MUTTAKI I BISMOY

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Detroit, MI, USA

SUMMARY

- **Machine Learning & Computer Vision engineer** with **4+ years** of applied research building deployable AI systems across UAV forestry, embedded devices, and WiFi sensing
- PhD researcher on **gesture detection with WiFi beamforming feedback matrices** (MATLAB + Python + AP/Router pipelines; cybersecurity context)
- Led state-of-the-art forestry models: **Oak Wilt (SwinV2-Tiny 98.68% acc.)** and **HWA (97.37% acc.)**; built a **Raspberry Pi 5** device for real-time field inference
- Experienced with **transformers & ViTs** (Swin-Tiny, SwinV2, BEiT/BEiT-v2, ConvNeXt, ViT-B/16) and classic CNNs (EfficientNet, DenseNet, ResNet)
- Tooling includes **MATLAB**, **PyTorch/Torchvision/Torchaudio**, **timm**
- Passionate about **applied research** bridging academia and industry through scalable AI solutions

EDUCATION

University of Michigan – Rackham Graduate School, Dearborn — Aug 2025 – Present
PhD in Computer and Information Science
Research: WiFi sensing, beamforming feedback–based gesture detection

Grand Valley State University — Aug 2023 – 2025
Masters in Applied Computer Science — CGPA: 3.87/4.00
Major in Software Engineering

BRAC University — Jan 2018 – Jun 2022
BSc. in Computer Science and Engineering — CGPA: 3.82/4.00

Notre Dame College — 2017
High School Certificate (HSC) — GPA: 5.00/5.00

Ideal School and College — 2015
Secondary School Certificate (SSC) — GPA: 5.00/5.00

SKILLS

- **Transformer/Vision Models**: Swin-Tiny, SwinV2, BEiT, BEiT v2, ConvNeXt, ViT-B/16; CNNs: EfficientNet B0/B1, DenseNet201, ResNet50, MobileNet, VGG16, BERT, GPT, Wav2Vec2, Prompt Engineering
- **Wireless Sensing & Cybersecurity**: WiFi sensing, BFI/CSI extraction, beamforming feedback matrices, AP/Router configuration, Radiotap/Dot11 parsing, time-windowing
- **Programming**: Python, MATLAB, Java, JavaScript, SQL, R, Dart
- **ML/AI Frameworks**: PyTorch, Torchvision, Torchaudio, timm, OpenCV, Pillow, Scikit-learn, Scapy, NumPy, Pandas, Matplotlib, argparse, SciPy (loadmat)
- **Software & Web Development**: FastAPI, Flask, VueJS, Streamlit, HTML/CSS, PyQt5 (MVC)
- **Data Analysis & Visualization**: Pandas, NumPy, Matplotlib, Seaborn, Tableau, PostgreSQL, MongoDB, ETL Pipelines, Docker, REST, GCP/Firebase
- **Software Testing**: Selenium, PyUnit, Mutation Testing, Boundary Value Testing, Performance Benchmarking
- **Remote Sensing & Geospatial Analysis**: Sentinel-1/2 processing, Google Earth Engine (GEE), NDVI/LAI/LCR modeling, Random Forest regression, stand health index mapping, UAV multispectral imagery
- **Embedded Systems**: Microcontrollers, Sensor Fusion, Real-Time inference, Raspberry Pi 5 deployments

WORK EXPERIENCE

Graduate Research Assistant Aug 2025 – Present Cybersecurity Research Lab, University of Michigan – Dearborn
- Researching **gesture detection via WiFi beamforming feedback matrices**; building MATLAB/Python hybrid parsers (Radiotap/Dot11) and shell-driven ETL for large pcapng corpora
- Implementing robust time-sync, batching, and feature extraction for AP/Router streams; designing reproducible experiments for **cybersecurity** and HCI tasks

Software Developer April 2025 – Aug 2025 Edge Forestry (Blue Nucleus), Grand Rapids, MI
- Built **UAV-based Oak Wilt detection** deployed by Michigan DNR; geotagging and image-processing companion tools (Vue.js, Flask, Streamlit)
- Modeled forest canopy structure and developed a novel Stand Health Index using Sentinel-1/2 satellite imagery integrated with Random Forest regression
- Applied remote sensing and machine learning to generate landscape-scale forest health index maps for monitoring resilience and disease impacts
- Integrated **SwinV2-Tiny** achieving **98.68%** accuracy for Oak Wilt and **97.37%** for HWA; created a **Raspberry Pi 5** field device for edge inference

Graduate Research Assistant Aug 2023 – April 2025 Grand Valley State University, Applied Computing Institute
- Developed real-time AI models for sign language translation achieving **99.85% accuracy** using DenseNet201 & EfficientNetB1
- Designed UAV-based Oak Wilt detection system with **98.37% accuracy** deployed on Google Cloud Platform
- Optimized image processing pipelines, reducing computational overhead by **30%** using CNN-based feature extraction
- Automated AI model testing and validation using PyUnit & Selenium, ensuring **98% code coverage**
- Applied **LLMs (BERT, DistilRoBERTa)** for sentiment analysis, enhancing classification speed by 30%

Machine Learning & Data Analyst Aug 2022 – Aug 2023 GroupM Bangladesh
- Built AI-powered market analysis tools, reducing campaign planning time by **20%**
- Conducted market trend analysis supporting **4+ annual campaigns**
- Developed automated Python scripts for trend forecasting, leading to a **41% increase in ROI**
- Conducted data integration and visualization using Pandas, NumPy, and Matplotlib

