

KALP SHAH

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Education

Indian Institute of Technology Gandhinagar

B.Tech in Electrical Engineering with Minor in Computer Science and Engineering

Jul. 2024 – Apr. 2028

GPA: 8.64/10 | Minor GPA: 10/10

Experience

Graviton Research Capital (Incoming)

SDE Intern (Quant Tools)

July 2027 - Dec 2027

AIResQ ClimSols

Machine Learning Intern

May 2026 – July 2026

- Engineered a **Computer Vision** pipeline for estimating depth of floods using CCTV Camera Networks
- Developed a **custom Camera and Radar device** for generation and validation of data in flood areas
- Implemented **single view metrology** algorithms for extracting features achieving **accuracy of $\pm 3\text{cm}$**

Barclays BIIC Mentorship Program

Mentee

May 2026 - June 2026

- Studied **Capital Markets** and **Currency Risk Management**, focusing on FX exposure and **hedging strategies**
- Researched** and **backtested** Currency Risk aversion methods such as **Options**, **Forward Swaps**, etc.
- Selected amongst **top 5** students to present solution to Barclays team

ABSix Robotics

Software Development Intern

May 2025 – July 2026

- Engineered a **cross-platform desktop application (Python, Qt)** with real-time robot-student communication via the **Dynamixel SDK** deployed across **15+ challenges** and actively used by **100+ students**
- Integrated a **RAG pipeline (LangChain + ChromaDB)** into the platform to query robotics concepts

Research Experience

Belief Tracking for Countering LLM Negotiation Agents using Hidden Markov Models (In Progress)

Supervisor: Prof. Manisha Padala

[Github](#)

- Modeled LLM negotiation behavior** through a bargaining game simulation as a time-varying latent-state process using Hidden Markov Models
- Implemented HMM inference** using Forward-Backward, Viterbi, and Baum-Welch algorithms to track posterior beliefs and recover the opponent's hidden negotiation regime over time
- Developed belief-driven negotiation agents** and benchmarked them against no-belief, frequentist, and static-Bayesian baselines using negotiation payoff, regime-detection accuracy, and detection-lag metrics

Identifying Landing Locations on Mars using Classical Computer Vision

Supervisor: Prof. Shanmuganathan Raman

[Research Poster](#)

- Developed a CV pipeline to identify **safe landing zones on Mars** with **ISRO** under compute constraints
- Designed a modular system utilizing Sobel derivatives for **slope detection**, Fast Fourier Transforms for **texture analysis**, and the Maximal Rectangle Algorithm for **zone identification**
- Achieved a verifiable, low-power solution with **1.5 seconds runtime** on consumer-level hardware

Projects

Trade Matching Engine

[Github](#)

- Engineered a **C++ 26 limit-order matching engine** implementing price-time priority with FIFO Order execution
- Implemented efficient **order matching, cancellation and trade execution**, using stable **std::hive** iterators and direct order ID
- Benchmarked the matching engine across 200K+ orders using **hardware RDTSC timers**, achieving **12.5M+ orders/sec** throughput with **80 ns mean latency** (p50: 60 ns)

Realtime Carbon Credit Market Analysis Platform

Inter-IIT Technical Meet 14.0 – December 2025

[Github](#)

- Architected a **full-stack real-time analytics platform** (Next.js, WebSocket, PostgreSQL) serving live carbon credit pricing, trend signals, and risk analysis to end users as part of an 8-person team
- Developed a **multi-agent RAG system** (LangChain, DeepSeek) generating context-aware recommendations
- Built a **data streaming pipeline** using **Kafka** and **Debezium** (CDC) to capture live **PostgreSQL** changes, cutting data freshness latency from **60 minutes to under 3 seconds**

Concurrent Asynchronous Logging System

[Github](#)

- Developed a **high-performance asynchronous logging library** (C++ 17) using producer-consumer architecture to achieve **1.7 Million logs/second throughput** with 128 concurrent threads
- Engineered **thread-safe logging engine** with dedicated background writer thread, generic ‘BlockingQueue;T;’ template, and automatic timestamp/thread-ID capture; eliminates file contention between worker threads through asynchronous message queueing
- Implemented **RAII-based resource management** with automatic background thread lifecycle (construction/destruction), graceful shutdown, pending message flushing, and cross-platform C++17 compatibility; includes multiple log levels, source metadata, and FIFO ordering guarantees

TriageIQ

Accenture Innovation Challenge 2026

[Github](#)

- Built a **full-stack clinical decision-support system** (Python 59.2%, JavaScript 38%) combining deterministic scoring logic with LLM-powered explanations for ED patient triage across **5 severity tiers** with age-specific thresholds (pediatric, adult, geriatric)
- Engineered a **Python backend** (FastAPI, SQLAlchemy) with auditable **scoring engine** computing confidence scores, severity tiers, and contributing factors with automatic escalation when confidence < 60%
- Developed **React + Vite frontend** with real-time **queue monitoring**, mandatory override reason codes, and HIPAA-compliant audit logging; system runs offline with Gemini/Claude integration optional

Controllable Font Generation using cGANs

[Github](#)

- Engineered a conditional dataset from **281,000+ TMNIST images**, enabling precise multi-label typographic control by parsing implicit font nomenclature into explicit binary style vectors
- Architected a **Conditional Generative Adversarial Network**, modeling a 784-dimensional feature space
- Synthesized 94-character font families, ensuring consistent stylistic features across the generated alphabet by locking latent noise vectors during inference achieving an **FID Score of 25.7466 over 1000 generations**

Technical Skills

Languages: Python, C++, C, HTML/CSS, JavaScript, SQL

Frameworks: PyTorch, OpenCV, Langchain, scikit-learn, Selenium, Next.js

Cloud/DevOps: Azure, Linux, Docker, Git, PostgreSQL

Achievements

Codeforces Rating – Handle: *kalpshah1808* | **Expert:** 1746

Finalist at AMS Derive 2026 conducted by **Qube Research** and **Jane Street** at IIT Bombay

JEE Mains 2024 – All India Rank **3917** and JEE Advanced 2024 – All India Rank **6637**

Integral Cup Season 1 **All India Rank 47** out of 2500+ students conducted by Optiver and Da Vinci Trading

Awarded a merit-based Department Change from B.Tech-M.Tech Mechanical to Electrical Engineering

Relevant Coursework

Data Structures and Algorithms I, Machine Learning, Foundations of AI: Multiagent Systems, Introduction to Competitive Programming, Computing, Data-Centric Computing, Digital Systems, Probability and Statistics