

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

- Y. Xia, F. Arab, **U. Saha**, B. Sipes, M. Chen, and A. Raj, "MAMBAxBrain: A Unified Neural Framework Linking Brain Functional Dynamics to Individual Fingerprints, Cognitive States, and Clinical Signatures." [**Submitted to**]
- **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 \times 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.