POLOK PODDAR

AI Engineer

Deep Learning • Reinforcement Learning • LLM Systems • Federated Learning • Robotics & Edge AI

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PROFESSIONAL SUMMARY

AI Engineer and researcher with experience in machine learning, generative AI, large language models (LLMs), Retrieval-Augmented Generation (RAG), computer vision, and intelligent automation. Proficient in Python, FastAPI, REST APIs, and developing end-to-end AI systems for practical applications. Experienced in translating research concepts and business requirements into functional, scalable solutions. Strong research interest in artificial intelligence, robotics, deep learning, reinforcement learning, and federated learning.

AI & AGENT SKILLS

Core Expertise

Large Language Models (LLMs) | Generative AI | RAG | Prompt Engineering | AI Agent Development | LangChain | LlamaIndex | Hugging Face | Deep Learning | Reinforcement Learning (PPO/DQN/SAC) | Federated Learning | Differential Privacy

Also Applied

Vector Embeddings | Transformer Architecture | Knowledge Distillation | Model Compression & Quantization | Explainable AI (XAI) | Transfer Learning

ROBOTICS & EDGE AI

Computer Vision | Sensor Fusion | Edge AI | Embedded C | ESP32

SOFTWARE & CLOUD

Python | REST API Design | FastAPI | Flask | AWS (EC2 / S3) | Docker | CI/CD | Git | Linux | FAISS | Pinecone | PyTorch | TensorFlow | Scikit-learn | NumPy | Pandas | MySQL | MongoDB | Model Monitoring | MLOps

LEADERSHIP

Technical Leadership | Cross-Functional Team Management | Mentorship | Project Ownership (Concept to Deployment)

PROFESSIONAL EXPERIENCE

AI Developer — Government Project

Bangladesh Agricultural Ministry

2024 – 2025 | Bangladesh

- Architected an end-to-end AI decision-support system for crop disease detection; fine-tuned YOLOv8 achieving 94% detection accuracy across 12+ crop disease categories in varied field conditions
- Built farmer-facing application features including image classification, confidence scoring with expert explanations, and contextual advisory recommendations; designed a Bangla-language voice interface for low-literacy accessibility
- Conducted field validation with farmers across 3 districts, iterating the design from real-world feedback and reducing misclassification errors
- Gathered requirements directly from government agricultural officers and ministry stakeholders and translated them into an AI system aligned with official best practices and regional crop calendars

Founder & Lead Instructor

dotPY Academy

Jul 2022 – Present | Dhaka, Bangladesh

- Founded and managed an online education platform focused on Python, AI, machine learning, robotics, and practical technology skills for students.
- Designed and delivered structured learning programs featuring hands-on projects in Python, machine learning, deep learning, computer vision, natural language processing, and applied AI.
- Mentored students through project-based learning, supporting the development of practical applications and helping learners apply technical concepts to real-world problems.
- Organized interactive workshops, project sessions, and learning activities to build a collaborative community and encourage hands-on experimentation.

Assistant Director, Research & Project Management

Robotics Club of BRAC University

Mar 2024 – Sep 2025 | Dhaka, Bangladesh

- Managed a 15-member team across 5 concurrent AI-driven robotics projects spanning computer vision, reinforcement learning, sensor fusion, and embedded AI for national and international competitions
- Led the OVIJAN V2 autonomous rescue robot project to 1st place nationally (Technoxian Bangladesh 2024) and 6th globally (World Robotics Championship, 50+ teams); integrated LiDAR/IMU/ultrasonic sensor fusion with SLAM and a 4-DOF robotic arm
- Mentored junior engineers on deep learning and robotics systems; several mentees went on to author research papers and receive internship offers
- Established standardized ML pipeline and hardware integration protocols, reducing project development time and improving code quality across team repositories

