

Google Summer of Code Proposal

Personal Information

Name: Arnav Nigam

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Degree: B.Tech (CSE)

University: Delhi Technological University, New Delhi

About Me

I am Arnav Nigam, a passionate developer, competitive programmer, and machine learning enthusiast currently pursuing a B.Tech in Computer Science and Engineering at Delhi Technological University.

I specialize in web development, blockchain, and artificial intelligence, with hands-on experience in React, Next.js, Node.js, Solana, AWS, and Vercel. My projects range from supply chain management (MediNexus - SIH 2024 Winner) to LLM-based chatbot development during my research internship at DRDO.

Beyond development, I am a Specialist on Codeforces with 700+ solved problems on LeetCode, demonstrating my strong problem-solving skills. I have also contributed to social impact initiatives, including guiding students on career opportunities and supporting special children through creative projects.

I am always eager to explore cutting-edge technologies, collaborate on impactful projects, and contribute to open-source communities.

- Technical Skills: C++, Python, JavaScript, React, Next.js, Node.js, Solana, Machine Learning, Blockchain
- Achievements: Smart India Hackathon 2024 Winner, DRDO Research Intern, Codeforces Specialist

Availability

I am fully committed to contributing to this project during the entire GSoC period. As a second-year B.Tech student at Delhi Technological University, my academic commitments will be minimal during the summer, allowing me to dedicate significant time to GSoC.

- Before the official coding period: I will actively engage with the mentors and community, refine the project plan, and familiarize myself with the codebase.
- During the coding period: I can dedicate 40+ hours per week to development, debugging, and documentation. My schedule is flexible, and I will ensure timely communication with mentors.
- After the final evaluation: I plan to stay engaged with the community, contribute further improvements, and help onboard new contributors.

I have no conflicting internships or major academic responsibilities during the summer, ensuring my full focus on the project.

Past Experience

- **Research Internship (DRDO)**

During the last summer break, I worked on **LLM and neural networks**, developing a chatbot from scratch using **T5, BERT, RNN, CNN, LSTM, and TCN**. Contributed to a **research paper**, focusing on optimizing large language models for specialized use cases.

- **Smart India Hackathon (SIH) 2024 Winner**

Led the development of MediNexus, a blockchain-based supply chain and inventory management system for healthcare. Implemented anti-theft tracking with holographic QR codes, demand prediction using SARIMA, and real-time location tracking.

- **Community Work**

Guided **10th-grade students on career opportunities** through the NSSS foundation. Worked with **Masoom Special School**, helping special children create and sell handmade diyas for fundraising.

Important Links

LinkedIn- <https://www.linkedin.com/in/arnavnigam31/>

GitHub- <https://github.com/arnavnigam31>

LeetCode- <https://leetcode.com/u/arnavnigam31/>

Personal Motivation

I am excited to contribute to this project because I have extensive experience in Machine Learning, as well as a deep understanding of how AI can be used for social good.

During my research internship at DRDO, I worked on building an LLM-powered chatbot from scratch. My research involved analysing different strategies to develop chatbots, comparing T5, BERT, RNN, CNN, LSTM, and TCN models. I also studied various fine-tuning and prompt-engineering techniques to optimize chatbot performance for real-world applications. This research led to a published paper, which was awarded **Best Paper** for its in-depth evaluation of chatbot development strategies.

Recently I have started studying Quantum computing and its enhancement to ML just fascinates me, so I would love to explore a new horizon with guidance from expert mentors and I hope that this journey will be beautiful.

Timeline

Phase 1: Dataset Collection & Initial Model Implementation (Week 1-4)

Goal: Gather relevant datasets and implement a basic QML model.

- Collect and preprocess the dataset.
- Implement a basic model with changing the data preprocessing strategies to understand which preprocessing is best.
- Training an initial model.

Deliverable: A working prototype with a basic hybrid QML model trained on quantum data.

Phase 2: Model Improvement & Performance Optimization (Week 5-8)

Goal: To enhance the model accuracy by fine tuning and using different architectures

- Trying different architectures and models.
- Improve pipeline using classical optimizers.

Compare model performance with classical ML baselines (accuracy, execution time).

Deliverable: A refined QML model with improved accuracy and computational efficiency.

Phase 3: Final Submission (Week 9-12)

Goal: To complete the rest of the work and make a proper submission

- Implement error mitigation techniques to improve quantum circuit reliability.
- Complete the documentation and any other tutorial required for the code.

Deliverable: A fully functional QML model with real-world application insights, optimized for execution on quantum and hybrid systems.

If selected to work with ML4SCI this summer, I will give my best effort to ensure the success of this project. I am truly excited about the opportunity and would love to continue contributing to QML even after the summer.

I look forward to working under the guidance of experienced mentors and collaborating on this impactful initiative.

Looking forward to working with you!

Thank you,

Arnav Nigam