

# Aheli Poddar

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## Education

- 09/22 - 06/26 **B.Tech. Electrical Engineering**, *Institute of Engineering & Management Kolkata*, India, [9.163/10.0]
- o **Dept. Rank 4** out of 56 students in third year (**Transcript**)
  - o Recipient of **Alumni Merit Scholarship (100% fee waiver)** in fourth semester
  - o Recipient of the prestigious **IndiaAI Fellowship** for Bachelor's thesis
  - o Bachelor's thesis named **Regional Winner (Asia), Engineering** at the **Global Undergraduate Awards 2026**

## Publications & Preprints

- [TBA] *KernelOPT: Dispatch-Aware Agentic Search for GPU Kernel Optimization*; **Aheli Poddar\***<sup>†</sup>, Sanskar Prasad\*, Arindam Samanta, Subha Chakraborty, Vishal Goyal, Rohit Rathaur. **Under Review @ AAAI'27.**
- [ArXiv, GitHub] *Understanding Syllogistic Reasoning in LLMs from Formal and Natural Language Perspectives*; **Aheli Poddar**, Saptarshi Sahoo, Sujata Ghosh. **Paper accepted at Bridge Logic & AI @ AAAI'26.**
- [Paper, GitHub] *AgrilR: A Scalable Framework for Domain-Specific Knowledge Retrieval*; **Aheli Poddar\***, Shuvam Banerji Seal\*, Alok Mishra\*, Dwaipayan Roy. **Paper accepted at IR for Good @ ECIR'26.**

\* - Equal Contribution, † - Corresponding Author

## Experience

- 02/2026 **Red Hat**, Associate Software Engineer, PyTorch, Bangalore, India
- Present
- o Landed multiple PRs in upstream **PyTorch** core across the TorchInductor, TorchDynamo, meta-tensor and autograd stack; granted **Triage access** to the repository. [**PyTorch PRs**]
  - o Driving device-agnostic accelerator enablement: PrivateUse1 torch.compile support and hw\_classification test migration across **30+** test files for hardware-agnostic CI.
  - o Led a GPU kernel profiling and agentic optimization effort (**PyTorch, Triton, Helion**) on **NVIDIA H200** using Nsight; benchmarked DeepGEMM FP8 (**3.09x**) and FlashAttention-3 (**2.0-2.6x**). [**torch-profiler**]
  - o Recognized as the **2nd Place Global Contributor** in the PyTorch Docathon 2026, optimizing core API documentation. [**Blog, Leaderboard**]
- 04/2026 **CORDA Democracy Fellowship**, Research Fellow, Remote
- Mentors: Jacob Haimes, Swaptik Chowdhury
- o Selected for the **Odyssean Process for AI Governance** project, developing decision-support tools for citizens assemblies on AI governance (UK 2026, Global 2027).
  - o Validating structured expert survey responses on AI governance horizon scanning; performing sensitivity analysis on weighting methodology and coding qualitative expert responses to extract key causal variables.
- 06/2025 **European Summer of Code Mentee**, Berlin, Germany
- 12/2025
- Mentors: Franz Király, Marc Rovira, Ankur Ankan
- o Collaborating with **German Center for Open Source AI** and **Electrolux Group** on causal inference for industrial time series analysis, targeting supply chain optimization and predictive applications.
  - o Contributing to open-source libraries **sktime** and **pgmpy** with multiple merged and open PRs implementing scoring methods and Causal discovery algorithms [**sktime PRs**], [**pgmpy PRs**].
- 05/2025 **IIIT Hyderabad [GitHub]**, Research Intern, India
- 07/2025
- Mentor: Dr Priyesh Shukla
- o Implemented custom BERT transformer architecture with multi-head self-attention mechanisms; researched Matrix Product Operator (MPO) decomposition techniques for neural network weight compression [**GitHub**].
  - o Investigated variational quantum circuits (VQC) for hybrid quantum-classical architectures; conducted comparative analysis of tensor network topologies including Tree Tensor Networks and Tensor Rings for transformer optimization.
- 05/2024 **IIT Roorkee, SPARK Fellow**, Summer Research Intern, India
- 07/2024
- Mentor: Dr D. Bharat
- o Engineered modified BiLSTM architecture for GDP nowcasting incorporating 32 macroeconomic indicators; achieved RMSE of **0.165** outperforming baseline LSTM and ARIMA models.
  - o Developed metaheuristic optimization framework integrating Particle Swarm Optimization (PSO) and Differential Evolution algorithms for automated hyperparameter tuning.

