

# Shirsh Mall

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## EDUCATION

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### Indian Institute of Technology Delhi

New Delhi

*Master of Science (MSc) in Physics*

*Aug 2021 – May 2023*

- Cumulative GPA : **7.4/10.0** | IIT JAM Rank : **97**
- Relevant Coursework: Classical Mechanics, Electromagnetism, Thermodynamics, Statistical Mechanics, Quantum Mechanics, Special Relativity, Optics, Nuclear Physics, Particle Physics, Condensed Matter Physics, Solid State Physics, Computational Physics, Deep Learning for Mechanics, Probability and Statistics

### Dyal Singh College, University of Delhi

New Delhi

*Bachelor Of Science (BSc) in Physics Honours*

*Aug 2018 – July 2021*

- Score : **8.5/10.0**

### Govt. Sarvodaya Bal Vidyalaya

Delhi

*Senior Secondary Higher School*

*April 2015 – May 2017*

- Score : **89.6%** | Science (PCM)

## TECHNICAL SKILLS

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- **Programming Languages:** Python, Basic C++
- **Machine Learning & Deep Learning:** Machine Learning Algorithms & Deep Learning (ANN, Auto-Encoders, LSTM, Tensorflow, Pytorch), Computer Vision(CNN), Natural Language Processing(NLP), Explainable AI (Shap), Model deployment (Streamlit, Heroku)
- **Data Science:** Exploratory Data Analysis (EDA), Data Preprocessing, Feature Engineering, Statistical Analysis, Time Series Forecasting, Elementary Excel
- **Coursera Courses and Certification:**
  1. Generative AI with Large Language Models - DeepLearning.ai and AWS
  2. ChatGPT Prompt Engineering for Developers - DeepLearning.ai
  3. Deep Learning Specialization - DeepLearning.ai

## PROJECTS

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### Fine-tuning Large Language Model for Question Answering

- **Fine-tuned Flan T5 Large** model on **Open Orca** dataset for **question-answering tasks**. Utilised the Hugging Face library, modified prompts. Achieved promising results with base model on 25k data points, with the training process ongoing.
- Employed **QLora** layer and optimised fine-tuning setup to enhance language understanding and response generation for question and answer tasks on the Open Orca dataset. Implemented efficient single and multi-GPU training using quantisation, demonstrating significant progress and potential for further improvements.

### Text Generation using Scriptures of game of thrones book

- \* Performed **pre-processing** of the GOT book's text data, **tokenization**, and **feature extraction**. Implemented a **Text Generation Model** using an **LSTM** neural network, and the model was able to generate new coherent text with context and relevance.

### Visoin-NLP Deep Learning Model for Image Captioning

- \* Developed two image captioning models using TensorFlow. The first model was built from scratch, combining a **GRU** (Gated Recurrent Unit) with a Vision Transformer (**ViT**) architecture.
- \* Utilized **pre-trained ViT** and **BERT** (Bidirectional Encoder Representations from Transformers) models from Hugging Face, fine-tuned on the **Flickr8k** dataset.
- \* Both models were trained to generate descriptive captions for images, showcasing the application of **generative AI** in the context of computer vision and natural language processing.

### MSc Project: Data Analysis of Particle Collisions at Large Hardon Collider

- Simulating proton-proton collision events, generating data of physical quantities using Linux-based simulation software, and constructing new features and images using theoretical learning
- Building Regression predictive models for physical quantities, Classification and Anomaly detection models to classify signal and background events using ANN, CNN and Auto-Encoders. Creating Clustering models for Jets clustering using Anti-KT Algorithm

### Assignments:-

- **Implementation from Scratch** (using numpy and scipy) :-
  - \* Univariate and Multivariate Non-Linear Regression for projectile motion problem.
  - \* Binary classification, One-vs-all multi-class classification and Softmax multi-class classification algorithm using various optimization techniques.
  - \* Artificial Neural Network(ANN) for Binary and Multi-class classification using MNIST datasets.
  - \* Convolutional Neural Network(CNN) for Multi-class Classification using MNIST datasets
  - \* Vanilla RNN network for simple time series dataset
- **Physics Informed Neural Network (PINN):-**
  - \* Implemented a Physics Informed Neural Network (PINN) using PyTorch to solve the differential equations of static bar problems for given loading conditions (forward and inverse problems) and the partial differential equations for the elasticity of a 2D plane.
  - \* Implemented DeepONet architecture and trained neural network for learning Integration operator.

## EXTRA CURRICULAR ACTIVITIES

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### Volunteering (Teaching) - Robin Hood Army (NGO)

Dec 2017 - Sep 2021

- Organized weekly education drives for underprivileged students, taught science and maths and implemented lesson plans and assessments to boost learning outcomes
- Maintained effective communication among volunteers of our academy and with the POCs of the other academies.