 7th Int. Conf. on Sustainable Technologies for Industry 5.0 (STI 2025).
doi:10.1109/STI69347.2025.11367567

- Implemented ROUND5 lattice-based cryptography to reduce post-quantum vulnerability; proposed an efficient key exchange protocol suitable for SMEs.

Under Review & In Progress

M. M. Hoque et al., *"Comparative Benchmarking of Traditional and Ensemble* [In Progress]
Machine Learning Models for Phishing Email Detection with Explainable AI."

- Benchmarks Decision Tree vs. Random Forest and XGBoost; applies SHAP and LIME for feature-level transparency.

M. M. Hoque et al., *"Adaptive Phishing Email Detection via Multiple LLMs: A* [In Progress]
Dynamic Keyword Based Approach."

- Designs a modular pipeline integrating multiple LLMs with dynamic keyword extraction for contextual threat analysis.

Project Work

Toxicity Analysis of 4chan's /pol/ Board Using OpenAI Moderation and Google 2025
Perspective APIs

- Developed an end-to-end pipeline to detect and analyze toxic speech patterns using OpenAI Moderation API and Google Perspective API for multi-dimensional toxicity scoring.
- Conducted ethical data collection, quantitative analysis, and visualization to identify trends in online discourse.
- Tools: Python, Pandas, Matplotlib. *Reviewed by Prof. Kai-Cheng Yang (Binghamton University).*

Machine Learning Based Speech Emotion Recognizer 2024

- Identifies and classifies emotions from speech, providing real-time emotional insights. Tools: JupyterLab, Python.
- Supervisor: Prof. Md. Alamgir Hossain, Professor (CSE) & Principal.

Automated Solar Positioning System using Arduino and LDR 2023

- Solar tracking system using LDR sensors and servo motors to maximize energy efficiency by aligning panels with sun movement.
- Tools: Arduino Uno, Servo Motor, LDR Module, Solar Panel. Supervisor: Khaleda Ferdousi, Asst. Professor (CSE).

Technical Skills

Programming Languages: Python, C/C++, Bash

Deep Learning Frameworks: PyTorch, PyTorch Lightning

Graph Neural Networks: TGN, TGAT, GraphMixer, DyGFormer, GCN, GAT, PyTorch Geometric (PyG), Deep Graph Library (DGL)

Trajectory Prediction: HiVT, DenseTNT, V2X-Graph, CTDG models, multi-modal forecasting, WOMD evaluation

Machine Learning Models: Logistic Regression, Naive Bayes, SVM, Decision Tree, Random Forest, Ridge Classifier, Passive-Aggressive Classifier

ML/NLP Techniques: TF-IDF, tokenization, lemmatization, stopword removal, n-gram analysis, fuzzy keyword matching, attention mechanisms

Explainability Tools: SHAP, LIME, GNNExplainer

Systems & Debugging Tools: GDB, objdump, strace, ltrace, IDA Pro, hexedit, xxd, Assembly (x86-64)

Cybersecurity Tools: Kali Linux, Metasploit, Nmap, Wireshark, Packet Analysis

Research Tools & Libraries: Scikit-learn, Pandas, NumPy, Matplotlib

Version Control & Collaboration: Git, GitHub, Overleaf, Google Colab

Training Experiences & Certifications

Cyber Security For Professionals, Byte Capsule   Feb 2023 – Aug 2023
- Six-month program covering threat analysis, risk management, network security, cryptography, and ethical hacking through hands-on exercises and expert-led lectures.

Standardized Test Scores

International English Language Testing System (IELTS)   14 December 2024
- Overall: 6.5   Listening: 8.0   Reading: 6.0   Writing: 6.0   Speaking: 6.0

Extra-curricular Activities, Awards, and Achievements

- MEC Computer Club (January 2023 – March 2024)
- 3rd Place at MEC CSE Carnival 2020 Programming Competition
- Batch Topper – 6-Month Self-learning Cybersecurity Training Program (Feb – Aug 2023)
- Champion of Invisible CTF 2023 (18 September 2023)
- Ranked in the Top 6% on TryHackMe
- Solved 95+ challenges in PicoCTF, including 50+ medium-level problems across cryptography, reverse engineering, and web security

References

Prof. Yanfu Zhang	**Md. Alamgir Hossain**	**Khaleda Ferdousi**
Department of Computer Science	Professor (CSE) & Principal	Assistant Professor (CSE)
William & Mary	Faridpur Engineering College	Mymensingh Engineering College
Williamsburg, VA, USA	University of Dhaka, Bangladesh	University of Dhaka, Bangladesh
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