Aditya Raj

B.Tech, Electronics and Communication Engineering
National Institute of Technology, Patna
Expected Graduation: 2026

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Education

Degree/Certificate	Institute/Board	GPA/Percentage	Year
B.Tech, Electronics and Communication Engineering	NIT, Patna	8.1 / 10.0	2022–2026
Senior Secondary	CBSE	93.2%	2020–2022
Secondary	ICSE	90.2%	2010–2020

Achievements

Stanford AI Lab	Interviewed at Prof. Jiajun Wu's Lab for research position in computer vision	*2025*
NK Securities Research	Ranked $67^{th}/2095$ in **IV Prediction**; **MSE = 1.3e-5**	*2025*
M2L Summer School	Selected from **1600+** global applicants (**BTech to Industry**); Split, Croatia	*2025*
Amazon ML Challenge	Ranked $184^{th}/75,000+$; **F1 score = 0.4667** using fine-tuned **moondream**	*2024*
IIT ISM AI of GOD	**Winner**; **WER = 0.116** using **TrOCR + T5**; post-processing algorithm	*2024*
RMO	Top **0.4%** nationwide mathematical olympiad(classes 8–12) in **India**, out of 250k students	*2019*

Findings

- **Knowledge is not localized circuits; it can be better understood as a network path of gated circuits**
  Application: MATS 9.0 (Neel Nanda)

Research

- **Knowledge Graph-Informed Query Decomposition(KG-IQD): Hybrid KG-RAG Reasoning in Noisy Contexts**
  Authors: Aditya Raj, Dr. Kuldeep Kurte[PI] | Poster (ISWC 2025) - Rejected

Experience

- **Founding AI Research Engineer** *India*
  QFI Research Capital *May 2025 – Present*
  - Working on the research and development of an **internal memory layer for the Risk Compliance system**, to **autonomously analyze trading and backtesting engine logs**, **identifying and preventing recurring performance and risk issues** to enhance **system reliability and strategic decision-making**.
  - Worked on the **metric calculation part of the trading engine**, **fixed critical bugs which calculated a few metrics differently**, and built the **complete internal tooling stack for workflow automation and business operations**.
- **Research Intern** *Hyderabad, India*
  IIIT-H | Dr. Kuldeep Kurte, Spatial Informatics Lab *Apr 2025 – July 2025*
  - Achieved **state-of-the-art results** on a **custom disaster QA benchmark**, outperforming RQ-RAG by **14%** and **KG by 18%**, by developing a **neuro-symbolic framework** that **guides query decomposition using Knowledge Graphs** and **interrelates points with RAG on sub-queries** for **robust reasoning over structured and unstructured data**.

Projects

- **Investigating Conditional Knowledge Circuits in LLMs – TinyLlama 1.1B** *docs | Aug 2025 – Sept 2025*
  Tools: Hugging Face, PyTorch, DPO/RLHF, Red Teaming
  - Demonstrated that **LLMs retain multiple competing factual knowledge simultaneously**, **retrievable via trigger-activated gates without erasing original knowledge**, and identified **sparse mid-layer attention heads as the locus of conditional computation**, revealing mechanisms for **dormant knowledge and circuit interference**.
  - Proving that **red teaming will always be successful**, as **knowledge is a gated network with dams inside an LLM**. Even if one circuit is removed—knowledge editing—**there are others which can trigger it and are unknown until triggered**, as these **dams (trigger), circuit gates are interconnected with other circuits**.
- **Multimodal-reranker** *March 2025 – Apr 2025*
  Tools: Python, CLIP, mxbai-embed-large-v1
  - Engineered a **multimodal reranking module** for an **AI search engine**, leveraging **Ollama LLM** for semantic filtering and JSON filter extraction from natural queries, combined with vision-language models and a fast **FAISS (HNSW + IVF) retriever** on **CLIP/mxbai embeddings**, reranking top-k results via cosine for refined search based on user intent and visual semantics.
- **OCR Model – LLM Re-correction** *Link | Oct 2024*
  Tools: Python, OpenCV, LLMs, OCR **Ranked 1st** on Kaggle; **Winner**, Annual ML Competition – IIT ISM
  - Engineered an OCR pipeline for medieval-era handwritten Spanish manuscripts by combining **TrOCR** for initial transcription with a **T5-based language model** for post-correction, fine-tuned on domain-specific linguistic features.
  - Designed and integrated a custom **text augmentation and similarity-preserving algorithm** to enhance LM robustness; achieved a **Word Error Rate (WER) of 0.116**, outperforming all competing models.

Technical Skills

Languages	Python, C++, SQL, HTML5, CSS, Typescript, MATLAB, BASH
ML/Stats	PyTorch, scikit-learn, TensorFlow, XGBoost, CNN, Transformers, LSTM, Catboost
Time Series	Gaussian processes, **signal smoothing**
DevOps & Tooling	Git, GitHub Actions, CI/CD, monitoring, logging — Bash, Linux (WSL/Ubuntu), Weights & Biases
Infra/Backend	**Docker**, **FastAPI**, **AWS**, Kubernetes (basic)