TALHA MAHMOOD

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EDUCATION

Bachelor of Computer Science, University of Delaware — Expected Spring 2025
GPA **3.98**
Minor **Mathematics**

RESEARCH INTEREST

I am interested in computer vision, multi-modal AI, and machine learning, with a focus on multi-class image segmentation, Vision Transformers, and spatial-temporal modeling for climate and agricultural applications. My work involves utilizing multi-spectral datasets for environmental analysis. I am also keen on exploring the integration of large language models (LLMs) in multi-modal AI and applying AI to robotics and autonomous systems, with an emphasis on enhancing perception and decision-making in dynamic environments.

EXPERIENCE

Research Assistant at Cybersecurity and AI for Sciences Lab — May 2024 - Present
University of Delaware — *Newark, DE*

- Conducted research on image segmentation using multi-spectral image data of coastal marine ecosystems, fine-tuning Vision Transformers and other state-of-the-art deep learning models.
- Performed data preprocessing to resolve labeling inconsistencies and implemented advanced techniques to address class imbalance and challenges with a small dataset.
- Improved the accuracy of U-Net from 30% to 93% by implementing advanced techniques to optimize model performance.

Undergraduate Teaching Assistant — Fall 2023, Spring 2024, Present
University of Delaware — *Newark, DE*

- Served as Teaching Assistant for Data Structures course, conducted office hours & laboratory sessions to provide one-on-one support and clarify complex algorithmic concepts for students
- Evaluated students' algorithmic implementations by reviewing and analyzing their code, providing detailed feedback to improve their programming skills and understanding of data structures

Undergraduate Teaching Assistant — Present
University of Delaware — *Newark, DE*

- Led instructional support as Teaching Assistant for General Computer Science for Engineers, Introduction to Computer Science I and their honors sections, facilitating student learning in Python programming, algorithmic thinking, and software design principles
- Provided comprehensive academic support through regular office hours, debugging assistance, and one-on-one mentoring, helping students master core programming concepts and develop problem-solving skills
- Supported diverse learning needs across both standard and honors sections, adapting teaching methods to accommodate different skill levels while fostering an inclusive learning environment

Summer Scholar — Summer 2024
University of Delaware — *Newark, DE*

- Conducted experimental analysis of MMST-ViT model performance for soybean yield prediction using Tiny-CropNet, evaluating various activation functions and achieving optimal results with ReLU (highest R^2 of 0.99, correlation of 1.0)

- Optimized model parameters through systematic testing of different optimizers, identifying AdamW as the best performing optimizer with lowest RMSE of 5.72
- Analyzed performance metrics across different model configurations to enhance crop yield predictions, contributing to improved agricultural planning and decision-making capabilities

Undergraduate Teaching Assistant Summer 2024
University of Delaware *Newark, DE*

- Teaching Assistant for Intro to Mobile Robot Programming course, supported students in their learning of Robot Operating System (ROS) fundamentals, including robot control, perception algorithms, and path planning for autonomous systems.
- Supported hands-on lab sessions with state-of-the-art platforms like UD CAR Lab ICAT and D-STAR BlueICE, enhancing students' practical skills in mobile robotics and autonomous driving

Undergraduate Teaching Assistant Fall 2022, Spring 2023
University of Delaware *Newark, DE*

- Guided students in developing abstract computational models across diverse topics, including primitive data types, fixed-size data structures, and variable-length lists through hands-on BlockPy programming sessions
- Facilitated weekly practicum sessions and worksheets focused on essential programming concepts including function composition, recursion, and algorithmic patterns while maintaining 95% student engagement, for General Computer Science for Engineers

PRESENTATIONS

Presented research on Towards Interpretable Machine Learning for U.S. Hospitals' CMS Rankings at the *Data Science Institute's (DSI) Symposium* (September 2023)

Presented research poster Multi-Modal Spatial-Temporal Vision Transformer for Crop Yield Prediction at *Symposium For Undergraduate Research And Creative Activity*, showcasing optimization techniques and model performance analysis (August 2024)

HONORS & AWARDS

Received *Most Impactful Project Award* at DSI Symposium Hackathon for innovative application of machine learning to healthcare quality assessment

SKILLS

Languages Python, C++, C, Java
Frameworks PyTorch, OpenCV, NumPy, Git