Mantri Krishna Sri Ipsit

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Ipsit Mantri • Senior Undergraduate

EDUCATION

Degree	University	Institute	Year	CPI/%
Bachelor of Technology	IIT Bombay	IIT Bombay	2022*	9.3
Intermediate/+2	BIE Telangana State	Sri Chaitanya Narayana Jr. College	2018	98.40
Matriculation	BSE Andhra Pradesh	Sri Chaitanya High School	2016	10.00

*Majors in **Electrical Engineering** and Double Minors in **Computer Science** and **AI & Data science**

RESEARCH INTERESTS

Social Networks, Machine Learning on Graphs and Structured Data, Applied Machine Learning, Image Processing

INTERNSHIPS

Automation of Query Expansion Pipeline — **Microsoft IDC**
Software Engineer Intern, Defensive Search @ Bing — *May'21-July'21*
- Developed a framework to automate the query expansion process to improve **agility** and **quality** using crowdsource
- Reduced query treatment time from **1 day to 3 hours** by using query sampling techniques to minimize the budget
- Built a **job manager** for submitting and tracking multiple workflows enabling **concurrency** without conflicts

Handbook on Algorithms and Digital Logic — **Unacademy**
Content Developer, India's largest learning plaform — *December'20-January'21*
- Curated a set of practice problems on various **Data Structures** for **GATE aspirants** of Computer Science stream
- Prepared **error-free** and detailed solutions for the problems after throughly **reviewing** the concepts involved

MicroMARS: Mars Rover Navigator — **Microsoft IDC**
The Mars Colonization Program, Engage 2020 — *June'20-July'20*
- Developed a web app in **Angular** to simulate the movement of a mars rover by ideating on different scenarios
- Implemented various **shortest-path** and **maze-generator** algorithms like Dijkstra,Floyd-Warshall,Prim&Sidewinder
- Modelled the **terrain** of Mars on a 2D grid using different types of obstacles and tackled **travelling salesman problem**

RESEARCH EXPERIENCE

Combinatorial Algorithms on Graphs — **Indian Institute of Technology,Bombay**
Prof. Abir De, Department of Computer Science and Engineering — *July'21-November'21*
- **Goal.** Coming up with neural gadgets to solve NP-hard combinatorial graph algorithms in a supervised fashion
- **Impact.** Speed up in inference on billion sized graphs with applications in areas like shortest path, node similarity etc.

Climate risk exposure of firms in S&P 500 using NLP — **Indian School of Business,Hyderabad**
Prof. Nitin Kumar, Center for Analytical Finance — *April'20 - June'20*
- Reviewed literature on traditional **linguistic** analysis in finance and current S.O.T.A deep learning methods
- Extracted text from websites and various articles using **Python** and modelled the topics using **LDA** and **TSNE**
- Built a deep **LSTM** model to tag climate related words in 10-Ks to come up with a measure of risk using **PyTorch**

Automated Gleason Grading using Deep Neural Networks — **Indian Institute of Technology,Bombay**
Prof. Amit Sethi, Medical Deep Learning & AI Lab (MeDAL) — *January'20 - June'20*
- Gleason grading is a prognostic technique for **prostate cancer**;based on specific pateterns present in prostate biopsies
- Approached this problem seperately as image **classification** and **segmentation** on whole slide images using **PyTorch**
- Experimented with attention based multiple instance learning (**A-MIL**) and acheived a patch level accuracy of **52.4%**
- Achieved 0.1 higher **Cohen's Kappa** Score of **0.53** between model and ground truth using the segmentation approach

Multi-Organ Nuclei Segmentation — **Indian Institute of Technology,Bombay**
Prof. Amit Sethi, Medical Deep Learning & AI Lab (MeDAL) — *December'19*
- Trained a **sliding window** CNN and a UNet seperately, on over **22,000** hand annotated nuclei spanning 4 different organs and tested them on **three unseen organs** for three classes in **Pytorch** on H&E stained images
- Implemented Structure-Preserving Color Normalization (**SPCN**) on WSIs using **SNMF** and SPAMS package
- Adopted **iterative region growing** to get n-ary Nuclear Maps and used **Aggregated Jaccard-Index** as accuracy metric