KEY PROJECTS

Lightweight Explainable RL Framework for Precision Agriculture

Bachelor's Thesis — BRAC University

2024 – 2025

- Designed a custom PPO-based reinforcement learning agent with an explainable decision-making module for optimizing irrigation and fertilizer application in rice cultivation; trained on synthetic farm states from agronomic models
- Applied knowledge distillation and quantization to substantially compress the RL model while maintaining strong policy performance; deployed on a resource-constrained ESP32 microcontroller
- Field pilot with farmers across multiple acres showed measurable water savings, reduced fertilizer cost, and improved farmer income over a multi-month period
- Integrated a real-time IoT sensor network with a Bangla-language voice interface for low-literacy farmer adoption

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RAG-Based Conversational AI System

AI Systems Project

2023

- Built a Retrieval-Augmented Generation (RAG) system using LangChain, FAISS, and LLM APIs to support domain-specific question answering and information retrieval.
- Implemented context re-ranking, source-based response generation, citation validation, and credibility checks to improve retrieval quality and reduce unsupported AI-generated responses.
- Developed and deployed a FastAPI backend with asynchronous request handling, caching, and efficient query processing to support responsive and scalable system performance.
- Evaluated the system using domain-specific test queries and compared retrieval performance with baseline approaches to identify opportunities for improving answer relevance and source quality.

EDUCATION

Bachelor of Science, Computer Science & Engineering

BRAC University

May 2021 – May 2026 | Dhaka, Bangladesh

- **Field of Study:** Robotics and Artificial Intelligence (EQF Level 6)
- **Thesis:** A Lightweight, Explainable Reinforcement Learning Framework for Agricultural Decision Support Using Knowledge Distillation and Generative AI Diagnostics
- **Relevant Coursework:** Machine Learning, Deep Learning, Computer Vision, Algorithms & Data Structures, Probability & Statistics, Linear Algebra, Embedded Systems, Database Management, Software Engineering

RESEARCH PUBLICATIONS

Vision Guard: AI-Powered Indoor Navigation System for the Visually Impaired

Conference Paper — Best Research Paper Award, ICDSAIA 2025

2025

- Fine-tuned YOLOv8 achieving strong precision and recall in GPS-denied indoor environments, with real-time inference on edge hardware
- Designed a monocular depth estimation pipeline validated against ground-truth LiDAR, enabling collision avoidance without depth cameras
- Integrated a voice feedback interface with low end-to-end latency and high command recognition accuracy
- User study with visually impaired participants showed high task success and usability ratings

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Federated Fuzzy-ClusterAOI with Differential Privacy for Privacy-Preserving Healthcare Knowledge Discovery

Research Paper — University of Salford, UK Collaboration (Submitted, Under Review)

2026

- Designed a federated learning framework combining a custom Fuzzy-ClusterAOI clustering algorithm with differential privacy for distributed healthcare knowledge discovery across multiple institutions without data centralization
- Developed an aggregation protocol with formal differential privacy guarantees, reducing privacy leakage relative to baseline federated learning
- Addressed data heterogeneity across federated nodes, improving model utility compared to standard federated averaging
- Implemented in TensorFlow Federated; validated on real healthcare datasets

HONOURS & AWARDS

Best Research Paper Award
ICDSAIA 2025 — *Vision Guard: AI-Powered Indoor Navigation for the Visually Impaired.*

National Robotics Champion
1st Place, Technoxian Bangladesh 2024; 6th Place Globally at World Robotics Championship with OVIJAN V2 (50+ teams).

ONGOING RESEARCH COLLABORATION

Research Collaborator — ML, AI & Federated Learning

University of Salford, UK

2025 – Present

- Collaborating with University of Salford faculty on ongoing research initiatives in federated learning and privacy-preserving machine learning.
- Co-authored a research paper titled *"Federated Fuzzy-ClusterAOI with Differential Privacy"*, currently under review for publication (see Research Publications).
- Contributed to the implementation and evaluation of differential privacy mechanisms and federated learning approaches, with a focus on balancing data privacy and model performance.