

Satnam Singh

AI / Machine Learning Engineer

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TECHNICAL SKILLS

Languages: Python, C++, C, SQL

ML / DL: PyTorch, PyTorch Geometric, XGBoost, Scikit-learn, LangGraph, FAISS, sentence-transformers

ML Practices: model evaluation design, class-imbalance handling, error analysis, retrieval-augmented generation, agentic pipelines

Tools: CUDA, FastAPI, Docker, Git, Linux, PostgreSQL

PROJECTS

NodeGuard – Graph Neural Network for Fraud Ring Detection

09/2026

PyTorch Geometric, Python

- Designed a 2-layer graph convolutional network to detect coordinated fraud rings from transaction-network structure, modeling two anti-money-laundering typologies (layering chains and bipartite funnel structures) under severe class imbalance (approximately 4.5% positive class).
- Diagnosed a validation-metric selection flaw where recall-only checkpointing converged on a degenerate high-recall, low-precision model; corrected with F1-based checkpointing and early stopping.
- Built a reproducible evaluation pipeline (precision, recall, F1, confusion matrix) and a structural error-analysis tool tracing false positives to feature-level or graph-topological causes. Submitted to the Razorpay AI Buildathon, AI Risk Manager track.

Domain-Specific Retrieval-Augmented Generation System

08/2026 – Present

Python, LangGraph, FAISS

- Built a multi-agent RAG pipeline (planner, retriever, generator, and critic nodes) over a scientific literature corpus, using sentence-boundary-aware chunking to preserve numeric claims during retrieval.
- Implemented sentence-level natural language inference verification with a cross-encoder entailment model and conditional retry logic for ungrounded generations.

Custom CUDA Matrix Multiplication Kernels

05/2026 – Present

CUDA, C++, C

- Optimized custom CUDA SGEMM kernels toward cuBLAS-class performance, improving FP32 GEMM throughput from 169.6 to 1052.9 GFLOPS on an RTX 4060 (6.5x speedup) through warp-aware thread mapping and memory coalescing.

RESEARCH

Graph Neural Networks for Defect-Site-Resolved p-type Dopant Viability in $\beta\text{-Ga}_2\text{O}_3$

08/2026 – Present

Centre of Excellence for Frontier Materials Research, Christ University

- Designing a defect-site-resolved graph representation encoding dopant identity, substitutional site, and coordination geometry to predict defect formation energy and ionization level, training on approximately 15,000 DFT-derived defect structures, with planned benchmarking against random forest and gradient-boosted baselines. Abstract under review, IIM ATM 2026.

EDUCATION

Christ University, Bengaluru – B.Tech, Computer Science and Engineering (AI/ML)

05/2025 – 06/2029

CGPA: 3.79/4.0 (First Year)

Indian Institute of Technology Madras – B.S., Data Science and Applications (Online, concurrent)

07/2025 –

07/2029