URMI SAHA

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EDUCATION

Wake Forest University **North Carolina, USA**
Master's in Computer Science (Thesis Track) *August, 2024 - May, 2026 (Expected)*

- **Tentative Thesis Title:** Towards Out-of-Distribution Generalization in Neural Operator Learning: Applications to System Biology.
- **Relevant Course Works:** Data Centric Artificial Intelligence *(ongoing)*, Advanced Software Engineering *(ongoing)*, AI for Health, Machine Learning, Deep Learning and Neural Networks, Safety and Explainability in Reinforcement Learning.
- **Cumulative GPA:** 4.0/4.0
- Awarded **Full Funding** with **100% Scholarship** with **Teaching** (Fall'24 – Spg'25) & **Research** (Fall'25 – Spg'26) Assistantships.

Chittagong University of Engineering and Technology **Chittagong, Bangladesh**
Bachelor of Science in Computer Science and Engineering *February, 2016 – November, 2021*

- **Cumulative GPA:** 3.71/4.0
- University Merit Scholarship, CUET, Bangladesh (2016 – 2021).

ONGOING RESEARCH PROJECTS

- Generalizing Tau Protein Progression on Brain Networks for Early Alzheimer's Detection.*(Manuscript in preparation)*
  Advisor: Dr. Minghan Chen
  - Investigated the generalization of neural-operator architectures on directed brain graphs.
  - Balanced local adjacency and global spectral coupling to ensure stable trajectory prediction under out-of-distribution perturbations.
- NeuroMAMBA: Scalable fMRI Modeling for Brain Fingerprinting and Cognitive Task Decoding.(*Manuscript in progress)*
  Advisor: Dr. Minghan Chen
  - Developed a unified state-space framework for fMRI-based cognitive decoding and behavioral prediction.
  - Achieved up to 99%+ accuracy on large-scale HCP datasets, exceeding baseline Transformer and MLP models.
- Course Research on LLM based Code Generation for *CSC790: Advanced Software Engineering*
  Mentor: Dr. Ying Zhang
  - Conducted an empirical study and developed two developer-centric metrics capturing correctness, readability, and repair stability in LLM-generated pull requests.

PUBLICATIONS

- **U. Saha**, S. M. M. Hossain, and I. H. Sarker, "Predicting depression level based on human activities and feelings: A fuzzy logic-based analysis," Data Science and Management, Elsevier, 2024. **[Online]**
- D. Gupta, S. R. Hassan, R. Gupta, **U. Saha** and M. S. Ali, "Classification of Tumor Cell Using a Naive Convolutional Neural Network Model," in Proc. 1st Int. Conf. Machine Intelligence and Emerging Technologies (MIET 2022), Noakhali, Bangladesh, Sept. 23-25 2022, Lecture Notes in Institute for Computer Sciences, Social Informatics and Telecommunications Engineering; pp. 167-176, Springer, Cham, 2023. **[Online]**

PROFESSIONAL EXPERIENCE

Graduate Research Assistant **August, 2025 – Present**
Advisor: Dr. Minghan Chen, Wake Forest University

- Collaborated with *UCSF's Raj Lab.* on tau-protein propagation modeling leveraging operator-learning frameworks for PDE-based brain dynamics to high-dimensional connectomes. *(Lead project)*
- Contributed architectural components and co-authored manuscripts on multitask fMRI modeling.

Summer Internship: *Research Assistant* **June, 2025 – July, 2025**
Lab: Chen's Modeling and Learning Lab

- Processed .mat data for a generalized AI pipeline's input and engineered positional encoding to capture trajectories predictions over regions × time steps.
- Achieved $< 4 \times 10^{-4}$ MSE on trajectory prediction to support early disease modeling ensuring stability and physical consistency in trajectory predictions.

