Adesh Gupta

✉ adeshgupta101@gmail.com 📞 +91 9313219654 🔗 4adex.github.io 🐦 a4dex in adesh-g ⌂ 4adex

Education

Indian Institute of Technology Roorkee *Aug 2023 – Present*
Bachelor of Science Mathematics and Computing
- **CGPA**: **9.56**/10.0
- **Coursework:** Discrete Mathematics, Real Analysis, Probability and Statistics, Stochastic Differential Equations, Data Science, Computer Programming, Database Management Systems, Theory of Computation

Govt Boys Senior Secondary School No-2, Uttam Nagar *Mar 2022 – Mar 2023*
Class 12, Grades: 94.20%

Experience

Google Summer of Code — *Graphite* — GSoC'25 ↗ *May 2025 - July 2025*
- Building advanced vector editing modes for Graphite, a node-based graphic editor in **Rust**, enhancing path and mesh editing workflows to deliver greater precision and creative flexibility for users.

Software Developer — *SDSLabs* — website ↗ *Feb 2024 - Present*
- Built and maintained production applications serving 1,500+ users, including Erdos (math platform) and Quizio (quiz platform). Contributed to open-source projects, and competed in international hackathons. Co-organized Syntax Error, IIT Roorkee's largest tech hackathon.

Research Member — *Vision and Language Group* — website ↗ *Aug 2024 - Present*
- Contributed to deep learning research projects, published papers at leading conferences, participated in leading AI challenges and competitions. Facilitated weekly paper reading sessions on SOTA AI research.

Achievements

- **Inter IIT Techmeet 14.0 Silver**: 1st runner-up in ISRO Geospatial VLM problem among 24 IITs.
- **HiLabs AIQuest**: Won first prize in HiLabs AIQuest hackathon, organized in IIT Roorkee.
- **ICLR 2025 BlogPost track**: Blog on positional embeddings in transformers accepted at ICLR.
- **Calimero x Starknet**: 2nd runner-up, made a decentralized game in Rust. Dorahacks ↗
- **ETHOnline 2024**: Won the DIMO and Sign protocol sponsor tracks with a team of 5. ETHGlobal ↗
- **JEE Advanced 2023**: AIR 10,008 among 1,80,372 candidates.
- **JEE Mains 2023**: AIR 14k among 11.5 lakh candidates.
- **IOQM 2021-2022**: Obtained the merit certificate for IOQM.

Projects

VortexDB — *Rust* *VortexDB ↗*
- Built a lightweight, modular **vector database** from scratch in Rust, implementing multiple indexing algorithms including KDTree and HNSW for efficient similarity search.

Drishti — *PyTorch, Huggingface, Ray Serve, Docker, Next.js* *DRISHTI ↗*
- Developed scalable remote sensing pipeline integrating EarthMind-4B (vision language model), RemoteSAM & BERT classifier for unified satellite imagery analysis. Developed Spatial Token Pruning (STP), a single-pass attention-based method that **reduced visual compute by 50%** while maintaining same accuracy.

Erdos — *PHP, MySQL, Nginx, Docker* *erdos ↗*
- Maintained and enhanced a mathematics problem-solving platform serving **1,500+ active users**. Managed deployment infrastructure, resolved critical bugs and security vulnerabilities, and shipped new competition features.

Healthcare Provider Insights Platform — *FastAPI, Next.js, Docker* [*hilabs* ↗]
- Engineered an automated data pipeline achieving **10× efficiency gains** in resolving entity duplication and standardizing provider records. Implemented fuzzy-matching for NPI registry compliance verification and developed a Text-to-SQL interface powered by a locally hosted SLM.

Quizio — *React, Express.JS, MongoDB, Node.JS* [*Quizio* ↗]
- Maintained SDSLabs' quizzing platform supporting end-to-end quiz creation, administration, and evaluation workflows. Actively resolved bugs across the user flow and successfully orchestrated the SDSLabs recruitment test for **500+ candidates with zero downtime**.

Library Management System — *Golang, MySQL* [*mvc-golang* ↗]
- Developed a comprehensive library management system in Go on **MVC architecture**, featuring JSON Web Tokens, password hashing, flash messages, with MySQL for database management. Utilized Go HTML templates for dynamic page rendering and virtual hosting.

Stock Sentiment Analysis using LSTM — *TensorFlow, Pandas, BeautifulSoup* [*LSTM* ↗]
- Developed a stock prediction pipeline using LSTM regression based on sentiment analysis of news headlines to predict stock prices and generate buy/sell signals. Utilized FinBERT to analyze sentiment from headlines and integrated it with market data to improve trading algorithm performance.

Publications

Positional Embeddings in Transformer Models: Evolution from Text to Vision Domains [*blog* ↗]
- Accepted in the ICLR 2025 Blogpost Track, this blog explores the role of positional embeddings in transformers, analyzing their transition from text-based models to Vision Transformers (ViTs). It presents an in-depth study of RoPE and ALiBi, focusing on their mathematical foundations, impact on sequence length extrapolation, and performance in ViTs.

Adaptive Urban Planning: A Hybrid Framework for Balanced City Development [*arxiv* ↗]
- Accepted in AAAI AI4UP workshop. Developed a Multi-Agent urban planning framework leveraging the reasoning and collaboration of different LLM agents. Used Genetic Algorithms and specialized agents for optimization and regional customization and achieved significant improvement in livability and accessibility compared to previous methods.

Extra Curricular

Joint Secretary — *onRec IITR* *Feb 2024 - Present*
- Led content strategy and visual design for IIT Roorkee's official podcasting club, producing episodes featuring industry leaders, professors, and distinguished alumni.

Technologies

Languages: Rust, Python, C++, JavaScript, Golang, BashScript, SQL, GDScript

Libraries and Frameworks: Pytorch, Docker, Nginx, React, Next.js, Node.js