Shivam Patel | **200070077**
Electrical Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 11/12/2002

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2024	9.47
Intermediate	CBSE	Hill Woods School	2020	97.00%
Matriculation	CBSE	Hill Woods School	2018	97.00%

Pursuing **Minors** in **Artificial Intelligence** and **Data Science** and **Honors** in **Electrical Engineering**

Scholastic Achievements

- Currently ranked $\mathbf{9^{th}}$ in Electrical Engineering department (B.Tech) **out of 100+** students *(2022)*
- Secured an All India Rank **551** in **JEE Main** among 1 million candidates *(2020)*
- Achieved an All India Rank **219** in **JEE Advanced** among 0.225 million candidates *(2020)*
- Accorded the Kishore Vaigyanik Protsahan Yojana (**KVPY**) fellowship with All India Rank **1165** *(2020)*
- Awarded the **National Genius Search Award** by the National Genius Search Foundation *(2017)*
- Stood among the **top 458** to clear the National Standard Examination in Physics (**NSEP**) *(2020)*
- Secured a **top 331** position in the National Standard Examination in Astronomy (**NSEA**) *(2020)*
- Conferred the **Academic Excellence Scholarship** by SOF foundation *(2017)*
- Won the **Zonal Gold Medal** in International Mathematics Olympiad (SOF) *(2019)*

Professional Experience

Electronic Tilt Estimation using Neural Networks *(May - July '22)*
Jio CoE for AI | Artificial Intelligence Intern *Reliance Jio Infocomm Ltd., Hyderabad*

- Utilised time-space weighted average of consumer demand data to design Neural Networks for **optimal electronic tilt prediction** of cell tower antennas, for pan-India deployment across multiple megacities
- Interpreted model predictions using Shapley Additive exPlanations (**SHAP**) and partial dependency plots
- Employed DBSCAN, K-Means and randomly initialised pivot centralisation for coordinate feature extraction
- Characterised discrete tilt prediction using regression and classification approaches, obtaining **MAE** of **0.59°** through regression model, and **0.07° MAE, 98.4% accuracy** through softmax classification model

Stochastic Climate Modelling *(May - July '22)*
Prof. Sandeep Juneja | Research Internship *Tata Institute of Fundamental Research, Mumbai*

- Studied **Statistical**, **Empirical** and **Dynamical** methods for long and short time-scale climate prediction
- Designed **Ensemble Multiple Linear Regression** and **Projection Pursuit Regression** models for statistical climate prediction, incorporating feature selection based on covariance and climatological arguments
- Explored published literature on dynamic climate modelling, with a special emphasis on modelling the Indian Summer Monsoon Rainfall using local and globalised **General Circulation Models**

Navigation Using Spiking Neural Networks *(July '22 - Present)*
Prof. Udayan Ganguly | Summer Undergraduate Research Program | IITB

- Analyzing SNN modules for emulating biological chemotaxis and klinokinesis based navigation in *C. elegans*
- Modelling **biological navigational behaviour** using **Leaky Integrate and Fire (LIF)** spiking neurons
- Adapting LIF and Amphid (L,R) neurons in Intel Loihi Neuromorphic Chip using SNN based software worm

Technical Projects

Autoencoder Architectures for Image Colorization and Noise Reduction *(Mar - April '22)*
Prof Biplab Banerjee | Course Project (Perfect Grade) *Introduction to Machine Learning*

- Designed CNN based autoencoder architectures, obtaining **RMSE** scores of **0.052** for **CIFAR-10 image colorization** and **0.096** for **MNIST Digits noise reduction** applications on unit range inputs
- Qualitatively explained data specificity of autoencoders by train-testing same model on different image classes
- Examined noise reducing capabilities of **conventional PCA** against **autoencoders** for salt pepper noise

Machine Learning for COVID-19 Data Analysis *(Oct - Nov '21)*
Prof Amit Sethi, Prof Manjesh K Hanawal | Course Project *Programming for Data Science*

- Obtained an **R2 score** of **0.854** on total COVID-19 casualty prediction using regularized linear models
- Performed **Hypothesis Testing** by utilising the χ^2 **Contingency Test** to validate the influence of medical parameters on the ICU admission of any patient, across all age groups and chronic illnesses
- Implemented **Multilayer Perceptron Neural Net** to predict the need of ICU admission of any patient based on blood and body parameters, obtaining a prediction **Accuracy** of **90.65%** , with an **F1-Score** of **0.905**

Visualising Deep Neural Networks *(Dec '21 - Jan '22)*
Winter in Data Science | Analytics Club

