Pushkal Mishra

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Professional Summary

Hello! I am a PhD student at UC San Diego. I've completed my BTech at IIT Hyderabad majoring in Electrical Engineering with a minor in Computer Science. My core research interest lies in the fusion of signal processing and machine learning, and its utility in real-world applications such as in audio, image, video and wireless communications. My objective is to delve further into this field through intensive research and experimentation, potentially looking towards hardware implementations of technologies.

Education

University of California San Diego
San Diego, USA

PhD in Electrical and Computer Engineering
Aug 2024 - Current

- Pursuing PhD in Wireless Communication and Sensing
- PI: Prof. Dinesh Bharadia, Lab webpage: https://wcsng.ucsd.edu/

Indian Institute of Technology Hyderabad
Hyderabad, India

B.Tech in Electrical Engineering and Minor in Computer Science (CSE)
Nov 2020 - May 2024

- Overall CGPA: **9.33 / 10**

Royale Concorde International School
Bangalore, India

High School and Senior Secondary - CBSE
June 2005 - Aug 2020

- 12th grade overall percentage: **96.2%**
- 10th grade overall percentage: **90%**

Research Projects

Realistic Radar Simulation Framework for CARLA
UC San Diego

Under the supervision of **Dr. Dinesh Bharadia**, ECE dept
Aug 2024 - Current

- Integrated an effective digital twin of radar sensor in Carla simulation framework.
- Developed and trained a robust end-to-end autonomous driving model using camera and radar sensor.
- Submitted to CVPR 2025, currently under review.

Graph Learning and Data Inpainting via Deep Neural Networks
IIT Hyderabad

Under the supervision of **Dr. Aditya Siripuram**, EE dept
Sept 2022 - Current

- Devised an algorithm that simultaneously performs **data restoration** in lossy environments and constructs a pertinent graph structure.
- Implemented a **closed-loop feedback mechanism** for graph learning which is guided by the inpainting performance.
- Achieved **F1-Score of 0.92** among learned graph and actual graph for synthetic data. Additionally, demonstrated robust performance in the presence of **10dB noise** and above on temperature sensor network datasets.
- Published in IEEE Signal Processing Letters, DOI: 10.1109/LSP.2024.3501273.

Proposed a new training method for Deep Neural Networks
IIT Hyderabad

Under the supervision of **Dr. Ayon Borthakur**, AI dept
Jan 2023 - Current

- Designed a novel local learning algorithm for training **multilayer MLPs** and **CNNs** with sensor data.
- Aims to **reduce time and space complexity** while having low power consumption through the use of **neuromorphic hardware**.
- Effective alternative to the traditional backpropagation using **Forward-Forward algorithm**.
- Complete implementation is done on PyTorch and currently working towards a publication.
- You can find the arxiv here: https://arxiv.org/abs/2402.09769

Experience

Texas Instruments
Bangalore

Signal Processing Intern
May 2023 - July 2023

- Designed and implemented an effective **cross-talk cancellation** algorithm for **spatial audio playback** through loudspeakers.
- Devised an efficient method for **low-order filter approximation** using bi-quadrilateral and all pass filters within a **tolerance of 3 dB**.
- Designed a new cross-talk cancellation architecture which works effectively for different listener angles.
- Introduced new **performance metrics** for evaluating spatial image reconstruction and the efficiency of cross-talk cancellation.
- Complete implementation was done on MATLAB's Signal Processing and Deep Learning toolbox.

Teaching Assistant   *IIT Hyderabad*

Linear Systems and Signal Processing   *Aug 2023 - Dec 2023*

I worked as a teaching assistant for the course **Linear Systems and Signal Processing** wherein I was involved with:
- Conducting **tutorial sessions** outside class hours to interact with students and solve their doubts from assignments and exams.
- **Formulating questions** for their bi-weekly quizzes and monthly exams.

Robotix Club - The robotics club of IIT-H   *IIT Hyderabad*

Core Member   *Aug 2022 - May 2023*

- Built a **mini-bipedal robot** from scratch using 3D printed parts, servo motors and arduino drivers.
- Worked on **hand gesture recognition** - used motion sensors to detect movement of hand and fed sensor data to a handcrafted deep neural network meant to perform **time-series analysis** for action classification.
- Conducted sessions on arduino and motor drivers.

Class Representative   *IIT Hyderabad*

Elected class representative of EE department - UG 2020 batch   *Aug 2022 - May 2023*

Skills and Courses

Programming	• Python (Numpy, Pandas, PyTorch, Tensorflow, Scipy) • Matlab: SP, DSP and Deep Learning Toolbox • C/C++, Cadence, LTSpice, NGSpice, Verilog, HDL and KiCAD • Kubernetes, Java, LaTeX, HTML, JavaScript, Git, Bash and Zsh
Courses	• Digital Signal Processing (DSP), ML for SP, Image and Video Processing and Wireless Communication • VLSI Design, Digital IC Design, Embedded Programming and Analog Circuits • Computer Architecture, Information Theory, Operating Systems, Computer Networks, Advanced Topics in ML, Introduction to Programming and Data Structures and Algorithms
MOOC certifications	• Deep Learning Specialization from Coursera Topics: Neural Networks and Deep Learning, CNN's, Sequence Models and Parameter Tuning • Machine Learning Specialization from Stanford Topics: K-Means, Anomaly Detection, PCA, Support Vector Machines and Regression

Achievements

2024	**Department Fellowship,**	Received department fellowship at UC San Diego to pursue my PhD	*San Diego*
2022	**Andy Grove Scholarship (AGS),**	Recipient of AGS scholarship from Intel among 1800 applicants	*Hyderabad*
2020	**All India Rank - 1910,**	JEE Advanced examination among 1 Million candidates	*Bangalore*
2020	**Merit certificate in Physics by CBSE,**	Scored within top 0.1% all over India among 1.7 Million candidates	*Bangalore*

Course Projects

Robust Wi-Fi based Indoor Localization   *UC San Diego*

Modern Communication Networks Project   *Sept 2024 - Dec 2024*

- Worked on a robust architecture for meter level localization using Wi-Fi signals.
- Implemented various state-of-the-art deep learning models for baseline comparison.
- Collected vast amounts of real-scenario data with dynamic environments.
- **Technical Skills:** PyTorch, Linux and Bash

Image Deblurring for Video Frame Prediction   *IIT Hyderabad*

Image and Video Processing Project   *Jan 2023 - May 2023*

- Video frame prediction models predicts the future frames of a video from past input frames.
- Used **image deblurring** on predicted frames to improve the performance and extended their relevance to multiple predicted frames.
- Implemented next frame prediction and video deblurring models based on **convolutional LSTMs** using PyTorch.
- Used the two models in cascade for prediction on Moving MNIST and KTH walking datasets.
- **Technical Skills:** PyTorch, NVIDIA GPU setup, CUDA programming, Linux, Bash and LaTeX