



Vikhyat Agrawal  
Engineering Physics  
Indian Institute of Technology Bombay

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B.Tech.  
Gender: Male  
DOB: 08/07/2002

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2024	
Intermediate	Maharashtra State Board of Secondary & Higher Secondary Education	Narayana Junior College	2020	87.70%
Matriculation	ICSE	Bombay Scottish School	2018	94.60%

Pursuing a Minor in C-MInDS (Centre for Machine Intelligence and Data Science)

### SCHOLASTIC ACHIEVEMENTS

- Secured Department **Rank 8** in a batch of **66** students of Engineering Physics (2022)
- Achieved All India Rank **590** in **JEE Advanced** out of 0.15 million candidates (2020)
- Attained **99.80** percentile in **JEE Main** amongst 0.92 million candidates (2020)

### PUBLICATIONS

- Deep Multi-task Learning for Early Warnings of Dust Events: Evidence from The Middle East. R Sarafian, Nissenbaum D, Raveh-Rubin S, **V Agrawal** & Rudich Y. **NPJ Climate and Atmospheric Science** (2023)

### RESEARCH INTERNSHIPS

**Weizmann Institute of Science** | AI Research Intern (May '22 - Aug '22)

Prof. Yinon Rudich | Department of Earth and Planetary Sciences

- Employed **meteorological data** of 18 years for predicting dust storms in Israel, **24 hours ahead** in time
- Developed extensive **model interpretability** visualisation tools for various model architectures
- Qualitatively **explained model performance** by implementing **Explainable AI** tools like **Integrated Gradients, Saliency Maps, GradientSHAP** and demonstrated formation of clusters using dimension reduction
- Improved Recall by 9% and Precision by 20%** compared to prior state-of-the-art models in literature

**University of Alberta** | MITACS Summer research intern (May '23 - Jul '23)

Prof. Russell Greiner, Prof. Sunil Kalmady | Department of Computing Science

- Performed **comparative analysis** on censored hospital re-admission data between state of the art Temporal Point Process (TPP) models and Individual Survival Distribution models within the field of survival analysis
- Enhanced TPP models (HYPRO, DualTPP) for right-censored patient data by integrating event meta-data
- Implemented **multi-label sequence generation** for heart failure (HF) patients to predict HF hospitalization events bound to happen 3 years ahead and achieved an **Optimal Transport Distance of 1.13**

### WORK EXPERIENCE

**Marsh McLennan** | Data Science Intern (Winter '22)

Received a pre-placement offer for exemplary performance

- Performed extensive research on **Differential Privacy** and **Synthetic Data** generation algorithms
- Researched on data synthesizers such as GoogleDP, YData, Gretel and tested them on appropriate metrics
- Experimented, compared and quantified the performance of various generative models (CGAN, WGAN, CWGANGP, DRAGAN) for generating **synthetic tabular data** and **synthetic time series data**

### KEY PROJECTS

**Grammatical Error correction** | Course Project, Deep Learning for NLP (Spring '23)

- Designed and evaluated two models for Grammatical Error Correction (GEC) as part of a course project
- Adapted and improved a Multi-layer Convolutional Encoder-Decoder Neural Network for GEC
- Achieved a **BLEU score of 0.732** along with an **F0.5 score of 0.693** using GloVe word embeddings
- Fine-tuned the T5 model for GEC and achieved a **BLEU score of 0.871** and a **F0.5 score of 0.832**

**Integrated Visual Perception Projects** | Learner's Space, IIT Bombay (Jul '21 - Aug '21)

- Implemented a **Numeric digit classifier** which recognizes handwritten digits by implementing customized convolutional neural networks with an accuracy of **98.25%** using the **MNIST** handwritten digit dataset
- Implemented a **Sudoku Solver** which reads a Sudoku from an image and solves it using **backtracing**
- Designed an **Image Stitcher** which stitches multiple images to form a single panorama image

**Real-time Simulation and Visualization of 2-D Ideal Gas on Arduino** (Oct '22 - Dec '22)

Course Project, Electronics lab (Microprocessors)

- Designed and implemented a real-time simulation of a 2-D ideal gas using Arduino thus proving theory
- Visualised it by dynamically representing gas particles on an LED Matrix as the container for gas

- Devised an **ingenious approach** to calculate and display real-time pressure and temperature of the simulated gas and implemented collision detection algorithms to track the number of particle-wall collisions
- Expanded the project's scope to **showcase at Techfest**, Asia's Largest Science and Technology Festival

## OTHER PROJECTS

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**Assesing Solar Wind Synergy in India** | Supervised Learning Project (Jul '22 - Jan '23)

