

Bhoomika R Hegde

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EDUCATION

PES University

2022 - 2026

B.Tech, Computer Science and Engineering (AI & ML)

• **Achievements:** DAC scholarships, Head of Sponsorship Aatmatrishha'25, Head of Sponsorship Chords'24, Head of Social Media AIKYA

Paper Publications

- ICMLC 2026. Discrete Representation Learning: A Review. *Conducted a structured survey of discrete latent representation learning methods, covering VQ-VAE, VQ-VAE2, residual quantisation, product quantisation, and transformer-based approaches. Analyzed trade-offs between reconstruction quality, codebook utilization, compression efficiency, and training stability across major architectures. Synthesized open research challenges around codebook collapse, scalability, and representation efficiency.*
- IJDSA 2026. Transaction Graph-Based Predictive Hurdle Model for Credit Scoring in DeFi Lending Protocols. ** Designed a graph-based credit risk framework leveraging on-chain transaction networks and behavioral features from DeFi lending ecosystems. Developed predictive models combining transaction graph structure with financial activity metrics to estimate lending risk. Investigated the applicability of traditional credit-scoring concepts in decentralized finance environments with limited identity information.*

EXPERIENCE

Yugasys | AI Engineer Intern

Feb 2026 - Present

- Built a voice AI orchestration backend integrating speech-to-text, intent parsing, and app-side actions across 60+ flows, enabling end-to-end voice-driven user interactions
- Engineered real-time communication systems using WebSockets and Agora SDK with state management, exponential backoff, and heartbeat monitoring for reliability on unstable networks
- Designed an agent-based integration layer using MCP with clear service boundaries and event contracts; applied domain-driven design and resolved failure modes across multi-service interactions while maintaining CI/CD stability

Zeru | AIML Engineer Intern

Jun 2025 - Aug 2025

- Built a modular data processing pipeline (Python) spanning 5 blockchain protocols for bot detection, enabling protocol-specific preprocessing components to evolve independently
- Implemented end-to-end traceability across the pipeline, tagging each transaction from ingestion through classification to ensure debuggability and auditability
- Improved production readiness by reducing silent failure modes, adding validation checks at stage boundaries, and ensuring error states were logged and observable

PES University | Teaching Assistant-Advanced Data Analytics (Dr. Bhaskar Jyothi Das)

Aug 2025 - Dec 2025

- Write exercises and case studies for a 250-student course; also sit with student teams when they're stuck on architecture decisions or debugging something that doesn't make sense yet.
- Mentored student teams on project architecture, debugging strategies, and efficient algorithm implementation.
- Helped standardise how work gets graded so assessment doesn't drift across 250 submissions.

CIE | Teaching Assistant, PES University

Jun 2025 - Jul 2025

- Helped student teams build a blockchain-based learning platform with NFT badges and smart contracts. Most of my time was spent on the seam between smart contract logic and the UI

Grain For All | Engineer Intern

Aug 2024 - Nov 2024

- Developed a Python-based ETL system to parse and normalize EPA documents into structured outputs using a modular plugin architecture for inconsistent formats
- Integrated a multi-step reasoning pipeline using ReAct and AutoGen; added validation and logging at each stage to prevent silent data corruption
- Collaborated in a production environment with cross-functional teams, ensuring modular updates without breaking downstream pipeline components

PROJECTS

Image Representation Enhancement using ViT and Product Quantisation

- Identified limitations in VQ-VAE2 and proposed a PQ-VAE architecture to improve representation learning and codebook efficiency.
- Designed an end-to-end encoding pipeline combining Vision Transformers with structured latent decomposition and differentiable codebook learning.
- Improved reconstruction quality and compression efficiency over baseline models, validated using SNR and SSIM; contributed to a companion paper accepted at ICMLC 2026.

Dog Activity Recognition System

- Architected an event-driven ML platform for multimodal activity recognition using Python, Kafka, FastAPI, PostgreSQL, and Docker.
- Engineered robust inter-service communication through API contracts, Kafka schemas, retries, and end-to-end traceability.
- Integrated CLIP-based zero-shot inference with REST APIs and production-ready testing to enable reliable model deployment.

Academic Management System

- Architected a microservice-based university portal with clearly defined service boundaries and API contracts, enabling independent deployment and evolution of services
- Containerised services using Docker for reproducible deployment; implemented REST-based inter-service communication with minimal coupling
- Applied domain-driven design to separate scheduling, feedback, and user management into distinct bounded contexts