Sushmita Paul

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LinkedIn | GitHub

RESEARCH INTERESTS

Primary: Vision Systems, Efficient AI Systems, Human Computer Interaction
Secondary: Trustworthy AI, Computer Vision for Health Analytics, Real-time ML Applications

EDUCATION

Bachelor of Science in Computer Science and Engineering March 2025
Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

- *CGPA*: 3.80/4.00 (Top 50% of cohort, Dean's List Award)
- *Relevant Coursework*: Artificial Intelligence, Machine Learning, Software Engineering, Data Structures & Algorithms, Database Management Systems, Operating Systems, Computer Security, Computer Networks

Higher Secondary Certificate 2019
Chittagong College, Chittagong, Bangladesh

- *GPA*: 5.00/5.00 (Ranked among top students, Chittagong Education Board)

RESEARCH EXPERIENCE

Undergraduate Thesis Research 2023 – 2025
Automatic Dengue Breeding Site Identification Using Drone Imagery
Bangladesh University of Engineering and Technology

- Developed automated computer vision system for identifying dengue breeding sites (flower pots, tanks, tires) from UAV-captured aerial orthophotos. Evaluated state-of-the-art detection and segmentation models (YOLOv8, YOLOv11, SAM, SegGPT) on custom-annotated dataset, selecting YOLO variants for optimal performance-efficiency balance.
- Designed geospatial data analysis pipeline for precise breeding site localization using GPS coordinates. Engineered Sliding Window Protocol and Non-Maximum Merging techniques, reducing false positives by 23% and improving computational efficiency.
- Achieved 83.6% balanced accuracy, demonstrating practical viability for real-world public health deployment.

Course Project: Lung Nodule Segmentation for Cancer Detection 2025
Machine Learning Course, BUET

- Fine-tuned SAM2 and SwinUNETR for lung nodule segmentation and a pre-trained Faster R-CNN (ResNet50-FPN) for nodule detection on the LIDC-IDRI dataset. Utilized point-prompt and sliding-window pipelines with hybrid loss functions, and implemented mixed-precision training, learning-rate scheduling, gradient accumulation, and checkpointing based on IoU and Dice metrics.
- Achieved Dice score of 0.93, Precision of 0.96, and Recall of 0.89; processed multi-annotator masks, performed medical image preprocessing, and handled clinical dataset-specific challenges.

Ongoing Research Project 2025 – Present

Streaming Machine Learning for Real-time Applications

Collaboration with Professor, Bangladesh University of Engineering and Technology

- Investigating streaming machine learning techniques for real-time model training and inference on continuously flowing data streams
- Exploring trade-offs between model performance, latency, and computational efficiency in stream processing environments
- Focus on enabling real-time applications in IoT systems, fraud detection, and dynamic recommendation systems through stream processing technologies

PUBLICATIONS

Under Revision

- **Paul, S.**, et al. "Detection of Dengue Breeding Sites in Large-scale Landscapes from Aerial Imagery and Remote Sensing with Deep Learning," *BMC Public Health* (Springer Nature), 2024.
  Co-first author

Conference Presentations

- **Paul, S.**, et al. "Deep Learning Based Detection of Dengue Breeding Sites from UAV Derived Aerial Orthophotos," Digital poster presentation at BEAR Summit 2025, Bangladesh.
  Co-first author

PROFESSIONAL EXPERIENCE

Associate Machine Learning Engineer **2025 April– Present**

Therap BD Ltd

- Optimized and deployed deep learning models on NVIDIA Jetson edge devices using TensorRT, including quantization for efficient inference.
- Built end-to-end ML pipelines covering training, evaluation, and deployment while ensuring high model performance.
- Applied computer vision techniques for video analytics, object detection, and OCR using modern deep learning architectures.

TECHNICAL SKILLS

Programming & Systems

- **Languages:** Python (advanced), C/C++, Bash, Assembly
- **Tools:** Git, Docker, Linux, Jupyter
- **Compute:** SkyPilot, Azure, GPU Clusters, NVIDIA Jetson

Machine Learning & Systems Research

- **Frameworks:** PyTorch, TensorFlow, scikit-learn
- **Model Efficiency:** TensorRT, FP16/INT8 quantization, pruning
- **Large Models:** LLM fine-tuning & benchmarking (Gemma 3, Qwen 3, GPT-OSS)
- **Computer Vision:** YOLO, Faster R-CNN, SAM, SegFormer, SkateFormer, OCR (DeepSeek-OCR)
- **Video Analytics:** Video reduction, real-time recognition

Data Science

- **Methods:** Transfer learning, ensemble methods, PCA, EM algorithms
- **Analysis:** Statistical modeling, hypothesis testing, experiment evaluation

SELECTED PROJECTS

EduByte: AI-Enhanced E-Learning Platform

- Developed full-stack e-learning platform with personalized course recommendations using collaborative filtering and content-based algorithms. Integrated GPT-based conversational chatbot for student support and AI-powered examination system with automated question generation and evaluation.
- Implemented role-based access control for users, administrators, and content creators. Built with React, Node.js, Express, PostgreSQL, and Bootstrap using RESTful API architecture.

Football Player Database Management System

- Developed a Java-based system to manage football player records with multi-attribute search (name, club, country, position). Implemented data persistence and basic statistics such as player distribution by country and club.

TEACHING EXPERIENCE

Private Tutor, Mathematics, Physics, and Computer Science 2020 – 2024

- Tutored Higher Secondary Certificate students in STEM subjects with customized lesson plans tailored to individual learning styles. Mentored students in developing critical thinking and problem-solving approaches for competitive examinations.

ADDITIONAL INFORMATION

Languages

- **Bengali:** Native proficiency | **English:** Professional working proficiency

Interests

- Exploring emerging research in AI, efficient machine learning, ML systems
- Singing, badminton, cycling, and cooking
- Making natural colors from flowers and collecting soils