

ADARSH KUMAR

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EDUCATION

Qualification	Institute	Score	Year
B.Tech (ECE)	Indian Institute of Technology Patna	CPI: 8.33 / 10	2029
Class XII (CBSE)	Indian Heritage School, Deoghar	91.8%	2025
Class X (ICSE)	Mount Assisi School, Godda	97.4%	2023

COMPETITIVE PROGRAMMING & ACHIEVEMENTS

- **NTU InnovateX Hackathon 2026** (Nanyang Technological University, Singapore): selected as 1 of 14 teams for the onsite finals
- **Codeforces Expert**: rating **1620** (handle: public_server)
- **Indian Olympiad Qualifier in Mathematics (IOQM)**: qualified in 2023 and 2024

TECHNICAL SKILLS

- **Languages:** C++, C, Python, TypeScript
- **Machine Learning:** PyTorch, Hugging Face transformers/PEFT, LoRA fine-tuning, sentence embeddings; reverse-mode autodiff implemented from scratch
- **Quantitative Foundations:** Probability & statistics, numerical methods, option pricing (Black-Scholes, binomial, Monte Carlo, Heston), efficient/high-performance computation
- **Tools & Frameworks:** Git, Next.js/React, PostgreSQL, Prisma, Redis, Solidity/EVM smart contracts
- **Relevant Coursework:** Calculus and Linear Algebra (MA1101), Probability Theory and Ordinary Differential Equations (MA1201), Data Structure (CS1201), Signals and Systems (EC2102)

PROJECTS

LedgerLighthouse

TypeScript · Solidity · x402

- Co-built (NTU InnovateX Hackathon 2026) an agentic payment system letting an LLM agent pay for API access over the x402 protocol against an on-chain spending budget it can never read, alter, or override.
- Deployed the encrypted on-chain budget (Inco Lightning) live on Base Sepolia behind a 327-test CI suite, capping a compromised agent's worst-case loss by policy; specified TEE-derived signing keys (Oasis ROFL) as the custody model, not yet deployed.
- Enforced a CI-checked import boundary blocking the untrusted orchestrator from reaching the signer or the vendor's API credential, and committed each spend's debit before the approval decision was knowable.

Mini Sparse Mixture of Experts

PyTorch · LoRA · Transformers

- Built a top-1 routed mixture-of-experts language system: three domain experts LoRA fine-tuned from a 135M-parameter base, each adapter training about 1M parameters (0.74%) against frozen attention weights.
- Trained a router MLP over 384-dimensional sentence embeddings on about 7,000 generated queries to dispatch each query to a single expert, evaluated by router accuracy, confusion matrix, and per-expert perplexity.

Option Pricing Model Library

C++ · Quantitative Finance

- Built a C++ library pricing European and American options under four models, Black-Scholes (closed-form), Binomial Tree (backward induction), Monte Carlo (100K-path simulation), and Heston (stochastic volatility).
- Wrote a validation suite checking each model against put-call parity, American $\geq$ European price under early exercise, and intrinsic-vs-time-value decomposition.

Chain Reaction AI Agent

Python · Game-Tree Search

- Built a competitive AI for the game Chain Reaction using Minimax with Alpha-Beta pruning, iterative deepening, and a transposition table, tuned to search maximum depth inside a 0.9-second move budget.