

SAMRUDDHI PAI

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EDUCATION

Carnegie Mellon University (CMU), Pittsburgh, PA

December 2022

Master of Science in Electrical and Computer Engineering

(GPA: 3.81/4.0)

Coursework: Image Processing, Deep Learning, Distributed Systems, Multimodal ML, Autonomous Driving, ML for Large Dataset

Dwarkadas J. Sanghvi College of Engineering, Mumbai University (MU), India

October 2020

Bachelor of Engineering in Electronics

(CGPA: 9.18/10.0)

Coursework: Applied Mathematics, Control System, Structured Programming Approach, Database Management System

PROFESSIONAL EXPERIENCE

Carnegie Mellon University - Graduate Research Assistant

May 2021 - Present

- Implemented Fast Gradient Sign Method (FGSM) in embedding space to generate adversarial binaries and train MalConv malware detector, making it robust to FGSM attacks (accuracy = 99.89%). Improved training time complexity on GPU by ~50% using Keras's multiprocessing APIs
- Co-authoring a paper analyzing the model's robustness on other attacks, under review at USENIX'22 conference

Indian Institute of Technology Bombay, Mumbai, India

Project Research Assistant

July 2020 - January 2021

- Performed comprehensive data analysis and devised experiments in Python for finding optimal freight trains paths for Indian Railways leading to efficient resources allocation (of crew and goods), thereby increasing net revenue by 3% (\$48.63 million)
- Automated end-to-end scheduling of Indian coaching trains, speeding up the time-table generation process by 75% (30 down to 7 days). Post-process analysis was done using SQLite and interactive dashboard was created using Plotly library.

Quantify Capital, Mumbai, India - Quant Research Associate (Intern)

April 2020 - July 2020

- Designed and wrote quantitative trading algorithms in Python and back-tested them using Backtrader library, to maximize profits and capped daily loss to 10% of buying power
- Extracted, analyzed, and interpreted large financial data sets to identify trading opportunities like creating straddles and strangles

ACADEMIC PROJECTS

Depth Perception using Monocular Vision, CMU

February 2022 - Present

- Creating depth maps from single image for generating pseudo lidar 3D point cloud. Aiming at creating 3D bounding box, improvise it using instance segmentation and simulating it on CARLA simulator. Benchmark on KITTI dataset

ALFRED - generating language directives for household tasks, CMU

February 2022 - Present

- Aiming to fine-tune language models (BERT) and vision models (CNNs) for creating sub-tasks that can be interpreted by an agent/robot, given a complex household task. Validate on ALFRED dataset and simulate on THOR
- Taking language directives and segmented images of the scene, model aligns both modalities and plans a path using graph models

Unsupervised Image Classification, CMU

September 2021 - December 2021

- Developed a self-refinement neural-network model inspired by MIX*EM and RUC research papers. A weighted stack of embedding layers was used as a feature extractor for clustering and labeling the input images. Benchmarked on STL-10 and CIFAR-10 datasets

MyTorch - Text Generation and Prediction, CMU

August 2021 - December 2021

- Wrote Deep Learning modules like PyTorch for linear layers, activation functions, losses, RNN, GRU, CNN, LSTM, backpropagation, dropouts, beam decoder. Used these for text generation and prediction with a negative log-likelihood of 2.8

Phoneme Recognition from Mel-Spectrograms, CMU

October 2021 - November 2021

- Built LSTM based model using CTC beam decoder for recognizing phonemes from the given Mel-Spectrogram data. Hash-map data-structure was used for generating phoneme map, evaluated the model by calculating Levenshtein distance which came to be 7.42 on test data

MoonRanger Robot, CMU

July 2021 - November 2021

- Developed and executed test plans (unit tests, thermal testing, functionality testing, and fault testing) for space graded avionics circuits for MoonRanger - an autonomous lunar micro-rover being developed by CMU in collaboration with NASA and Astrobotic

Autonomous Quadruped Robot, MU

August 2018 - February 2019

- Developed image processing based MATLAB application that traced path and detected obstacles during navigation of a self-built quadruped robot. Published a paper in ICIMA 2020, Springer - DOI: https://doi.org/10.1007/978-981-15-4485-9_36

TECHNICAL SKILLS

Programming Languages: Python, C, Bash

Cloud Services: AWS EC2 instance, Amazon S3

Databases and Visualizations: Microsoft SQL, Tableau

Design and Simulation Software: MATLAB, LT Spice, Altium Designer

ML Frameworks and Libraries: PyTorch, TensorFlow, Keras, Scikit-Learn, Numpy, Pandas, Matplotlib, SQLite, PySpark, Plotly

LEADERSHIP AND EXTRACURRICULAR ACTIVITIES

- Robotics Team Captain, DJS RoboCon, India

March 2018-June 2019

- Volunteered, FIRST LEGO League competition, RoboFun Labs, India

November 2019-January 2020