MUKUL MEHAR

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EDUCATION

Indian Institute of Science — **Aug. 2022 – July 2024**
M.Tech, Computational and Data Sciences — *Bengaluru, Karnataka*

Jaipur Engineering College and Research Centre — **Aug. 2018 – July 2022**
B.Tech, Computer Science and Engineering — *Jaipur, Rajasthan*

MENTORSHIP

Linux Kernel Development | The Linux Foundation — **Jan 2023 – May 2023**
Mentee

- Designed a system call for **memory check-pointing** in the Linux Kernel. Achieved a speed-up of 12.3 compared to the fork-based implementation.
- Made an **open-source contribution** by getting the patch accepted in the linux-staging tree.
- Explored ways to visualize and send a daily report of test results to team members using git.

PROJECTS

Option Pricing using Physics-Informed Neural Networks | *M.Tech Dissertation Project* — **May 2023 - Present**

- **Objective:** To find the fair value of different types of options that are traded in the financial market by solving their corresponding PDEs using Physics-Informed Neural Networks.
- **Progress:** Implemented PINNs architecture in python for pricing European Put options by solving Black-Scholes equation. Tested the model by using simulated data generated from the FTCS scheme. Achieved an at-par accuracy of that of classic ML methods using less data.

Large Scale Image Classification using Vision Tranformer | *Transformer, TensorFlow* — **Aug 2023**

- Designed an encoder-decoder architecture, incorporating **self-attention**, for image classification at scale. Used image preprocessing techniques to extract patches from images.
- Pre-trained the model on the ImageNet-21K dataset and achieved 2% higher accuracy than that of ResNet-50, when transferred on CIFAR-100.

Joint Sentence Classification in Medical Paper Abstracts | *LSTM, TensorFlow* — **May 2023**

- Developed a sequential sentence classification model using bi-directional LSTMs. Performed text data analysis, and used **tribrid embeddings** i.e., token + character + positional encodings, to transform the raw data.
- Designed a series of experiments to compare different models, such as **tf-idf**, **1-d convolution**, for the given task. The best-performing model achieved an F1-score of 89.9 on the PubMed-200k dataset.

Hybrid CPU-GPU KMeans clustering | *CUDA, MPI, OpenMP* — **April 2023**

- Implemented hybrid CPU-GPU KMeans clustering on a 1-billion dataset involving **MPI**, **OpenMP** and **CUDA** parallelization, using CPU cores and GPUs of multiple nodes simultaneously.
- Experimented with different values of K, and different numbers of threads, processes, and nodes. Performed experimental comparisons against CPU-only and GPU-only implementations.

Rotating Staircase Deadline Scheduler | *C, Linux-6.0.19, Git* — **March 2023**

- Built and integrated the Rotating Staircase Deadline Scheduling (RSDL) policy with the existing Linux kernel.
- Registered a new system call in the kernel to isolate a CPU core. Tested the RSDL scheduler on the isolated core.

RELEVANT COURSEWORK

- Linear Algebra
- Probability and Statistics
- Deep Learning
- Numerical Optimization
- Scalable Systems
- Tensor Computations for Data Science
- Parallel Programming
- Advanced Operating Systems

TECHNICAL SKILLS

Programming Languages: Fluent in C, C++, and Python; Prior Experience in JavaScript and Solidity
Libraries and Frameworks: Tensorflow, Keras, Scikit-learn, Numpy, Pandas, MPI, CUDA
Other: SQL, Linux, Git

ACHIEVEMENTS

- Captained district U-19 cricket team in a state-level tournament organized by Rajasthan Cricket Association. Achieved 2nd position in the pool.
- Gold medalist in CBSE Table Tennis State Championship.
- Represented district U-25 football team at the open state tournament.