Farhat Binte Azam

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Research Areas: Computer Vision; Trustworthy/Explainable AI (XAI); Edge-to-Cloud AI Systems; Public Health AI; Citizen Science
Research Mission: Build deployable, trustworthy AI systems that transform real-world sensing data into actionable intelligence for public-health decision-making.
Evidence: 10+ publications (e.g., *Scientific Reports (Nature)*, *Artificial Intelligence in Medicine*, *Insects*); 1 U.S. patent application; collaborations and deployments with public-health partners.

Education

Ph.D. in Computer Science and Engineering (CSE) Jan'21 – Dec'25
University of South Florida (USF)

M.S. in Computer Science Jan'21 – Dec'23
University of South Florida (USF)

B.Sc. in Electrical and Electronics Engineering (EEE) Feb'15 – Mar'21
Bangladesh University of Engineering and Technology (BUET)

Honors & Awards

- USF I-Corps Fellowship Program (Fall 2024) — Selected Fellow.
- Best Paper Award, *Insects* (2022) — "Integrating global citizen science platforms to enable next-generation surveillance of invasive and vector mosquitoes."

Academic Appointments

Postdoctoral Scholar (AI Research & Engineering Lead) Jan'26 – Present
Bellini College of Artificial Intelligence, Cybersecurity and Computing, University of South Florida (USF)
Supervisor: Dr. Sriram Chellappan

- Lead end-to-end development of a next-generation AI-driven mosquito surveillance platform spanning embedded sensing, cloud-native data engineering, and production-grade model deployment to enable scalable, real-time vector monitoring.
- Architect and operationalize a Google Cloud–based data pipeline (trap → storage → SQL database → analytics), and drive model development for dense-object mosquito localization to improve detection robustness under cluttered field conditions.
- Mentor and coordinate undergraduate, M.S., and Ph.D. researchers; translate research prototypes into usable tooling (annotation workflows and dashboards) that accelerate dataset growth and reproducible model iteration.

Graduate Research Assistant Jan'21 – Dec'25
Social Computing and Research (SCoRe) Lab, Computer Science, USF
Supervisor: Dr. Sriram Chellappan

- Designed and developed an AI-powered system (MosquitoAI) using computer vision for mosquito anatomy classification and segmentation.

- Led multidisciplinary deployment of AI models on embedded hardware (Mosquito-Trap) to advance real-time surveillance capabilities.
- Collaborated to deploy models into accessible AI dashboards to support citizen scientists in mosquito monitoring.

Research Assistant Feb'20 – Dec'20

mHealth Laboratory, Biomedical Engineering, BUET
Supervisor: Dr. Taufiq Hasan

- Led creation of a comprehensive phonocardiogram (PCG) dataset by coordinating data collection with clinicians in hospital environments.
- Developed a deep learning framework with a novel feature-fusion approach to address noise and channel distortion in heart-sound signals captured via digital stethoscopes.
- Co-authored a research publication detailing the dataset and model, contributing key signal preprocessing and noise-handling methods.

Industry Experience

Data Extraction Team Member May'19 – Dec'19

Bengali.AI, Dhaka, Bangladesh

- Co-developed the Bengali.AI Handwritten Grapheme Recognition Dataset by coordinating large-scale handwritten data acquisition across institutions and enforcing consistent collection protocols to improve dataset reliability.
- Built and validated metadata extraction and QC workflows (error detection, normalization, deduplication), delivering analysis-ready annotations and supporting the Bengali.AI Computer Vision Challenge 2019 (Kaggle-featured).

Research Funding & Proposal Activity

- Key personnel / lead technical contributor on externally funded research programs supporting MosquitoAI and smart surveillance platforms, including awards from the U.S. National Science Foundation (NSF), U.S. National Aeronautics and Space Administration (NASA), the European Commission (EC), and the Dutch National Research Agenda (NWA).

Professional Service

- Journal peer reviewer: *Bulletin of Entomological Research* (Cambridge University Press) — Manuscript BER-D-23-00159 (2024).
- Ad hoc reviewer: *Parasites & Vectors* — "Self-Supervised Learning for Mosquito Species Classification with Limited Labeled Data: Superior Performance Using Body and Wing Images" (in review).
- Ad hoc reviewer: *Human-Centric Intelligent Systems* — "Breaking the Single-Mosquito Barrier: SyntheticSwarm Data for Acoustic Vector Monitoring" (in review).
- Conference volunteer: 2nd IEEE International Conference on Telecommunication and Photonics (ICTP).
- Member: IEEE (since 2016).

Talks & Presentations

- Poster presentation: MosquitoAI / AI-enabled mosquito surveillance research, American Mosquito Control Association (AMCA) Annual Meeting.

Advising & Mentoring

- Provide technical mentorship and research direction to undergraduate, M.S., and Ph.D. students in the SCoRe Lab, including project planning, code reviews, experimental design, and paper/presentation preparation.
- Lead cross-functional coordination between engineering students and domain experts (certified entomologists and mosquito control partners) to ensure scientifically valid data labeling and evaluation.

