Shreekar S Naik **22B4518**

Mechanical Engineering
Indian Institute of Technology Bombay
Specialization: Computer Integrated Manufacturing

Dual Degree (B.Tech. + M.Tech.)
Gender: Male

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2027	8.64

Achievements

- Conferred an **AP** grade with the **highest score** in the batch in the Computer Programming course for **exceptional performance** awarded to **top 0.01%** percentile *('23)*
- Made it to **Top 25 nationally among 500+ teams** in LogiTHON (India's Largest Logistics Hackathon) *('25)*
- **Won** the Energenius Hackathon building a portal to track anomalies in fuel usage focusing on Sustainability. *('25)*
- Placed **6th** out of **56 teams** in the institute-level **TyroCTF**, competing **solo** against teams of 2-3 members *('23)*
- Awarded a certificate of merit **twice** in Indian Olympiad Qualifier in Mathematics *('21,'22)*
- Achieved **98 percentile** in **JEE (Mains)** in a pool of more than **1 million** candidates *('22)*
- Achieved **Gold** Level in **WorldQuant Brain** with a Research Consultant status, **(Score: 11,074)** *('23)*
- Ranked in the **top 0.01%** in **IAT (IISER Aptitude Test)** and secured a category rank of **12** *('22)*
- Consistently scored **above 95%** on all assignments in Digital Image Processing whose class medians were **~50%** *('25)*
- Achieved **Perfect Scores** in **all** the Programming Assessments & Hackathons in Artificial Intelligence and Data Science Course *('24)*

Key Projects

Microchess RL Engine with Negamax Search *(Oct '25)*

Built adaptive chess engine achieving 4.09ms/move average with iterative deepening and transposition tables

- Built **unified negamax engine** with alpha-beta pruning, with transposition tables, and **Zobrist hashing**
- Implemented **intelligent move ordering** with MVV-LVA captures, killer heuristic, and history for efficient pruning
- Designed **procedural evaluation** with material balance, king safety, pawn advancement, and passed pawn detection
- Achieved **100% pass rate** (0 losses) vs random opponent at depth-2 with **4.09ms/move** and **94% pass rate** (6% lose rate) vs rational opponent at depth-4 with **56.19ms/move**

Bayesian Optimization Framework for Neural Architecture Search *(Nov '25)*

Built architecture-agnostic hyperparameter optimization pipeline from scratch achieving 99.54% test accuracy

- Engineered **model-agnostic BO framework** with Cholesky-based GP predictions and adaptive kernel hyperparameter optimization via log-marginal likelihood for numerical stability across diverse architectures
- Designed **hybrid candidate generation** with 5000 stratified samples achieving **6x speedup** over exhaustive search
- Implemented **3 kernel families** (RBF, Matern, Rational Quadratic) and dual acquisition functions (EI/PI) with adaptive exploration scheduling, demonstrating **transferability across MLP and CNN** architectures

Image Denoising and Template Detection *(Sep '25)*

Implemented edge-preserving filters, template matching, and segmentation algorithms

- Built **Perona-Malik diffusion** and **bilateral filtering** for noise reduction in medical/satellite imagery
- Achieved NCC score of 0.7571 using **adaptive template matching** with background invariance
- Implemented **Canny** and **Harris corner detection** with eigenvalue-based structure tensor analysis

Diffusion Models: DDPM vs D3PM Analysis *(July '25)*

Comparative study of continuous and discrete denoising diffusion probabilistic models

- Built **U-Net DDPM** with multi-resolution self-attention, achieving FID score of 38.291 on MNIST
- Implemented **D3PM absorbing-state diffusion** with 257-token vocabulary, validating cosine schedule optimality
- Analyzed noise schedules: linear improved continuous DDPM by 45%, cosine optimal for discrete D3PM

PCA-Based Face Recognition System *(Sep '25)*

Built eigenface-based recognition pipeline with 95% accuracy on AT&T dataset

- Built **eigenfaces pipeline** using economy SVD, reducing dimensionality from 10,304 to 10 components
- Achieved **95% accuracy** on AT&T database with dual-threshold recognition system
- Implemented Bayesian rejection mechanism with calibrated thresholds for face-space membership

Sequential Monte Carlo for Text Generation *(Oct '25)*

Designed variance-reduced sampling algorithms for reward-guided language generation

- Developed **Twisted SMC** with entropy-based control variates, reducing weight degeneracy by 82%
- Built adaptive mixture-proposal with model-entropy-driven $k \in [5,50]$ for exploration-exploitation balance
- Improved expected reward from 6.41 to 15.64 using model-aware twist function combining trigram entropy