- Assessed the Spatio-temporal synergy between wind and solar energy resources for the Indian subcontinent
- Quantitatively analysed feasibility of **hybrid solar-wind power** plants in place of conventional sources

**Traffic Sign Classification using CNNs** | Winter in Data Science, Analytics Club (Winter '21)

- Implemented customised **LeNet** CNN architecture on the **German Traffic Sign Recognition** dataset
- Accurately classified **43 target classes** and achieved a test accuracy of **98.97%** on 34,000 images

**Covid-19 Data Analysis with MCGM** | Guide: Prof. Mitra, Department of Physics (Jul '21 - Jan '22)

- Evaluated and Assessed the success of **Contact Tracing Program** deployed by **MCGM(Government)**
- Effectively Visualized and cleaned large real-time **spatio-temporal Covid-19 government data**
- Extracted key insights by modelling the spread by using a **tree-based transmission graph model**

**Football Performance Analysis** | Course Project, **Programming for Data Science** (Oct '21 - Dec '21)

- Analyzed Premier League Data of the past 4 seasons and **created a team/individual performance index**
- Compared the standings obtained due to the performance index with the actual league standings and got **Kendall Tau Correlation coefficient of 0.68** with a significance (p-value) in the order of  $10^{-6}$

**Analysis of Ion Multiplicity Fluctuations** | Course Project, **Data Analysis and Interpretation** (Oct-Dec '21)

- Reported the event-by-event fluctuations of charged particle multiplicities and their distributions as a function of centrality in p-p collisions, generated by PYTHIA 8 Monte Carlo event generator
- Analyzed** and visualised data of **millions of events** on ROOT data analysis framework by CERN

**Digital Numeric Lock** | Course Project, **Digital Systems** (Oct '22 - Dec '22)

- Worked in a **team of 6** and designed a 4-digit Digital Numeric Lock circuit with a **reset-password feature**
- Utilized various **complex logical circuit** components like Registers, Latches, Comparators and Flip Flops

## POSITIONS OF RESPONSIBILITY

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**Core Team Member** | Data Analytics and Visualisation Team (Jul '22 - May'23)

- Provided **data-driven solutions** to **external organizations** and insights into **university grading data**
- Collaborated with Prof. Sunita Sarawagi from CSE, IIT-B for projects leveraging public Indian datasets by investigating **demographics** and **criminal** data by the government to **predict crime** indicator variables

## Teaching Assistantships

Basics of Electricity and Magnetism	Department of Physics	Mar '22 - Jul'22
Introduction to Classical Physics	Department of Physics	Mar'23 - May'23
Programming for Data Science	Centre for Machine Intelligence and Data Science	Jul'22 - Nov'22
▪ Conducted weekly <b>doubt solving</b> sessions for a class of <b>148 students</b> along with creation and correction of Machine Learning <b>programming assignments</b> of <b>15 students</b> based on real-life demographic datasets		

**Mentor for Artificial Intelligence** | Summer of Science, Maths and Physics Club (May '22 - Jul'22)

- Mentored **10 freshers** by providing curated handpicked resources in the field of artificial intelligence

**Mentor for Applied ML in Astronomy** | Summer of Coding, Web and Coding Club (Apr '22 - Jul'22)

- Instructed and **assessed 6 undergraduates** on topics in Machine Learning and Deep Learning libraries
- Cultivated their proficiency in crafting intelligent algorithms for Kaggle's **Stellar Classification** challenge

**Department Academic Mentor** | Department of Physics (May '22 - Jul'22)

- Mentored **6 sophomores**, actively involved in bridging the student-faculty gap and making their academic experience better by **writing blogs** about the department and **writing course reviews**

## TECHNICAL SKILLS

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- Programming Languages** - Python, C++, FORTRAN, MATLAB, R
- Deep Learning** - PyTorch, TensorFlow, Captum, OpenCV, Scikit-learn, Numpy, Pandas, Matplotlib
- Software** - **LaTeX**, LTSpice, Git, AutoCAD, Google Cloud computing, Jupyter notebook, AWS, Azure

## EXTRACURRICULAR ACTIVITIES

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- Attained **2<sup>nd</sup> place** in the RSL Badminton League held at a university-wide level (Mar '22)

- Bagged **1<sup>st</sup> Place** with a team of 3 in the Freshiesta Sports Quiz conducted by IIT-B Sports (2021)

- Secured **6<sup>th</sup>** place out of 30 participants in the Blitz Chess Tournament at CASCADE 25 (2017)