Balbir Prasad

(+91) 6378533796
20je0246@me.iitism.ac.in, prasadbalbir1056@gmail.com
github
Linkedin

Education

Indian Institute of Technology(ISM) Dhanbad, Bachelor of Technology in Mining Engineering **8.00/10.0** Dec 2020—May 2024

Experience

Indian Institute of Science Bangalore | Undergraduate Research Intern **May-July 2023**

- Worked with Centre for infrastructure, Sustainable Transportation and Urban Planning under **Dr. Tarun Rambha** on **Network Optimization** Models for Traffic and Transit.
- My research aimed at working on an **open-source** tool to simulate transit systems and predict crowding/ congestion accurately.
- Experimented the passengers behaviour in case of ticket price change, events like delays and cancellations, their collective selfish choices of agents translate to flows and crowding in transit systems.
- The proposed framework is designed especially for dense large-scale networks like Bangalore.
- Utilised tools like **C++/OpenMP** to implement efficient algorithms for calculation of fare, in-vehicle travel time, waiting time, route occupancy, KD tree, etc and **Python/Pandas** for visualization and validation of the model.

Biofluids Lab, Indian Institute of Technology(ISM) Dhanbad | Project Fellow **May 2024-Present**

- The project aims at detecting the deviation of the nasal septum region in human being quantitatively and measuring the pressure drop hydraulic resistance post and pre septoplasty surgery using Machine Learning Model.
- Additionally, the goal of this project is devise a software to ease the doctors to provide optimal flow parameters of drug delivery given computed tomography of the patient in DICOM format.

Plaid Inc, Tokyo, JP | Software Engineer Intern **July-Aug 2023**

- Designed and developed an **AI bot** for Slack workspace, resulting in a **30%** increase in team productivity.
- Utilized **Docker** for containerization, reducing deployment time by **50%** and ensuring consistent performance.
- Leveraged **Terraform** for infrastructure provisioning and management for **GCP**, reducing provisioning time by **40%**.

Mercor | AI Benchmarker **July - Aug 2024**

- Evaluated and compared performance of **LLM** models such as GPT4o, Gemini Pro 1.5, Claude, etc on various prompts.
- Reviewed and annotated **100+** prompt and answer pair correcting model responses from wide area of tasks such as code generation, code summarization, language translation, etc.

Key Projects

Automating Nasal Septum Deviation Quantification and Pressure Correction pre and post septoplasty surgery Using Deep Learning **May 2024-ongoing**

- The goal of this project is to develop a methodology to detect the deviation and measure the extent of the deviation of nasal septum in human using state of the art deep learning model such as **UNet** and its variants.
- Utilized **Python/vtk** tool to preprocess the **DICOM** data to extract individual desired slices.
- Utilized the **label-studio** software to custom annotate(segment) the septum deviation region for over **1000+** samples data from wide variety of patients DICOM data such as C, reverse C, combination of C and reverse C shapes and their variants.
- Used **Pytorch** to implement UNet model to train for the pixel to pixel **segmentation** task on the prepared data.
- Evaluated the UNet model on different **metrics** such as dice score, IOU score, precision, recall, f-1 scores.
- Post processed the segmented outcome to finally quantify the extent of deviation of the nasal septum.
- Mapped the **CFD** based data of pressure correction with the extent of deviation to predict the pressure correction using Machine learning methods.

Particle Dynamics of Prolate Spheroids in weakly Corrogated Stenosed Artery **Sept 2024-ongoing**

- The project aims at modelling the blood flow in a **stenosed artery** to analyze the particle dynamics motion of **ellipsoidal** particles inside the wavy channel.
- Utilizing **physics informed neural network** to model different kinds of asymmetric wavy geometries assuming symmetric wavy channel as the base case.

Predicting the porosity of granite at elevated temperature using machine learning **Under Review(Earth Science Informatics)**

- The porosity property of rock is one of the major factors determining **efficient retention** of the geothermal energy as resource from subsurface of earth.
- The determination of porosity of rocks at elevated temperature in laboratory setting is a tedious and time consuming process.
- Implemented an **ensemble** of machine learning models (RF, SVM, XGBoost, KNN) to estimate the porosity of the rock at elevated temperature **(1000°C)** with over **95% accuracy**, **RMSE** score of < 0.4, **MAE** score of <0.38 on test data.
- Performed the **sensitivity analysis** (one way and two way coupled) on the independent variables determining the porosity variations.

Application of Natural Language Processing and Machine Learning for analyzing Mining Accident Reports and Automating the Process of Root Cause Analysis **Under Review(International Journal of Coal Science & Technology)**

- Analyzed the text data corpus of Mining hazards and fatality report data using regular expressions and pandas to derive statistical information.
- Developed **NLP** based model to predict the violation of rules and possible suggestions to mitigate future accidents in Indian coal mines.

Prediction of paper topics: ***Using Graph Neural Networks***

- Utilised **Networkx** to visualize the citation graph.
- Constructed a baseline classifier model employing **feedforward neural network** (FFN) blocks with skip connections.
- Engineered a custom **graph convolutional layer** and GNN node classifier for improved node classification.
- Incorporated node features, edges, and edge weights in the GNN model.
- Enhanced the GNN by introducing new instances as nodes in the graph, forming connections to existing nodes.
- **Technologies Used -** Python3, Pandas, Numpy, Networkx, Tensorflow

Key Courses Taken

Data structures and algorithms, Object Oriented Programming, Machine Learning, Deep Learning, Data Analytics, Advanced Quantum Mechanics, Cryptography, Graph Algorithms, Image and Video Processing
**All courses taken at Indian Institute of Technology(ISM) Dhanbad.*

Technical Skills

Programming Languages	C, C++, Python, Matlab, Rust, Go, SQL, Javascript
Core Skills	Data structures and algorithms, Object Oriented Programming, Machine Learning, Computer Vision, NLP
Libraries/Frameworks	Pytorch, Tensorflow, Numpy, Pandas, OpenCV, Scikit-learn
Tools	Git/Github, VS Code, Docker

Awards

- Global rank-19 at codechef long challenge (div-3)
- Selected in **Amazon** ML Summer School, May-2022.
- Selected as **Microsoft** Engage Mentee, June-2022.

Activities

Machine learning member at **CyberLabs**, official technical club of IIT(ISM) Dhanbad. March 2022 — May 2024
Student Co-Cordinatior **AI Club, NVCTI-IIT(ISM) Dhanbad** August 2022– May 2024