

Abhinav Kumar Singh

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EDUCATION

Thapar Institute of Engineering & Technology, Patiala, Punjab

Aug 2024 – May 2028

B.E. Computer Engineering

Coursework: Data Structures & Algorithms, Operating Systems, Computer Networks, Discrete Mathematics, OOP

EXPERIENCE

Software Engineering Intern | COE-FS, Thapar University (coefs.thapar.edu)

Mar 2026 – Present

- Redesigned PostgreSQL schema with composite indexes and query-plan analysis on a **FastAPI + SQLAlchemy** backend, cutting median API response time by **40%** under **100+ concurrent users**; moved I/O-bound handlers to `async/await` to stabilise throughput during traffic spikes.
- Containerised the stack with **Docker + Nginx** and automated deployments with **GitHub Actions CI/CD**, replacing manual SSH releases with `deploy-on-push`; exposed **10+ REST APIs** with schema-validated request/response contracts.

Technical Secretary | Microsoft Learn Student Chapter, TIET

Jul 2025 – Present

- Built and shipped a full-stack hackathon management platform (play.google.com/store/apps/details?id=com.mlsc.makeathon7) used by **100+ teams** at Makeathon 8, with live leaderboards, judge assignment, and submission tracking; reused for later campus events.
- Mentored **10+ junior developers** on backend design, concurrency, and Git/open-source workflows; three mentees merged their first production PRs within six weeks.

PROJECTS

LSSD Pipeline: Distributed HPC Job Scheduler

Jan 2026 – Present | github.com/abhinav29102005/lssd-pipeline

- Implemented **Raft consensus** (leader election, log replication) for a fault-tolerant scheduler in Python, FastAPI, Redis, and gRPC; load-tested on a **1,000-node simulated cluster** at **1,000+ concurrent jobs** with sub-100 ms scheduling latency, and verified recovery from single-node failure.
- Built a priority-aware job escalation engine with worker pools and `async` task queues that re-queues stalled jobs within **500 ms** of a missed heartbeat; added a **Three.js/WebGL** dashboard for live cluster monitoring.

NEBULA: Sovereign Autonomous Personal AI Assistant

2026 | github.com/abhinav29102005/nebula

- Built a **speculative streaming-RAG pipeline** that processes speech in 0.8 s chunks and starts retrieval before the speaker finishes, returning answers with document-section citations; all chats, settings, and embeddings stored locally in **SQLite**.
- Designed a **two-tier LLM architecture**: a fast 30B model for sub-150 ms intent and chunk decisions, and a 120B model for planning and tool calling; added a cross-platform tooling layer for audio, brightness, and system telemetry on Windows, macOS, and Linux.

Lumo: Real-Time Collaborative Whiteboard

Nov 2025 – Mar 2026 | lumo.bigboyaks.me | github.com/abhinav29102005/eraser

- Built multi-user sync over **8 typed Socket.IO channels** with operational-transform-style delta merging; sustained **60 fps** cursor broadcast under **4 KB/s** per user with **20 simultaneous editors**; backed by **42 JWT-secured REST endpoints** on FastAPI + PostgreSQL.
- Integrated **GPT-4** with per-region canvas context for AI-assisted diagram generation, holding AI round-trips under **1.2 s** in concurrent load tests.

Tezz: Transpiled Backend Language for the Edge

2026 | tezz.abhinavkumarsingh.tech | github.com/abhinav29102005/tezz-lang

- Designed a programming language with an **AST parser** and code generator that transpiles to JavaScript for Node.js and Cloudflare Workers; a short `service/route` definition generates routing, CORS, payload parsing, and error handling.
- Added `spawn` blocks compiled to **worker threads**, compile-time macros, and English/Hinglish syntax; published on npm as `tezz-lang` (npmjs.com/package/tezz-lang) with a VS Code extension for syntax highlighting and snippets.

TECHNICAL SKILLS

Languages: Python, C++, C, JavaScript, TypeScript, SQL

Systems: Distributed Systems (Raft), Concurrency, Async I/O, OS, Networking, System Design, Compilers (AST/parsing)

Backend: FastAPI, Node.js, Hono, REST, gRPC, WebSockets, Socket.IO

Data: PostgreSQL, Redis, SQLite, MongoDB, SQLAlchemy, Query Optimisation

Infra & Cloud: Docker, Nginx, GitHub Actions CI/CD, Linux, Cloudflare Workers, AWS (EC2, S3, Lambda), Azure

Frontend: React, Next.js, TailwindCSS, Three.js

AI & ML: PyTorch, ONNX, Scikit-learn, LangChain, LLM APIs

ACHIEVEMENTS

- 1st Prize**, Agentic AI Hackathon, Ulster University, UK abhinavkumarsingh.tech/cert_1.pdf
- Cyber AI Innovation Award**, University of Derby, UK abhinavkumarsingh.tech/cert_2.pdf
- Most Innovative Idea**, Pitchcraft, GTBIT Delhi abhinavkumarsingh.tech/cert_3.pdf
- AWS Academy Graduate, Cloud Foundations** (20-hour training badge), Sep 2026 credly.com/go/QqNYmw27
- URJA TIET Technical Executive**: maintained the event platform for **10,000+ participants** through a 72-hour peak registration window at Thapar's national sports fest.