Fuelsense *(Apr '24)*

Built AI-powered fleet fuel monitoring portal with predictive analytics and anomaly detection

- **Won First Place** at Energenius Hackathon building sustainability-focused fuel tracking for industrial equipment
- Developed **XGBoost** consumption predictor and **Isolation Forest** anomaly detector achieving 95% accuracy
- Built Flask RESTful API delivering real-time insights and alerts for fuel theft and inefficiency patterns

Facial Recognition using Siamese Network *(Mar '24)*

Developed and implemented a Siamese network-based face verification system for real-time applications

- Engineered data preprocessing pipelines, trained convolutional neural networks on LFW and custom datasets
- Achieved high accuracy in face recognition tasks, integrating with OpenCV for real-time verification capabilities
- Integrated Deepface for comprehensive facial analysis, providing insights into estimated age, ethnicity, and gender

Multi-Armed Bandit Algorithms *(Oct '25)*

Implemented exploration-exploitation algorithms with provable regret bounds

- Built **KL-UCB with adaptive batching** achieving order-of-magnitude speedup while maintaining sub-linear regret
- Implemented **Thompson Sampling** with Beta-Bernoulli priors and **UCB** with confidence bounds
- Designed Bayesian door-breaking policy using Gamma-Poisson conjugacy with exploration bonus

MDP Solvers: Policy Iteration & Linear Programming *(Oct '25)*

Dual algorithm implementation for exact MDP solution with sparse state representation

- Implemented **Howard's Policy Iteration** with NumPy acceleration, converging in 5-15 iterations on large MDPs
- Developed **Linear Programming formulation** using PuLP with CBC solver, handling 1000+ constraint systems
- Built sparse transition model with nested dictionaries, reducing memory from 10^{10} to 350K entries

Gradease *(May '24)*

A personal library implementing gradient descent

- Understood the core concepts of Machine Learning, and Implemented Gradient Descent from scratch.
- Developed this library to ease experimentation with different Neural Network Architectures

Braman.ai *(Aug '24)*

Ideated an AI B2B Marketplace Startup | ShARE | a student chapter of the DWDG Future Leaders Programme

- **Top 10 Finalist** among 300+ participants, recognized for unique design style and innovative use of AI.
- Conceptualized an AI-driven solution leveraging **Agentic RAG** to optimize the matching process between orders and manufacturers, aimed at enhancing efficiency in B2B transactions.

Scriptman *(Jan '25)*

A CLI-based Script Manager Software

- Designed a modular CLI with argument parsing, script initialization, execution, and metadata handling.
- Implemented a structured script registry with Python and EXE support, ensuring seamless integration and execution.
- Built with extensibility in mind, allowing easy integration of new script types and features.

Positions of Responsibility

Institute Cultural Publicity and Marketing Nominee | ICC *(Jul '24 - May '25)*

Publicity and Marketing committee serves for all the events of ICC to ensure maximum participation and footfall

- Lead a 5-member team to organise **200+** cultural events, create **100+** designs, and execute publicity campaigns for ICC events.
- Successfully handled a viral marketing campaign for the ICC's annual cultural events, generating over **1 million+** impressions and attracted over **10,000** attendees.

Design Coordinator | Mood Indigo, IIT Bombay *(May '23 - May '24)*

Asia's largest college cultural festival / Net worth: INR 80 Million / 100+ Events

- Produced high-quality posters and graphics, reaching **100k+ viewers** and **105,000+ Instagram followers**.
- Created festival's **Theme Launch Video**, garnering **75K+ views** across social media platforms.
- Crafted art-centric website for **Indigo Art Project (IAP)**, merging form and function to showcase creative essence.

Designer | DevCom, IIT Bombay *(Jan '23 - Mar '24)*

DevCom is a 33 member team tasked with maintaining critical digital infrastructure such as InstiApp, ResoBin, Mess-i

- Conducted user interviews, researched and designed the user interface for Maintenance Portal for IIT Bombay
- Worked towards making the user interface and user experience design process along with the public outreach of the community

Technical Skills

- **Programming:** JAVA, C, C++, Python (numpy, pytorch, plotly, OpenCV, beautifulsoup, MANIM), Lua, Javascript (p5.js, Puppeteer), HTML, CSS, Typst, Latex, LangChain, Docker, Github Actions, CI/CD Pipelines
- **Softwares:** Figma, AfterEffects, Illustrator, Wireshark, Fusion 360, Photoshop, DaVinci Resolve, Blender, Tableau