SCHOLASTIC ACHIEVEMENTS

- Received a **certificate of merit** for extraordinary performance in Digital Signal Processing course (2020)
- Secured an All India Rank of **242** in JEE Advanced among over 0.2 million candidates (2018)
- Secured an All India Rank of **123** in JEE Mains (Engineering) among over 1.3 million candidates (2018)
- Placed in **national top 1%** in NSEC and NSEA and selected to appear for Indian National Chemistry Olympiad (INChO) and Indian National Astronomy Olympiad (INAO) (2018)
- Recipient of the **KVPY Fellowship** by Department of Science and Technology, **Government of India** (2016)

TECHNICAL SKILLS

Languages: C++,Python,MATLAB,C#,VHDL

ML: PyTorch,Tensorflow,Scikit-Learn,NLTK,Gensim

Boards: Arduino, Raspberry Pi, 8051μC

Web Dev: HTML,CSS,JS,TS,Angular,Flask,MySQL

Software: Git,GNURadio,NgSpice,LaTeX,GNUPlot,XCircuit

Others: Cirq, Tensorflow Quantum, DGL, PyG

KEY PROJECTS

Quantum Machine Learning for HEP at LHC — **Machine Learning for Science Umbrella Organization**
Evaluation Task, Google Summer of Code 2021 — *March'21-April'21*

- Implemented basic **quantum circuits** involving different gates and measured probability of states using **Google Cirq**
- Implemented a Quantum Generative Adversarial Network (**QGAN**) using Cirq and **Tensoflow Quantum** (TFQ) to seperate signal events from background events from High Energy data
- Implemented a Quantum Convolutional Neural Network (**QCNN**) using TFQ to perform **binary classification** on particle physics data
- Implemented a **Node Classification** and **Graph Classification** Graph Neural Networks (GNN) using **Deep Graph Library** (DGL) for quark/gluon jet classification

Autorickshaw Fare Simulator using 8051 — **Indian Institute of Technology,Bombay**
Microprocessors, Wadhwani Electronics Lab — *March'21-April'21*

- Programmed an 8051 μC in embedded C to simulate real-time fare calculation modelling traffic delays and waiting times
- Employed the concepts of timers and interrupts to make efficient use of resources available on the μC to increase throughput

Lazy Prices — **Indian School of Business,Hyderabad**
Mr.Anand Sekhar, Center for Analytical Finance — *April'20-June'20*

- Lazy Prices is a **trading strategy** based on the reporting practices of firms; using the complete history **regular filings**
- **Backtested** this strategy on **Indian Equity Market** by reviewing a paper by **Prof.Lauren Cohen** of HBS using **python**

Constellation Detection — **Indian Institute of Technology,Bombay**
Institute Technical Summer Project, Institute Technical Council — *June'19-July'19*

- Devised a mechanism to detect constellations from an image, irrespective of rotation or scaling
- Processed images using OpenCV library and implemented **Geometric Hashing** for every 4-tuples of stars
- Used **similarity metrics** like L1 and L2 norms, cosine similarity and gaussian similarity to compare hashcodes
- Designed a graphical user interface using **Tkinter** library in python to check for the constellations

Sketching Images using Python — **Indian Institute of Technology,Bombay**
Hobby Project, Python Art — *June'19*

- Developed an algorithm in python to sketch any given image using the concepts of **edge detection** from image processing
- Used **OpenCV** library to detect the edges in an image and **Turtle** library to draw them on a blank canvas

Bluetooth Modulated Bot — **Indian Institute of Technology,Bombay**
XLR8 Competition, Electronics & Robotics Club — *August'18-September'18*

- Constructed a four-wheeled bot with **Differential** steering via H-Bridge motor driver
- Controlled the bot via **wireless interconnection** between onboard bluetooth module and a mobile app

COURSE PROJECTS

Face Recognition using Tensorflow — **CS 419: Introduction to Machine Learning**
Prof. Abir De, Department of Computer Science and Engineering — *April'21-May'21*

- Implemented the **FaceNet** model developed by Google using **Keras subclassing API** for a custom model
- Trained the model using **triplet loss** to effectively learn the embeddings of the images irrespective of **pose** and **illumination**
- **Visualized** the learnt embeddings using PCA, t-SNE and interdistance matrix and tested the model on personal photographs

Statistical Compressed Sensing of Gaussian Mixture Models **CS 754: Advanced Image Processing**
Prof. Ajit Rajwade, Department of Computer Science and Engineering *April'21-May'21*

