



Monu Kumar Pathak
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Qualifications	University	Institute	Year
M.Tech Specialization:	IIT Bombay Operations Research	IIT Bombay	2023-25

PROFESSIONAL EXPERIENCE

Cognitio Analytics India PVT LTD | Data Science Intern (May'24-Jul'24)

- Reviewed over **10 research papers** on Generative AI and documented their use case into the medical domain
- Preprocessed medical database containing **58,000** hospital admissions, **38,000+** adult patients and their diagnosis
- Developed **LSTM** and **Transformers** based models to predict patient next visit embedding from medical history
- Classified diseases into **5 classes**, achieved **19%** higher **AUROC** with **LightGBM** over end-to-end NN models

ACADEMIC WORK AND PROJECTS

A.I. for Advance Data Analysis and Simulation | Master's Thesis Project (May'24-Present)
Guide: Prof. Jayendran Venkateswaran

Objective: To develop a system that analyzes simulation data & generate meaningful insights using **Generative A.I.**

- Implemented **Data Farming techniques**, integrating the **explainable AI (XAI)** to analyze large simulation data
- Performed **1M+ simulations** & clustered the output data using **K- Means, DBSCAN & Hierarchical** algorithms
- Extracted insights & improved model transparency with explainability in **Neural Networks** and **Random Forest**

Simulation & Optimization of Operations in Rocktron PVT LTD | Course Project | Simulation (Jan'24-April'24)
Guide: Prof. Jayendran Venkateswaran

- Analyzed process, input, and layout data, fitting valid distributions using **KS Test** for the accurate simulation
- Utilized **DES** to model 5 different scenarios using **Arena** & analyzed worker & machine utilizations as **KPIs**
- Developed a plan to **reduce the workforce** by **51%** while ensuring it could handle **1.5x** of the current capacity

Simulation of On-Demand Food Delivery | Course Project | Simulation (Jan'24-April'24)
Guide: Prof. Jayendran Venkateswaran

- Leveraged **Agent-Based Modelling** for Food Delivery Systems and 2D-3D Animation Using **GIS** in **AnyLogic**
- Performed **10+** replications for **5 scenarios** to establish the tradeoff between the **service level** and **delivery cost**
- Identified the optimum location of parking & the number of delivery executives to achieve **99.81%** service level

Optimizing Flight Delays using Heuristics | Course project | Application of OR in Service Sectors (Jan'24-April'24)
Guide: Prof. Narayan Rangaraj

- Developed a **heuristic** based solution for a complex **multi-objective** problem to effectively **reduce flight delays**
- Utilized **Gurobi Solver** to generate **Pareto optimal solutions** & created a pool of efficient options for selection
- Improved Pareto optimal solutions using a **threshold-based approach**, iteratively minimizing the flight delays

Airline Ticket Sales Prediction using Time Series Forecasting | Self Project (Jan'24-April'24)

- Analyzed the given data to check for **stationarity** & decomposed it to get **level, trend, seasonality, and residue**
- Performed **ADF test** for stationarity & used **ARIMA, SARIMA, Prophet** and **XGBoost** to predict future sales
- Achieved **14.27% MAPE** using Facebook's Prophet model, surpassing SARIMA's **19.23%** in forecasting accuracy

Truck Delivery Optimization with Metaheuristics | Course Project | Optimization (Jan'24-May'24)
Guide: Prof. Vishnu Narayanan

- Utilized a dense network of **36 nodes**, including a depot, with X and Y coordinates & customer demand values
- Applied **Genetic Algorithm & Genetic K-means** metaheuristics to approximate optimal solution for the VRP
- Achieved an optimal cost of **1,702 units** with **3 vehicles** using GA, and **957 units** with **5 vehicles** using GKM

KEY COURSES & TECHNICAL SKILLS

- Machine Learning:** Principles and Techniques
- Mathematical Optimization Techniques**
- Languages:** Python, C++, Java, SQL, Kotlin,
- Softwares & Tools:** Hugging Face, Power BI, Matlab, OR Tools, OpenCV, Android Studio, Azure ML, Gurobi
- Deep Learning** for NLP
- Engineering Statistics**
- Libraries:** Scikit-Learn, Pytorch, NLTK, Pandas, Matplotlib
- Modelling and Computation Lab**
- Simulation Modelling and Analysis**

POSITIONS OF RESPONSIBILITY

Teaching Assistant | Modelling And Computation Lab (Jul'24 - Present)

- Mentoring **50+ students** and help them with conceptual doubts, conducting lab sessions in Python and Matlab

Department Cultural Secretary | Department of I.E.O.R. (Aug'24 - Present)

- Organized cultural and festive events for the department, such as Farewell, Freshers and Diwali celebration

P.G. Convener | Entrepreneurship and Business Club | E-Cell | IIT Bombay (Sep'23 - Apr'24)

SCHOLASTIC ACHIEVEMENTS & EXTRACURRICULARS

- Represented **IIT Bombay** on a **global level** in the **IISE Rockwell Student Simulation Competition** (2024)
- Achieved **AIR 23** in GATE 2023 and **AIR 196** in GATE 2022 Textile Engineering and Fiber Science. (2023)
- Developed an **IoT device** for hostel power conservation and secured **3rd place** in Jarvis Technical GC (2023)
- Awarded a **Bronze Medal** in the Tug of War General Championship for outstanding performance (2023-2024)
- Awarded a Silver Medal in 2024 and a Bronze Medal in 2023 in the Volleyball PG General Championship