Graduate Teaching Assistant **August, 2024 - May, 2025**
Instructor: Prof. Sarah Parsons, Wake Forest University

- Assisted for *CSC 111 (Introduction to Computer Science)* Fall'24 & *CSC 102 (Problem Solving with Python)* Spring'25.
- Mentored students in debugging, algorithmic thinking, and efficiency during office hours & TA Center sessions (approx 25 students per semester).

Lecturer **November, 2021 – July, 2024**

Bangladesh Army University of Science and Technology *Saidpur, Bangladesh*

- Maintained OBE curriculum, developed course materials, and prepared questions addressing Complex Engg. Problems.
- Taught Computer System, Structured Programming Language, OOP, Numerical Method, Applied Statistics for Computer Science, Mathematical Analysis for CS, Artificial Intelligence, Database with associated lab classes.
- Served as an academic advisor and guided students in research and career planning.

TECHNICAL SKILLS

Programming Python (advanced), Java (intermediate), C, and C++
DL/ML PyTorch (advanced), TensorFlow, scikit-learn, Neural Operators, Transformers, Mamba, Autoencoder, LLMs, Foundation models, Computer Vision
Data Science NumPy, pandas, SciPy, Cleanlab, Matplotlib
Databases: MySQL, Oracle
Web: HTML, CSS, JavaScript
Tools: High Performance Computing, Visual Studio Code, Colab, Git, Anaconda, PyCharm, IntelliJ

COURSEWORK PROJECTS

Human Activity Classification with Transformers and Mamba Models **Spring 2025**

- Designed sliding–window segmentation pipelines and a baseline RLinear classifier for the UCI HAR70+ dataset.
- Integrated advanced time–series encoders (PatchTST, iTransformer, Mamba) for multichannel activity recognition.
- Achieved 99%+ macro–F1 with Mamba through hyperparameter optimization and task reformulation for sequence classification.

Counterfactual Policy Similarity Metric (PSM) for RL Explainability **Spring 2025**

- Applied entropy-based measures to identify critical vs. non-critical states in the Taxi domain.
- Derived optimal and alterfactual policies to enhance interpretability of agent behavior.
- Surveyed 15 papers, reimplemented the PSM algorithm from scratch, and visualized state-level divergences using heatmaps; analyzed limitations in sparse-state environments.

Algorithm Development Project **Spring 2025**

- Extended the M-Adaptive Huffman Algorithm to support compression-size tracking and bitstream encoding for images.
- Implemented Python and C++ versions achieving major memory reductions (3.1 MB → 125 KB).
- Developed modular components and executed large-scale tests with improved runtime efficiency.

EZParking: Smart Parking Management App (Team) **Fall 2024**

- Built a mobile parking-management system using React Native and Expo for cross-platform deployment.
- Integrated Google Maps API to support real-time parking spot detection, routing, and navigation.
- Collaborated in an agile environment with iterative development and sprint-based deliverables.
- Used Persona, Mural, Jira, and Balsamiq for UI/UX workflows, prototyping, and project coordination.

SERVICE & LEADERSHIP

Graduate Student Association **Wake Forest University**

Graduate Diversity and Inclusion Chair *April 2025 - Present*

- Transformed cultural differences into learning sessions by "A Language Cafe" to share their alphabets and letters on Tailgate Football Tournaments.

Women in Computer Science **Wake Forest University**

Active Member *Fall 2024 – Present*

- Introduced "Educative Platform" among undergrad and grad students to ease Leetcode Problem Solving.

ACM Student Chapter **Wake Forest University**

Member *Fall 2025 – Present*

- Reproducibility of ACM papers under the guidance of **Dr. Natalia Khuri** (CSC 790: Data-Centric AI), through data-centric strategies and scientific experimentation.

WFUke: WFU Ukulele **Wake Forest University**

Active Member *Fall 2024 – Present*

- Learned basic ukulele chords by myself by performing through sessions led by Dr. Todd Torgersen (Retired CS Faculty) and Dr. Sam Cho (CS & Physics Faculty) and observing them playing.