- Exploited the **statistical properties** of natural images to efficiently reconstruct a collection of images using a **linear** decoder
- Compared the results of SCS with conventional CS using a dictionary learnt via **K-SVD** on Berkely Segmentation dataset
- Performed **blind CS** on standard images like **Lena** and Peppers and contrasted the results with SCS and CCS in **MATLAB**

Fast Texture Transfer using Wavelets **CS 663: Digital Image Processing**
Prof. Ajit Rajwade, Department of Computer Science and Engineering *November'20-December'20*

- Used **wavelet-based image fusion** to transfer texture from a texture image to a source image taking **linear time** wrt size.
- Employed **Cohen–Daubechies–Feauveau** 9/7 wavelet decomposition to extract the approximation and detail coefficients
- Applied 2d-DWT on Y channel of Y-Cb-Cr color space and used **histogram matching** as a post-processing technique

Wavelet Based ECG Delineator and ECG Data Compression **EE 338: Digital Signal Processing**
Prof. Vikram Gadre, Department of Electrical Engineering *November'20-December'20*

- Used **Singular Value Decomposition** to compress the ECG signals by expoiting their periodicity in time
- Employed filter banks based on **quadratic spline wavelet** and *Algorithme à trous* to robustly delineate a noisy ECG signal
- Tested our procedure on ECG databases from physionet and achieved accuracies greater that 95% even on signals with artifacts

KEY COURSES UNDERTAKEN

EE: Wavelets, Control Systems, Comminucation Systems, Microprocessors, Digital Signal Processing, Probability & Random Processes, Analog Circuits, Digital Systems, Network Theory, EM Waves

CS: Advanced ML†, Optimization in ML†, Introduction to ML, Advanced Image Processing, Digital Image Processing, Operating Systems†, Logic in CS, DSA, Computer Networks, Programming 101

Mathematics: Calculus,Linear Algebra,Differential Equations - I & II,Complex Analysis

Misc.: Quantum Physics and Applications, Basics of Electricity and Magnetism, Philosophy, Economics 101

†to be completed by May 2022

POSITIONS OF RESPONSIBILITY

Undergraduate Teaching Assistant **Indian Institute of Technology,Bombay**
Freshman and Senior Undergrad Courses

- CS 419M: Introduction to Machine earning | Prof. Abir De — January'22-May'22
- MA 108: Ordinary Differential Equations | Prof. Prachi Mahajan — May'21-June'21

Web Nominee, Hostel Affairs Council **Indian Institute of Technology,Bombay**
Tier-2 Position, Council formulates policies with Institute functionaries *July'20-May'21*

- Created and **deployed** portals used by institute functionaries and students for **vital operations**
- Revamped Married Research Scholar Portal for **Hostel Coordinating Unit** to manage operations in **3** buildings
- Developed a website for **DoSA Office** with information about various student activities and respective POCs

Class Representative **Indian Institute of Technology,Bombay**
EE Students' Association, Department of Electrical Engineering *August'20-May'21*

- One of the three Class Representatives of a batch of **150** third year undergraduate students in Electrical Engineering
- Responsible for **bridging the gap** between the students and the professors pertaining to both academics and **logistics**
- Aided the instructors and the students to adapt to the new normal of **online education** by being their **first POC**

Student Mentor **Indian Institute of Technology,Bombay**
Institute Technical Summer Project, Institute Technical Council *April'20-June'20*

- Mentored **twelve** freshmen on **three** different projects in the field of object detection & localization
- Scrutinized mentees' progress periodically and provided regular **assistance** to successfully finish the projects

EXTRA-CURRICULAR ACTIVITIES

- Volunteered as an instructor at **MastAI ki paathSHALA** - an online initiative by experts from academia and industry to teach AI free of cost to both students and professionals during the covid-19 lockdown (2020)
- Was among the **top 3** teams who presented their work to students from various colleges of India as a part of **Immersive Pedagogy Workshop** under the **'KITE'** initiative of the **MHRD, Govt. of India** (2019)
- Contacted **100+** alumni out of a total of **12000+** as a part of Phonathon, a telephonic marathon for contacting alumni under Student Alumni Relations Cell (SARC), IIT Bombay (2019)
- Participated in the **Web Development** Bootcamp at Technical Summer School, IIT Bombay (2019)
- Successfully completed an year-long training in **Lawn Tennis** under **National Sports Organization** (2019)
- Volunteered in **IIT Bombay Half Marathon** organized by IIT Bombay Sports (2018)
- Attended the **Vijyoshi Science Camp** organized by the **Indian Institute of Science** (IISc) (2017)