## Projects

- Ongoing **quantspt**, Mathematical Finance | Stochastic Portfolio Theory, **PyPI Package**
- o Authored and published an open-source Python library implementing E.R. Fernholz's Stochastic Portfolio Theory for functionally generated portfolios and relative arbitrage strategies. [GitHub]
  - o Designed the **GammaGradientStrategy** targeting the excess-growth-rate gradient; achieved **+269 bps/yr** beta-adjusted alpha on the S&P 500 (2020–2026) with near-zero size-factor correlation.
  - o Implemented entropy-based diversity measures, log-optimal growth rate calculations, and a Monte Carlo back-testing framework across volatility regimes.
- 07/2026 **SecLoyal, Top 50%** – **Apart Research Secret Loyalties Hackathon**
- o Probed covert LLM loyalties via mechanistic interpretability on **Qwen2.5-7B**; linear probes separated loyalty-conditioned activations at **Cohen's d 26.9**. [GitHub]
  - o Demonstrated activation-based detectors transfer across installation vectors (AUROC up to **1.000**) while behavioral fingerprints do not (**0.64**); layer-8 steering achieved **78%** suppression.
- 04/2026 **FuncScreen, Top 25%** – **Apart Research AlxBio Hackathon**
- o Developed an evasion-resistant biosecurity screener using supervised contrastive learning over frozen **ESM2** embeddings, to isolate functional threats bypassing sequence homology. [GitHub]
  - o Hardened decision boundaries via high-temperature **ProteinMPNN** adversarial training, achieving **1.000 AUROC** on hard negatives, **0.991 AUROC** against structural variants.
- 11/2025 **ExogenousAI, 4<sup>th</sup> Place** – **Apart Research AI Forecasting Hackathon**
- o Developed quantitative framework for modeling AI capability timelines under exogenous policy and market shocks using MacKinlay-style event study methodology. [GitHub]
  - o Implemented Monte Carlo simulations with Geometric Brownian Motion incorporating policy drift terms and volatility decomposition for probabilistic AGI timeline stress testing.
- 08/2025 **IndicAgri, Top 14 Nationals** – **Capital One Launchpad Hackathon**
- o Developed multi-modal Retrieval-Augmented Generation (RAG) chatbot supporting **20+** Indian languages for agricultural advisory services.
  - o Engineered autonomous data pipeline constructing 15,000+ document knowledge base from government agricultural resources; implemented chunking strategies and embedding optimization for domain-specific retrieval.
  - o Achieved **45%** reduction in inference latency through model quantization (INT8/INT4), KV-cache optimization, and intelligent response caching mechanisms.
- 04/2025 **DeepLense**, Google Summer of Code 2025 Evaluation - ML4SCI
- o Designed ensemble DenseNet architecture achieving **96.4%** accuracy in multi-class classification of gravitational lensing images; implemented custom ResNet for continuous parameter regression (**RMSE 0.034**).
  - o Built convolutional Variational Autoencoder (VAE) with 256-dimensional latent space for synthetic data generation; achieved **87%** structural similarity (SSIM) between generated and real astronomical images

## Grants, Fellowships & Scholarships

- 2025 **European Summer of Code Mentee** – Selected for open-source research contribution program
- 2025 **Google Generation APAC Scholar** – Selected across Asia-Pacific for leadership and academic excellence
- 2025 **McKinsey APAC Next Generation Women Leader** – Recognition for leadership potential in technology
- 2025 **McKinsey Forward Scholar** – Professional development program for emerging leaders
- 2024 **SPARK Fellowship, IIT Roorkee** – Competitive research fellowship for summer research internship
- 2023 **Amazon AWS AI & ML Scholar** – Scholarship for demonstrated excellence
- 2021 **JBNSTS Senior BKMB Scholar** - Highly competitive merit-based state scholarship

## Awards & Honors

- 2026 **1<sup>st</sup> Place** – **UIDAI National Data Hackathon 2026** [GitHub]
- 2026 **Top 3 State Representative** – **VBYLD 2026** (National Parliamentary forum in New Delhi with Hon. PM)
- 2025 **4<sup>th</sup> Place** – **Apart Research AI Forecasting Hackathon 2025**
- 2025 **Top 14 National Finalist** – **Capital One Launchpad Hackathon 2025** (5000+ teams)
- 2024 **Top 5 National Semifinalist** – **Google Girls Hackathon India 2024**
- 2024 **Top 2% Delegate** - **Harvard Project for Asian and International Relations 2024** (50000+ applicants)
- 2024 **Best Paper Award** – **PJMT AI for Climate Change Summit 2024**
- 2023 **Top 150 Regionals** - **IET India Scholarship 2023** (43137 applicants)
- 2023 **Global Finalist** – **TCS Quantum Challenge 2023**

## Professional & Community Service

- 2026 **Reviewer** – **Women in Computer Vision (WiCV) @ ECCV 2026**
- 2026 **Speaker** – Session on **PyTorch Profiler** at the **IISc × PyTorch** community event, Bengaluru [Slides]
- 2026 **Organizing Team** – **Red Hat × Hugging Face** ML systems event, Bengaluru (150+ attendees)

## Technical Proficiency

|                    |                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Languages          | Python, C/C++, MATLAB, R, SQL, $\text{\LaTeX}$                                                                                         |
| Tools & Frameworks | NVIDIA NSight, Pandas, LangChain, PyTorch, vLLM, DeepSpeed, TensorFlow, Sklearn, Hugging Face, Keras, Sktime, Pgmpy, Git/Github, Linux |
| Analytical Methods | Statistical Modeling, Time Series Analysis, Causal Inference, Monte Carlo Simulations                                                  |

## Relevant Coursework

|                  |                                                                                                                                                     |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Mathematics      | Advanced Calculus, Ordinary Differential Equations, Probability & Statistics, Complex Analysis                                                      |
| Computer Science | Data Structures & Algorithms, Artificial Intelligence & Machine Learning, Database Management System, Object-Oriented Programming, Computer Network |
| Engineering      | Signal Systems, Control Systems, Power Systems I/II, Analog Electronics, EMFT, Microprocessors                                                      |