Monirul I. Mahmud

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Education

M.S. in Analytics, Georgia Institute of Technology, *Atlanta, USA*

- Starting online from Spring 2026 at the world's **Top 10** CS Ranked universities.
- Major in Business Analytics track, focusing on advanced statistics (PCA, empirical bayes, hierarchical Bayesian models), predictive modeling, and Monte Carlo simulations.

M.Sc. in Computer & Information Science, Fordham University, *New York, USA* ***Aug. 2024 - Present***

- As a Full time Graduate Student, 90% of my Tuition Fee is funded by **GSAS Centennial** Scholarship.
- Courses in Data Mining, Blockchain, Cloud Computing, NoSQL Databases and Data Visualization. (CGPA: 3.83 / 4.00)

B.Sc. in Computer Science, North South University, *Dhaka, Bangladesh* ***Feb. 2020 – Dec. 2023***

- Engaged in a comprehensive curriculum covering key areas such as Applied Statistics, Artificial Intelligence, Software Engineering, Theory of Computation and Machine Learning.
- Thesis on "*Multi-Head Temporal Attention based Human Activity Recognition"*, Supervisor – Prof. Intisar Tahmid Naheen. (CGPA 3.43 / 4.00)

Current Research Interests

- **Zero-Knowledge Proof Systems:** Exploring practical optimizations of zero-knowledge protocols for enabling privacy-preserving and verifiable computation in blockchain environments.
- **Privacy-Preserving Smart Contracts**: Investigating the design of smart contract systems that ensure confidentiality and integrity, enabling private and trustless execution on decentralized platforms.
- **Federated Learning with Blockchain Integration**: Exploring the integration of federated learning and blockchain to enable decentralized, privacy-preserving model training across distributed devices.

Technical Skills

- **Data Analytics:**
  SAS, SPSS, Minitab, Microsoft Excel, Tableau, R/RStudio, Stata, Power BI, BigQuery.
- **Machine learning and Data Mining:**
  TensorFlow, Octave, Weka, Google Cloud Platform, R, H2O, Deeplearning4j, Matplotlib, Seaborn, Scikit- learn, PyTorch, RapidMiner, GAN, Transformer, Federated Learning, A/B testing, t-test.
- **Software Engineering & Programming Languages**:
  Python, C/C++/C#, Java, Assembly, Perl, Ruby, JavaScript, PHP.
  Framework: JQuery, Ajax, D3.js, Flask, FastAPI, Docker, AWS (Sagemaker), Django, Stream lit.
- **Database Administration**:
  SAP, MySQL, MS SQL, SQLite, MongoDB, Neo4j, Cassandra.
- **Big Data Ecosystems:** Hadoop, MapReduce, Apache Spark.
- **Simulation and Analysis:** MATLAB, OPNET Modeler, Sketchup, Roboflow, AutoCAD.

Research Experience

Volunteer Researcher, *Fordham University* ***Jul. 2025 - Present***

- Collaborated with **Dr. Mohamed Rahouti** on a research project - *Merkle Trees and Zero-Knowledge Proof enhanced secure credit risk modeling*.
- Contributed to the development of privacy-preserving *Smart Contracts*, focusing on cryptographic techniques with *Federated Learning* for data security and transparency.

Graduate Research Assistant, *Design Inclusion & Access Lab (DIAL)* ***Jan. 2024 - Feb 2025***

- **Team Lead** of *Medical Imaging* group - mentoring 5 members to ensure successful project execution under the supervision of **Dr. Nova Ahmed**.
- Worked on 2 projects - *'Attention and Residual Mechanism-based Deepfake Recognition*' and *'Reliable and Trustworthy Diabetic Foot Ulcer Detection'* projects.

Student Researcher, *Design Inclusion & Access Lab (DIAL)* ***Jul. 2023 – Jan. 2024***

- Collaborated on the '*Feasibility of Alternative Credit Scoring for the Credit Invincibles*' project funded by **NSU-CTRG (CTRG-23-SEPS-02)**, increasing Loan approval by 20%.
- Implementing feature selection techniques - Information gain, Gain ratio, and Fisher score to enhance model interpretability in the Credit Scoring project, aiming to optimize risk assessment for South Asian banks.

