Raj Patel

3rd Year Undergraduate, Department of Chemical Engineering
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Academic Qualifications

Year	Degree/Certificate	Institute	Performance
2022 - Present	B.Tech, Chemical Engineering	Indian Institute of Technology Kanpur	7.52/10
2021	CBSE (XII)	St. Xavier's High School, Fatehpur	96.2%
2019	CBSE (X)	St. Xavier's High School, Fatehpur	94.6%

Key Projects

Machine Learning with Python | *Chemineers, IITK* *Dec'23 - Jan'24*

- Developed a **linear regression model** and a **polynomial regression model** from **scratch** using **Numpy,Pandas** libraries
- Designed custom **regression models** from scratch with an **R2 score of 0.99** for predicting specific volume of saturated vapor
- Developed a **neural network** model using **TensorFlow and Keras** for **MNIST digit classification**, with an R2 score 0.98
- Created a **3-layer Artificial Neural Network** from scratch, using **Backpropagation** algorithm and **Relu** activation function

Face Detection and Student Entry System | *self project* *May'24 - June'24*

- Utilized image processing techniques, including generating **facial encodings**, to accurately recognize and identify students
- Developed an automated attendance system using **facial recognition** library for real-time student identification and marking
- Designed and implemented **Firebase** integration for student data management and seamless **real-time** attendance updates
- Enhanced system functionality by **extracting and displaying** student details (Name, total attendance,etc.) from the database

Forecasting using Time Series Analysis | *Stamatics, IITK* *May'23 - June'23*

- Acquired foundational knowledge in **prob & stats, linear regression**, and time series analysis, including forecasting techniques
- Utilized Python and libraries to analyze a sample dataset **(stock prices)**, applying forecasting methods to predict future trends
- Implemented Time Series forecasting models **MA, ARMA, ARIMA, SARIMA process** and their practical applications

Development of ML model to predict activity of catalyst | *Summer Project* *May'24 - June'24*

Mentor: Prof. Sri Sivakumar, Department of Chemical Engineering, IITK

- Prepared **amorphous alumina** and **silica** catalyst supports, using the **wet impregnation** and **colloidal synthesis** method
- Characterized particle sizes of alumina and silica; developed a **ML model** to predict catalyst efficiency based on support size
- Achieved an **R2 score** of **0.98** predicting catalyst efficiency using a model trained on amorphous alumina and silica particle sizes

Virtual Startup: Chemical Process Industries | *Course Project* *March'24 - Aprail'24*

Mentor: Prof. Sri Raghvendra Ragipani, Department of Chemical Engineering, IITK

- Establish a profitable **virtual enterprise** dedicated to researching, analyzing, and innovative practices to meet market demands
- Developed a comprehensive industrial process for manufacturing diphenic acid and mass balance analysis using **Aspen Plus**
- Evaluated the **approximate capital** required for constructing diphenic acid plant, including equipment, and operational costs

FPV quadcopter Drone | *Aeromodelling Club, IITK* *Aug'23 - Nov'23*

- Simulated an FPV quadcopter using CAD tools; programmed flight control algorithms for manual and autonomous flight controls
- Calibrated FPV drone using QGC software and **PixHawk Black Cube**, including radio, compass, and accelerometer calibration

Technical Skills

- **Programming Languages and libraries:** C++, C, Python, HTML, CSS, Numpy, Pandas, Sklearn, Matplotlib
- **Software and utilities:** Git, GitHub, Matlab, Jupyter Notebook, LATEX, Aspen, Canva Script, Excel

Relevant Courses

Fundamentals of Computing	Linear Algebra and ODEs	Computational Methods of Engineering
Multivariable Calculus	Single variable calculus	Intro to Chemical Engineering

Positions of Responsibility

- **Secretary (Events), Media and Cultural Council IITK** *(Jul'23 - Apr'24)*
  - Coordinated the organization of **fresher 3 days** event, engaging and managed the crowd of **1200+** undergraduate students
  - Coordinated the Galaxy inter-hall cultural competition, ensuring seamless execution and high participant engagement
- **Secretary, Prakriti cell** *(Jun'23 - Mar'24)*
  - Led and managed a plantation drive, actively engaging the campus community in environmental sustainability initiatives
  - Collaborated with Kanpur Ploggers to conduct cleanliness drives in various part of Kanpur, promoting sustainability
- **Secretary (Marketing), Antrangni** *(Sep'23-Oct'24)*
  - Negotiated and secured brand deals with multiple companies, significantly boosting fest sponsorship and managed on-campus

Extra-Curricular Activities

- Provided **academic guidance** to a village student, addressed study-related issues and improved their academic performance
- Conducted **NSS** village visits to raise awareness about **Ayushman Bharat Yojana**, educated villagers on healthcare benefits
- Mentored students at Science Mela organized by Professor **H.C Verma**, guided participants in conducting science experiments
- Participated in the Galaxy Inter-Hall competition, performed in a Dramatics play before an audience of over 200 students