Atharv Ramesh Nair

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Education

Indian Institute of Technology Hyderabad (IITH) Hyderabad, India

*Bachelor of Technology in Electrical Engineering: Overall **GPA: 9.03/10** Final Year :**9.42/10** Nov 2020 – May 2024*

Relevant coursework: Machine Learning, Deep Learning, Image and Video Processing, Natural Language Processing, Statistics, Convex Optimization, Matrix Theory, Probability Theory, Information Theory, Computer Networks, Digital Signal Processing, Data Structures and Algorithms, Computer Architecture and Microprocessor

Extracurricular: Represented IITH in the 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). Part of reading group where I presented about recent literature in Deep Learning.

Skills

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

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

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

Publications

Du, K.; **Nair, A.R.**; Shah, S.; Gadari, A.; Vupparaboina, S.C.; Bollepalli, S.C.; Sutharahan, S.; Sahel, J.-A.; Jana, S.; Chhablani, J.; et al. Detection of Disease Features on Retinal OCT Scans Using RETFound. Bioengineering 2024, 11, 1186. https://doi.org/10.3390/bioengineering11121186

Research Experience

Biomedical Artifical Intelligence - Optical Coherence Tomography (OCT) Images

Prof. Soumya Jana (IIT Hyderabad), Dr. Kiran Kumar and Dr. Sandeep Chandra (University of Pittsburgh Medical Centre)

- Worked on VIP CUP where we developed an InceptionNet based model to detect biomarkers in OCT B -Scans
- Continued my research on Detecting disease-related features using foundational models like RETFound (Masked Autoencoder). Worked on Generating artificial OCT Scan Dataset using GANs and Latent Diffusion Models

Far Field Text Independent Speaker Recognition System in a moving robot Nov 2023- Apr 2024

Prof. K Sri Rama Murthy *SP CUP 2024*

- Presented at ICASSP 2024 on adapting the ERes2Net architecture for speaker verification in challenging conditions. Utilized a dual-strategy of data augmentation and speech enhancement to address limited training data. This methodology notably improved the EER, resulting in the team being awarded as the overall winners.

Cosmic Ray Detection in Astronomical Images May 2023-

Prof. Sumohana S. Channappayya *Research Project*

- Identification of Cosmic Ray affected pixels in Astronomical Images. Worked on improving over existing baseline using Transformer based segmentation models. Upto 2 % improvement in Recall Value (at fixed FPR) and Dice Score using a tiny TransUNet-based model with (3% less parameters). Worked on VIT explainability also

Industry Experience

Netradyne Bengaluru, India

Associate AI Engineer *June 2024 – , Full-time*

- Working on ADAS and driver monitoring on a Qualcomm SOC device with strict memory and compute constraints
- Was able to contribute to memory Optimization (3 % gain) and also implemented Fast Collision Warning (FCW) on the Hexagon DSP reducing runtimes by 50%

Silicon Labs Hyderabad, India

Software Engineer Intern *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) improvements
- 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 including path planning
- Developed Motor Interface, YoLo based object detection, Custom Planner and Software Watchdog for the Robot

Select Projects

Document Level Text Simplification - A Two-stage Plan-Guided Approach Mar-Apr 2024

CS5803 (Course Project) - Natural Language Processing

- Devised a unique integration of two separate models, Plan Generation and SIMSUM, for document-level text simplification. RoBERTa was used along with contextual embeddings for generating operational plans like copy, rephrase, split, and delete. These plan tokens were prepended to the sentence before passing into a two-stage transformer model (Summarizer and Simplifier) Achieved a 20% relative improvement in SARI and D-SARI metrics

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 standard supervised models 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

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

Achievements

Winner - SP (Signal Processing) CUP South Korea

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

- Represented IITH finishing first and presented our work on far-field speaker verfication in a mobile robot.

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 the team 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. Presented our work on Secure Physiological Behaviometrics.

JEE Advanced 2020 All India Rank - 1247

- Achieved an AIR of 1247 (top 1%)among 150,000 candidates who cleared JEE Mains in 2020.

JEE Mains 2020 All India Rank - 1585

- Achieved an All India Rank of 1585 (top 0.15%) 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.