



Dhvanil Gheewala

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🔗 [dhvanil-cse.github.io](https://github.com/dhvanil-cse)

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Education

Indian Institute of Technology Bombay

B.TECH WITH HONORS IN COMPUTER SCIENCE AND ENGINEERING

(Oct.2022 – Jun.2026)

(GPA : 8.69/10)

Key Courses : Formal Methods in ML, Logic and Automata Theory, Automated Reasoning, Game Theory and Algorithmic Mechanism Design, Compilers, Programming Paradigms, Discrete Structures, Calculus, Linear Algebra

Honors and Achievements

- Secured an **All India Rank 335** in **JEE Advanced '22** among **160 thousand** candidates (2022)
- Secured an **All India Rank 659** in **JEE Mains '22** among 1 million candidates with **100 percentile** in **Maths** (2022)
- Awarded the prestigious **Kishore Vaigyanik Protsahan Yojana Scholarship** (KVPY) scholarship by the Indian Government with **All India rank of 342** in **SA stream** in 2020 and **606** in **SX stream** in 2021 (2020,2021)
- Cleared **PRMO 2019** from Gujarat, Daman, Diu, Dadra & Nagar Haveli and advanced to **HBCSE's RMO** (2019)

Work Experience

QBF Proof Systems and Skolem Synthesis

IIT Bombay

Guide: Prof. Supratik Chakraborty and Prof. S. Akshay

(Jan 2025 - Present)

- Studied foundational QBF proof systems: Q-Res, LD-Q-Res, \forall Exp+Res, AReQS, and QRAT and analysed soundness
- Analysed Skolem function extraction from proofs, including DAG-based techniques from [Balabanov and Jiang](#), and began developing a direct extraction method from LD-Q-Res proofs without reduction to Q-Resolution

Revenue Maximising in Intermediary Network Auctions

IIT Bombay

Guide: Prof. Swaprava Nath

(Jan 2025 - Present)

- Modeled the Intermediary Network Auction problem as a weighted, unidirectional graph with agents and sellers as vertices, incorporating Bayesian type distributions and valuation models for buyers and intermediaries
- Designed allocation and payment rules for line and star topologies using [Myerson's optimal auction theory](#), and proved that extending to general trees is at least as hard as the Unit-Demand Multiple-Object auction problem

Product Engineer Intern : Optimising Whisper for Low Resource Languages

Sprinklr, Gurugram

Manager: Yoginkumar Patel

(Summer 2025)

- Fine-tuned and distilled Whisper models for low-resource ASR using high-resource counterparts, pseudolabeling, and subsampling; evaluated against zero-shots while experimenting with encoder freezing and WER thresholds
- Improved Whisper's transcription accuracy by integrating **n-gram KenLM** and **StableLM** to rescore top-*k* beam outputs, and enhanced the model by incorporating **secondary labels as prompts** to guide decoding

Software Development : Automata Tutor v3

Masaryk University, Brno

Guide: Prof. Jan Křetínský

(Summer 2024)

- Developed an automated assignment and practice system for Automata Tutor using **Flask**, **BeautifulSoup**, and **SOAP**, enabling generation of diverse problem types and users to practice independently; implemented grammar derivation verification, dynamic feedback generation, and user data storage for personalized assistance
- Created **templates** and **blueprints** for clean integration of new problem types and backend logic and dockerised both backend and frontend for easy deployment

Key Projects

Robust Non-Probabilistic Shield for Environmental Uncertainty

Formal Verification

Guide: Prof. Supratik Chakraborty

(Autumn 2024)

- Developed a robust pre-emptive non-probabilistic shield for safe reinforcement learning under partial observability, **handling up to k oblivious steps in n-step** windows, with formal safety guarantees else terminates the training
- Implemented a **Perception Loss Simulator** for testing dynamic shield wrapper to generate real-time safe actions under probabilistic perception loss

Compiler for Simple C-like Language

Compilers

Guide: Prof. Uday Khedkar

(Spring 2025)

- Built a compiler that incrementally supported a set of features in C including conditionals, control flow and recursion
- Generated intermediate representations - Abstract Syntax Trees, Three Address Codes, Register Transfer Language, MIPS assembly code with register allocation, using tools like lex and yacc for scanning and bottom-up parsing

A 4-Piece Chess Relocation

Formal Verification

Guide: Prof. Ashutosh Kumar Gupta

(Spring 2024)

- Developed an optimization framework using Stockfish to simulate and evaluate 4-piece pre-game relocations in chess, using combinatorial search and heuristic pruning to identify maximum advantage strategies

Simulation of a P2P Cryptocurrency Network and Smart Contracts

Guide: Prof. Vinay Ribeiro

Blockchains

(Spring 2025)