Projects

- **WiFi-Sensing Gesture Detection (BFI)**: MATLAB/Python toolchain to parse PcapNg (Scapy), extract Radiotap/802.11 fields, batch windowing ($0.1\,s \approx 10$ packets), and feature generation for gesture classification
- **Forest Canopy Structure Modeling & Stand Health Index Development**: Applied Random Forest and SVM on Sentinel-1/2 satellite imagery and field data to estimate LAI/LCR ($\mathbf{R^2}$ **up to 0.82**) and generate novel stand health index maps for large-scale forest health monitoring
- **End-to-End ML Pipeline for Bangladeshi and American Sign Language Translation**: Developed real-time sign language recognition system using CNNs, achieving **99.85% accuracy**
- **CNN-based Real-Time Oak Wilt Detection Using UAVs**: Trained deep learning models to detect tree diseases with **98.37% accuracy** using high-resolution UAV imagery
- **Raspberry Pi 5 Disease Detector**: Edge device for **Oak Wilt (98.68%)** and **HWA (97.37%)** using SwinV2-Tiny; camera capture, pre/post-processing, and on-device inference
- **Advanced Multimodal Emotion Recognition System**: Built an emotion classification system using Wav2Vec2 + DistilRoBERTa + DeepFace; unified dashboard and exportable plots
- **Monthly Expense Tracker Software**: Designed and implemented a desktop application using PyQt5 and the Model-View-Controller (MVC) architectural pattern for managing personal and household finances
- **Embedded Control Systems**: Designed PID-controlled plant watering system with Arduino and Developed sensor fusion algorithms combining LiDAR

Selected Presentations & Workshops

- **Graduate Research Showcase 2025**, GVSU — Poster: *Early Detection of Oak Wilt using ML & UAVs*.
- **Innovation Day 2025**, GVSU — Demo: *Emotion Interpreter: Real-Time Multimodal Feedback System for Sermon Analysis*.
- **Reach Higher Showcase 2024**, GVSU — Exhibit: *Early Detection of Oak Wilt via UAV and Computer Vision*.
- **North Central Forest Pest Workshop 2025** — Participating researcher, Oak Wilt UAV-based detection.

Publications

- **Bismoy, M. I.**, Shahrear, F., Mitra, A., Bikash, D. M., Afrin, F., Roy, S., & Arif, H. (2022). Image translation of Bangla and English sign language to written language using convolutional neural network. In *2022 International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME)* (pp. 1–6). IEEE doi:10.1109/ICECCME55909.2022.9988088
- **Bismoy, M. I.**, Rafiq, R. I., Burns, L., Frei, H., & Alphenaar, G. (2025). Early Detection of Oak Wilt Using Machine Learning and Unmanned Aerial Vehicles (UAVs). In L. Huang & D. Greenhalgh (Eds.), *Proceedings of the 17th International Conference on Machine Learning and Computing (ICMLC 2025)* (pp. 221–236). Springer Nature Switzerland. doi:10.1007/978-3-031-94898-5_17
- **Bismoy, M. I.**, Rafiq, R. I. (2026). Advancing UAV-based Forest Disease Surveillance: Comparative Analysis of CNN, Hybrid and Vision Transformer Models for Early Detection of Oak Wilt. In *Proceedings of the 41st ACM/SIGAPP Symposium on Applied Computing (SAC '26)*, March 23–27, 2026, Thessaloniki, Greece. ACM. *In Review*
- **Bismoy, M. I., Rafiq, R. I., Burns, L., Frei, H., & Alphenaar, G.** (2025). Data Collection and Detection of Oak Wilt using Reinforcement Learning with Human Feedback and UAVs. *In Proceeding to publish at, "Recent Advances in Robotic Perception for Forestry" Book*

Thesis & Preprint

- **Bismoy, M. I.** (2025). *Early Detection of Oak Wilt using Unmanned Aerial Vehicles (UAV) & Computer Vision*. Master's Thesis, Grand Valley State University. scholarworks.gvsu.edu/theses/1161
- **Bismoy, M. I.** (2025, September). *Oak Wilt UAV Aerial Imagery Dataset for Machine Learning Classification (Oak Wilt vs. Not Oak Wilt)*. Zenodo. doi:10.5281/zenodo.17109752

Certifications

- **CITI Program (Issued Apr 2025 – Expires Apr 2034)**:
  - HSR – Social-Behavioral-Educational Researchers — Credential ID 67126668
  - IRB Members – Basic/Refresher — Credential ID 67126669
  - RCR – Applied Computer Sciences Graduate Students — Credential ID 67126667
  - Wildlife Research — Credential ID 67126666
  - GCP – Social & Behavioral Research Best Practices (Basic) — Credential ID 67126670
- **Machine Learning** – TestDome (Jan 2025), ranked **top 10%**
- **Thesis & Dissertation Workshop** – Grand Valley State University (Winter 2025)
- **IELTS Academic** – Overall Band 7.0 (CEFR C1), Jul 2022

Awards and Honors

- **67th Forest Pest Management Forum** – UAV Disease Detection Showcase (2024)
- **Reach Higher Showcase '24** – Oak Wilt ML & UAVs (2024)
- **Best Student Performance Award** – Cambrian School and College (2015)
- **Multiple recognitions** in photography, STEM outreach, and robotics (2011–2019)

References

- **Dr Rahat Rafiq**
  Assistant Professor, College of Computing, Grand Valley State University
  Relation: Thesis Supervisor and Graduate Mentor — rafiq@gvsu.edu
- **Dr Lawrence Burns**
  Professor, Clinical Psychology, Grand Valley State University
  Relation: Thesis Co-Supervisor and Research Project Mentor — burnsl@gvsu.edu