Research Program / Selected Projects

MosquitoAI: AI-Driven System for Mosquito Monitoring

- Built a comprehensive mosquito (adult and larvae) database through collaboration with Mosquito Alert, iNaturalist, and GLOBE Observer's Mosquito Habitat Mapper.
- Developed end-to-end deep learning pipelines (data preprocessing, training, benchmarking) to categorize diverse facets of mosquito anatomy.
- Implemented explainable AI (XAI) methods for feature attribution and interpretability analysis.

Edge-to-Cloud Smart Mosquito Trap for Automated Vector Monitoring

- Designed an end-to-end edge-to-cloud pipeline that syncs multi-focus captures from embedded devices (Raspberry Pi) into cloud storage and structured databases for downstream labeling and modeling.
- Trained and evaluated detection/localization models for dense sticky-pad imagery to improve robustness under challenging clutter and occlusion.
- Integrated human-in-the-loop annotation workflows to accelerate iterative dataset creation and model refinement with certified entomologists.

Ceps-NET: AI-Based Cardiac Auscultation Systems in Noisy Environments

- Analyzed additive noise and convolutional distortion impacts on short-term mel-filterbank energy features and CNN layers.
- Proposed a combined linear and logarithmic feature representation with ResNet-style modeling to reduce background-noise and sensor-variability effects for PCG classification.

Vein-NET: Robust Human Authentication using Dynamic ROI Extraction from Dorsal/Palm Hand Vein Images

- Developed a CNN-based ROI extractor to crop vein regions from full hand images and applied computer vision algorithms to derive discriminative features.
- Trained on challenging datasets and applied domain adaptation via Domain-Adversarial Neural Networks (DANN) for domain-invariant recognition.

Publications

Journal Articles

- **Farhat Binte Azam** et al. "Artificial intelligence and community science as a solution for enhanced global surveillance of invasive malaria mosquito *Anopheles stephensi*: Madagascar case study." *Insects* 16(11): 1098, 2025.
- **Farhat Binte Azam** et al. "GLOBE Observer: A Case Study in Advancing Earth System Knowledge

with AI-Powered Citizen Science." *Citizen Science: Theory and Practice*, 2024.

- **Farhat Binte Azam**. "Classifying stages in the gonotrophic cycle of mosquitoes from images using computer vision techniques." *Scientific Reports* (Nature Portfolio), 2023.
- **Farhat Binte Azam** et al. "Evaluation of bactericidal effects of silver hydrosol nanotherapeutics against *Enterococcus faecium* 1449 drug resistant biofilms." *Frontiers in Cellular and Infection Microbiology* 12, 2023.
- **Farhat Binte Azam** et al. "Integrating global citizen science platforms to enable next-generation surveillance of invasive and vector mosquitoes." *Insects* 13(8): 675, 2022 (Best Paper Award).
- **Farhat Binte Azam**. "Cardiac anomaly detection considering an additive noise and convolutional distortion model of heart sound recordings." *Artificial Intelligence in Medicine* 133, 2022.

Conference Proceedings

- **Farhat Binte Azam**. "Deep Learning-Based Classification of *Anopheles stephensi* Adult Mosquitoes with Enhanced Solutions for Data Imbalance." *IEEE Engineering in Medicine and Biology Society (EMBC)*, 2025.

Preprints / Under Review

- **Farhat Binte Azam** et al. "SMART Trap: Digitizing Mosquito Surveillance Leveraging Artificial Intelligence." *IEEE Journal of Biomedical and Health Informatics*, 2025 (submitted)
- **Farhat Binte Azam** et al. "BUET Multi-disease Heart Sound Dataset: A Comprehensive Auscultation Dataset for Developing Computer-Aided Diagnostic Systems." arXiv:2409.00724, 2024 (accepted).

Thesis

- **Farhat Binte Azam**. *Mosquito Classification and Explainability from Image Data via Deep Learning Techniques*. Ph.D. Thesis, 2025.

Abstracts / Posters

- **Farhat Binte Azam** et al. "Citizen Science-Enabled Tools for the Global Surveillance and Control of Mosquitoes." *AGU Fall Meeting Abstracts*, 2022.

US Patents

- **Farhat Binte Azam**. "Methods and techniques to classify stages in the gonotrophic cycle of mosquitoes from images using computer vision techniques." U.S. Patent Application No. 18/776,899.

Professional Development

- Generative AI with Large Language Models (DeepLearning.AI & Amazon Web Services).
- Deep Learning Specialization (DeepLearning.AI; Instructor: Andrew Ng).
- Machine Learning (Stanford University).

Research & Technical Skills

Programming & Cloud: Python, C, C++, SQL, Git, MATLAB, Amazon Web Services (AWS), Google Cloud Platform (GCP)
ML/CV Stack: PyTorch, TensorFlow, Keras, OpenCV, NumPy, Pandas, Scikit-learn, Matplotlib
Systems & Hardware: CUDA, Linux, Arduino, Raspberry Pi