- Built a **discrete-event simulator** modeling transaction generation, network topology, block mining, propagation delays, state transitions using a blockchain tree structure with Proof-of-Work, fork resolution, orphan block recovery
- Simulated **selfish mining** and **eclipse attacks** using private chains and visibility manipulation; mitigated eclipse attacks through priority-based message handling and peer blacklisting, and benchmarked system performances
- Implemented a functional **Decentralized Exchange** using Solidity, modeling constant-product AMM logic, LP token issuance, swap functionality, and arbitrage opportunities across asymmetric liquidity pools

MangoDB : An Advance IMDB clone

Guide: Prof. S. Sudarshan & Prof. Suraj Shetiya

Databases

(Spring 2025)

- Built a full-stack IMDB clone using **PostgreSQL**, **React.js**, and **REST APIs**, with advanced search, content discovery, personalized recommendations, and interactive features for tracking and reviewing movies, shows, and books
- Integrated secure signup with email verification and DoS protection; added social features, review summarization using pre-trained model, and a weighted recommendation system based on genre, decade, cast, and ratings

xv6 Operating System

Guide: Prof. Mythili Vutukuru

Operating Systems

(Spring 2024)

- Extended memory management in xv6 by adding **on-demand paging** and **COW** optimisation on shared pages
- Added support for kernel space threads, a custom priority process scheduler and low level filesystem interaction

Sound based Data Link Layer and Routing Protocols

Guide: Prof. Vinay Ribeiro

Networks

(Autumn 2024)

- Implemented a sound-based link layer protocol using 4-bit tone encoding with RZ signaling for reliable transmission
- Designed an error control system using a custom **CRC-k algorithm** and Welch's method for signal denoising; integrated **CSMA/CA** with RTS/CTS and dynamic backoff to efficiently manage collisions
- Implemented a distance-vector routing protocol using custom logic for sending segments, receiving packets, and handling periodic events, and split horizon optimization to prevent count-to-infinity problems

Homomorphic Encryption for k-NN on the Cloud

Season of Code

Cryptography

(Summer 2023)

- Implemented a [research paper](#) on **secure and controllable k-NN queries** over encrypted cloud data, enabling **data owners** to preserve **privacy**, enforce **access control**, and retain full **query authority**
- Designed a robust, dockerised system with **Cloud Server**, **Query Server**, and **Data Owner**, using **Homomorphic Encryption** and used **SageMath**, and **sockets** to ensure secure, efficient, and modular communication

Algorithmic Trader

Guide: Prof. Ashutosh Kumar Gupta

Data Structures

(Autumn 2023)

- Executed **algorithmic trading strategies**, including arbitrage and median filter, while managing the order book through advanced **customised data Structures** to match compatible stocks **optimizing trade execution**
- Developed a **market simulation** featuring various traders and an autotrader that achieves **profitability within asymptotically polynomial time** that provides summary for all the traders and their profit at the end of the day

Position of Responsibility

Mentor - Brain Tumor Detection

(Winter 2023)

Analytics Club IIT Bombay

- Guided students in learning **CNNs** and hands-on implementation using **PyTorch** for robust **Brain Tumor Detection** models that can detect tumor upto the accuracy of 89%
- Mentoring on the fundamentals of **Neural Networks**, emphasizing the **Linear algebra** and **Calculus** involved and practical application through **NumPy** implementations, reducing reliability on pre-existing frameworks

Volunteer Tutor for Underprivileged Students

(2022–2023)

National Service Scheme (NSS)

- Participated in a year-long NSS initiative, mentoring Class 12 students preparing for the JEE entrance exam
- Taught basic topics in Physics and Mathematics, like Kinematics, Newton's Laws of Motion, and Trigonometry

Technical Skills

Languages	C/C++, Python, HTML, CSS, \LaTeX , Bash, Sed, Awk, VHDL, Arduino IDE, MIPS, x86, XML, Scheme, Haskell, Prolog, Yacc/Bison, Solidity
Software	Docker, Git, Ubuntu, MATLAB, SageMath, Z3, Flask, MySQL, Node.js, REST APIs, CGSuite
Libraries	PyTorch, TensorFlow, scikit-learn, Pandas, NumPy, Matplotlib, Seaborn, Transformers, Datasets, spaCy, NLTK, Socket, NetworkX, Weights & Biases (wandb)

Extracurricular Activities

- Created a fun animated short film "A Loyal Protector" and pixilated Mortal Kombat style action film (2025)
- Studied the profit model of **"Malabar Jewellers"** as a part of Management Course project (2022)
- Participated in **XLR8** and successfully made a remote-controlled 4-wheeler bot that completed the track (2022)
- Attended the **"Vijyoshi Camp"** at **IISc Bangalore** and gained insight about their ongoing research project (2021)
- Actively engage in badminton, cycling, walking, and exploring diverse places, their history and cultures