Work Experience

Machine Learning Engineer, *EMPERIO IT, New York, USA* ***Jan. 2025 – Jun. 2025***

- Working part-time remotely as a Machine Learning Engineer, contributing to project - Customer Purchase Behavior Prediction System for **Food Bazaar** super shop, enabling targeted marketing and inventory optimization.
- Developing and deploying machine learning models for predictive analytics, optimizing pipelines for production, and collaborating with cross-functional teams to meet client objectives.

Junior Data Scientist, *COSMIC IT LTD, Dhaka, Bangladesh* ***Sep. 2022 – Dec. 2023***

- Worked on a Government project for the **Bangladesh Road Transport Authority**, developing an Automated Toll Collection system using Live Vehicle License Plate Scanning.
- Designed and deployed interactive data visualization dashboards for client reporting and system monitoring, using Tableau, Google Looker Studio, and D3.js.

Trainee Engineer (Data Science), *SYSTECH DATASOFT, Dhaka, Bangladesh* ***Apr. 2022 – Jul. 2022***

- Developed and customized an **automated resume screening system** for Systech Datasoft, achieving **97.92% accuracy** in predicting candidate suitability by using advanced **PDF parsing** and data analysis.
- Designed a data-driven solution that streamlined the **hiring process** at Systech Datasoft, significantly improving the efficiency and accuracy of candidate shortlisting.

Ongoing Research Projects

1. **SecureCare: Blockchain Assisted WBAN with Federated Learning for IoT Healthcare**

   Developed a blockchain-based WBAN framework for secure, scalable IoT healthcare data flow. Integrated smart contracts and local servers with our collected health dataset from Raspberry Pi to ensure privacy, ownership, and tamper-resistant data exchange.

2. **3D Alveolar Bone Defect Segmentation via Unsupervised Domain Adaptation**

   Segmented alveolar bone defects using **unsupervised** domain adaptation on **3D DICOM** data. Automated 3D data labeling and processing pipeline for **cross-domain** medical image analysis. **[Code]**

3. **Ground based Sky Cloud Semantic Segmentation with U-Net**
   Developed a ground-based cloud segmentation model using a U-Net based **FCNN** on **110** collected images (Annotated with **Roboflow**). Handled modular training pipeline to allow easy scalability. **[Code]**
4. **Unveiling the LinkedIn Job Hunt: Skill, Industry and Salary Trends in the USA**
   Developed an interactive **Tableau** visualization analyzing LinkedIn job trends across various industries, skill demands, and salary ranges in the United States 2024. **[Visit]**
5. **Advancing Cloud Perception: Hyperbolic CLIP for Open-Vocabulary Semantic Segmentation in Ground-Based Imagery**

   Spearheaded a novel research project performing **open-vocabulary semantic segmentation** of ground-based clouds by fine-tuning **CLIP** (Contrastive Language-Image Pre-training) in hyperbolic space, using **collected 300 images** meticulously annotated with **Roboflow**.

Journal Publications

[1] M. I. Mahmud, M. S. Reza, M. O. A. Akash, F. Elias, and N. Ahmed, "DFU_DIALNet: Towards Reliable and Trustworthy Diabetic Foot Ulcer Detection with Synergistic Confluence of Grad-CAM and LIME," *PLoS ONE.* 2025 (**Q1**, **ACCEPTED**).

[2] M. S. Reza, F. Elias, **M. I. Mahmud**, and N. Ahmed, "Attention and Residual Mechanism-based CNN Architecture (ARC-Net) with Enhanced Fairness Generalization for Deepfake Facial Image Detection," *PLoS ONE.* 2025 (**Q1**, under review).

[3] M. I. Mahmud, M. S. Reza, F. Elias, K. A. Ahmed, M. Ahammad, I. A. Abeer, and N. Ahmed, "Multi-Domain Validation of Bayesian Optimized Stacking Ensembles for Next-Generation Credit Risk Modeling with Granular Explainability and Robust Statistical Inference," *SN Computer Science.* 2025 (**Q2**, under review).

[4] M. I. Mahmud, S. Patel, M. Rahouti, and A. Chehri, "Trustworthy and Secure Credit Scoring: A Merkle Tree and Zero-Knowledge Proof-Enhanced Approach with Proactive Security Strategies in Consumer Applications," *IEEE Transactions on Consumer Electronic.* 2025 (**Q1**, under review).

