Atharv Ramesh Nair

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Education

Indian Institute of Technology Hyderabad — Hyderabad, India

BTech in Electrical Engineering; ***GPA: 8.99/10*** — *Nov 2020 – Jun 2024*

Relevant coursework: Deep Learning, Convex Optimization, Matrix Theory, Probability Theory, Information Theory, Image and Video Processing, Computer Networks, Computer Architecture, Digital Signal Processing, Data Structures and Algorithms, Linear Optimisation

Extracurricular: Represented IITH in Inter IIT Sports Meet (Dec 2022) held in Roorkee(Hockey). Led the team participating in Drona Aviation Problem Statement in the Inter IIT Tech Meet (Feb 2023) held in Kanpur. Head of Robotics Club (2022-23)

Maharishi Vidya Mandir — Chennai, India

Central Board of Secondary Education (12^{th} *grade);* ***97.8 %*** — *Jun 2020*

Skills

Languages: Python, C/C++, MATLAB, HTML, CSS, Javascript

Libraries: Pytorch, Numpy, Matplotlib, Seaborn, Pandas, Scipy, CVXpy, Tensorflow, Sklearn, OpenCV

Miscellaneous: Linux, Git, Vim, Robot Operating System (ROS),Arduino, Raspberry Pi, ESP32 boards

Research Experience

Far Field Speaker Recognition System — Nov 2023-

Prof. K Sri Rama Murthy — *SP CUP 2024*

- Working on Speaker Verification Task on a noisy far field speaker talking to a mobile robot.
- Ongoing work on adapting State of the Art Speech Recognition Models through extensive use of data augmentation to handle the motor noise, reverberation, babble noise etc.

Cosmic Ray Detection in Astronomical Images — May 2023-

Prof. Sumohana S. Channappayya — *Research Project*

- Identification of Cosmic Ray affected pixels in Astronomical Images. Achieved improvement on existing baseline using TransUNet (Vision Transformer) architecture to Dark Energy Camera (DECam) Dataset.
- Ongoing work on further improvement using Dictionary Learning (K-SVD and OMP).
- Working towards building generalized models for both ground-based and space-based (Hubble Space Telescope) using continual learning techniques.

Biomarker Detection in Optical Coherence Tomography (OCT) Images — July-Sep 2023

Prof. Soumya Jana — *VIP CUP 2023*

- Work done representing IITH as part of IEEE VIP (Video and Image Processing) CUP at ICIP 2023.
- Task involved detection of six medical biomarkers for future diagnosis for eye-related diseases
- Our ensemble model involving InceptionNet and custom-attention augmented models achieved the second highest score in the challenge
- Was exposed to Self supervised contrastive Learning techniques like SimCLR.PCA etc.

Internships

Silicon Labs — Hyderabad, India

Software Design Engineer — *May 2023 – July 2023, Full-time*

- Part of the Wifi Software Team which worked towards making low-power chips designed for IOT applications
- Worked on adaptive rate control (i.e modifying data rates based on the environment) implementing the Minstrel Algorithm on Silab's RS9116 Chip which achieved significant RVR (Rate vs Range) improvement
- Gained proficiency in embedded C, Git, Vim, Linux Drivers, and the IEEE 802.11 stack

Alog Tech — Hyderabad, India

Robotics Software Developer — *May 2023 – July 2023, Full-time*

- Worked as a Robotics Software Developer in a startup (Alog Tech) at the Tech Incubation Cell of IITH
- Implemented Completely Autonomous Navigation using ROS Navigation Stack
- Built Motor Interface, Custom Planner and Software Watchdog for the Robot

Select Projects

Exploring Self-Supervised Learning: Deep Dive into DiNo Sep-Nov 2023

EE6380 (Course Project) - Deep Learning

- Implemented DiNo (Self Distillation with No Labels) in a self-supervised setting using Imagenette dataset and compared results obtained with a standard supervised model on a partially labelled dataset
- 12% & 20 % superior results compared to supervised baseline using ResNet and VIT backbones respectively
- Reproduced Results on Downstream Tasks - Image Classification on CIFAR10,CIFAR100 and Image Segmentation (Jacard Index Computation on Pascal VOC 2012 Dataset)

OFDM Channel Estimation using Deep Learning Feb-Apr 2023

EE6300 (Course Project) - Wireless Communication

- Simulated of an end-to-end single-carrier OFDM system using comb-type pilot insertion.
- Channel Estimation was done using Least Squares, Minimum Mean Squares, and a novel CNN-based technique
- Proposed CNN-based estimator providing comparable results with the Minimum Mean Square Estimator (MMSE) with limited training.

Review of Image Denoising Techniques Feb-Apr 2023

EE6310 (Course Project) - Image and Video Processing

- Reviwed, implemented and compared a varitety of classical and deep learning-based image denoising techniques.
- Classical Methods : Wavelet-based, NLM, BM3D, WNNM
- Modern Methods : Autoencoder-based, DnCNN, RIDNet, CBDNet, PRIDNet

Image Denoising using Total Variational Regularization Feb-Apr 2023

EE5606 (Course Project) - Convex Optimization

- Analyzed total variational image denoising as a convex optimization problem, presenting the mathematical formulation and reviewing existing solutions in the literature
- Implemented and compared methods - Gradient Descent, Chambolle's (from scratch), CVX solver.

PID Control of Drone using Overhead Camera Feb 2023

Inter IIT Tech Meet 11.0

- Developed a Python wrapper to control the Pluto 1.2 Drone using socket and struct libraries in Python
- Implemented pose estimation using ArUco tags on the camera feed from an overhead camera using OpenCV
- Developed PID control of the drone using pose estimate which significantly enhanced the stability of it

Autonomous Irrigation Robot Feb-Apr 2022

Robotics Club IITH

- Implemented Potted Plant Detection using MobileNet-SSD V1 Model using transfer learning on TensorFlow and converted it to a tflite model for deployment on a Raspberry Pi
- The distance was estimated using the bounding box and PID Control was used for movement and subsequent watering

Achievements

2nd Runner Up - VIP (Video and Image Processing) CUP Malaysia

IEEE ICIP (International Conference on Image Processing) *2023*

- Represented IITH finishing 2nd Runner Up and presented our work on Ophthalmic Biomarker Detection.

Runner Up - 5MICC (5-minute Video Clip Contest) Greece

IEEE ICASSP (International Conference on Acoustics Speech and Signal Processing) *2023*

- Represented IITH and finished as runner-up position. Presented our work on Secure Physiological Behaviometrics.

JEE Advanced 2020 All India Rank - 1247

- Achieved an AIR of 1247 among 150,000 candidates who cleared JEE Mains in 2020.

JEE Mains 2020 All India Rank - 1585

- Achieved an All India Rank of 1585 among 1 million candidates in 2020.

Kishore Vaigyanik Protsahan Yojana (KVPY) Scholar 2019

- Awarded the prestigious KVPY-SX Scholarship.(among 1600 students from all over India in 2019.