- Explored **Attribution Approach** for interpreting Deep Neural Networks, with a qualitative focus on image recognition neural architectures, by acquiring ground truth labels and studying the model activation maps
- Studied the applications of **Class Activation Maps, Occlusion Sensitivity Maps** and **Saliency Maps** to visualise CNN functioning for intuitive understanding of various image classification and detection algorithms

IITB-RISC Microprocessor Design *(March - April '22)*
Prof Virendra Singh | Course Project *Microprocessors*

- Designed an **8-register, 16-bit RISC** microprocessor with a Turing complete 17 instruction ISA in VHDL
- Developed the **flowcharts** and **datapath structure** for single and multicycle models from scratch
- Simulated the designed microprocessor models on Cyclone-IVE FPGA, implemented on Quartus software
- Utilised **data forwarding** and **stalling techniques** in six stage pipelined microprocessor to obtain a near perfect cycles per instruction ratio of unity, with clock rate adjusted to maximum time consuming step

Option Pricing Models and Their Accuracy *(July '22 - Present)*
Finsearch | Finance Club

- Investigating Options markets and pricing models along with fundamental mathematical underlyings
- Studying the **Black Scholes Model** and **Monte Carlo Simulations** for options pricing and evaluation

Lasso Game Project *(Nov '20 - March '21)*
Prof. B. Raman | Course Project *Computer Programming and Utilization*

- Devised a **user friendly interface** by developing on a base code, creating user manuals, executing real time score display, dynamic command interface and restructuring game flow for enhanced user experience
- Adopted an **object oriented approach** in **C++**, using **classes** to represent projectile bodies, the lasso, and moving coins, with recurring functions to model continuous step motion for parabolic projectiles

Positions of Responsibility

Core Member | Institute Investment Team | IITB *(July '21 - May '22)*

- Part of a dynamic 28 membered institute wide team, which focuses on **financial instruments, algorithms** and **indicators** with the goal of maximising profit forecasts through research and analysis models
- Created an **Investment Strategy Model** by utilising 52-wk High-Low markup and Market Cap for companies to determine distribution of investment across shortlisted companies, for varying levels of investor risk appetite
- Discovered **primary level markers** in financial ecosystems, trading systems analyses and risk management

Corporate Relations Coordinator | E-Cell | IITB *(June '21 - April '22)*

- Harmonised a 3-tier team to **develop and forge relations with venture capitalists** to expand the outreach of E-Cell and procure startup investments for **Eureka, Asia's largest business model competition**
- Contacted over **6 venture capital firms** in three phases, including initial databasing and contacting, directing partnership proposals and negotiating with corporate firms for navigating through a successful partnership

Technical Skills

Programming	Python, VHDL, C++
Python Libraries	Pytorch, Keras, Tensorflow, Scikit-learn, NumPy, Pandas, Matplotlib, Seaborn
Tools	GitHub, AutoCAD, LaTeX, Microsoft Office

Key Courses Undertaken

Electrical Engineering	Markov Chains and Queuing Systems, Probability and Random Processes, Signal Processing-1, Microprocessors, Control Systems, Analog Circuits, Digital Systems
Data Science	Programming for Data Science, Introduction to Machine Learning

Extracurricular Activities

- Completed 80+ hours of service under **National Service Scheme (NSS)**, Green Campus division *(2020-21)*
- Mentored **5** freshmen students as a part of **Summer of Science** in **Machine Learning** *(2022)*
- **Madhyama Prathama** in **Musical Arts in Tabla**, Akhil Bharatiya Gandharva Mahavidhyala *(2016)*
- **Chess master** in the U-11 and U-13 categories, and participated in various privately organised chess tournaments, including **charity events at Blind School, Ahmedabad**
- Secured **3rd position in Physics Bazinga Quiz (IITB)**, as part of a four membered team *(2021)*
- **Active birdwatcher** since 7 years, have observed and studied over **250 species of birds**
- **Head Boy**, Junior School at Hillwoods School, Gandhinagar *(2012-13)*
- **Competitive skater**, participated in speed and endurance skating tournaments in U-9 category *(2008-10)*
- **Stood 1st** in Hillwoods Technofest, for exhibiting a working model of Human Circulatory System *(2014)*
- **Secured 1st** position in Sparx General Knowledge Quiz, Mt. Carmel School, Gandhinagar *(2017)*
- Participated in the **National Patriotic Song Competition** organised by Bharat Vikas Parishad *(2015)*