[5] M. I. Mahmud, M. S. Reza and I. T. Naheen, "Multi-Head Temporal Attention Enhanced Bi-LSTM for Human Activity Recognition: Introducing a Novel Benchmark Wearable Sensor Dataset," *Knowledge-Based Systems.* 2024 (**Q1**, under review). **[Code]**

Conference Publications

[1] M. I. Mahmud, "Towards Trustworthy Keylogger detection: A Comprehensive Analysis of Ensemble Techniques and Feature Selections through Explainable AI," *arXiv.org*, May 22, 2025. https://arxiv.org/abs/2505.16103

[2] M. S. Reza, **M. I. Mahmud**, I. A. Abeer and N. Ahmed, "Linear Discriminant Analysis in Credit Scoring: A Transparent Hybrid Model Approach," *2024 27th International Conference on Computer and Information Technology (**ICCIT**)*, Cox's Bazar, Bangladesh, 2024, pp. 56-61, doi: 10.1109/ICCIT64611.2024.11022149.

[3] M. I. Mahmud, M. S. Reza, and S. S. Khan, "Optimizing Stroke Detection: An Analysis of Different Feature Selection Approaches," in *Companion of the 2024 on ACM International Joint Conference on Pervasive and Ubiquitous Computing (**UbiComp '24**)*. New York, NY, USA: Association for Computing Machinery, 2024, pp. 142–146. doi: 10.1145/3675094.3677602.

[4] M. I. Mahmud, "ZeroML: A Next Generation AutoML Language," arXiv.org, May 23, 2025. https://arxiv.org/abs/2505.18243

[5] M. I. Mahmud, M. S. Reza, and H. Akter, "Human Activity Recognition Using Multiple Learning & XAI Techniques with Wearable Sensor Data," *North South University*, Dhaka, Bangladesh. 2023. https://repository.northsouth.edu/handle/123456789/1093 **[Capstone Poster]**

Benchmark Datasets

[1] Human Activity Recognition from Wearable Sensors

A comprehensive dataset of 72,000 time-series readings from 6 participants using 3D accelerometer and gyroscope data collected via Arduino Uno. Includes a mobile app prototype for data collection and prediction. ***Status:*** *To be released*

[2] Diabetic Foot Ulcer Dataset

A curated set of 500 labeled foot images (250 normal, 250 ulcers), collected under IRB approval (*NSU IRB 2024/OR-NSU/IRB/1110*) for DFU detection research. **(Dataset Access)**

[3] Bangladeshi DeepFake and Real Face Image Collection

500 facial images (real + deepfake), sourced with written consent from diverse individuals. Approved by IRB (*NSU IRB 2024/OR-NSU/IRB/1109*). **(Dataset Access)**

[4] Ground-Based Cloud Segmentation Dataset

110 annotated ground-based sky/cloud images for training U-Net-based segmentation models. Annotated using Roboflow. ***Status:*** *To be released*

Awards & Extra-Curricular Activities

- Fordham University **GSAS Centennial** Scholarship, 2024 - Present
- Served as a **Reviewer** for Peer-reviewed journal **IEEE Pervasive Computing**.
- ACM ICPC Regional Contest (Dhaka) 2022 - Placed **6th** among 90 teams.
- National Programming Competition (Bangladesh) 2020 - Placed **9th** among 117 teams.
- Banglalink Ennovators-6.0 (Bangladesh) 2023 – Placed **7th** among 86 teams.
- Primary School Talent-pool Scholarship by UNICEF and the Government of Bangladesh.
- IEEE NSU Student Branch (INSB) – worked on ***Team Content Writing and Publication.***
- NSU ACM Student Chapter – worked on ***Team Operation***.

Mentoring

- Md Zawad Mahmud, Current M.Sc. student at Fordham University.
- Farhana Elias, Data Engineer at Invisible AI, USA. B.Sc. at North South University.

Languages

- Strong **English** language skills (written, oral, comprehension)
- Strong **Bengali** language skills (written, oral, comprehension)

References

1) **Dr. Nova Ahmed**
   Professor, Department of Electrical & Computer Engineering (ECE)
   North South University, Dhaka, Bangladesh
   Email: *nova.ahmed@northsouth.edu*

2) **Dr. Ruhul Amin**
   Assistant Professor, Department of Computer and Information Science
   Fordham University, New York, USA
   Email: *mamin17@fordham.edu*

3) **Dr. Mohamed Rahouti**
   Assistant Professor, Department of Computer and Information Science
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