Anirudh Nakra

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Education

University of Maryland, College Park, MD — Aug. 2021 – Present
PhD, Electrical and Computer Engineering — ***GPA: 4.0/4.0***
Advisor: Prof Min Wu

Delhi Technological University, Delhi, India — Aug. 2017 – May 2021
BTech, Electronics and Communication Engineering — ***GPA: 8.93/10*** *(Top 5%)*

Publications

Anirudh Nakra et al.,"Design Of High Bandwidth Circularly Polarised Antipodal Vivaldi Array for 5G Applications" 2021 2nd IEEE International Conference for Emerging Technology (INCET), Karnataka, India, 2021

Research Experience

Research Assistant, Physiological Sensing — Sept 2022 – Present
Media and Security Team, UMD — *College Park, MD*

- Working on creating an explainable mapping to ECG signals from PPG signals
- Gathering and analyzing data of patients from a large-scale real-world clinical database with Python
- Working on representation learning of PPG-ECG data using dictionary learning and Causal ML models
- Extending representation learning to mapping remote-PPG to the gold standard ECG

Research Assistant, Microplastics Detection — Nov 2022 – Present
Media and Security Team, UMD — *College Park, MD*

- Collaborating with Prof Gong Cheng's lab to detect bioplastics in aquatic and terrestrial environments.
- Parameterising outlier detection for experiments using distribution fits

Computer Vision Intern — Sep. 2018 – May 2021
Delhi Technological University — *Delhi, India*

- Worked on Nocturnal Object Detection problems.
- Created a pipeline that used statistical signal processing techniques like **Hough Transforms** and **Markovian Random Fields** to denoise and extract ROI improving performance of algorithms by upto 8 % in test accuracy and SNR by over 30 %.
- Interfaced with stereo-vision cameras and automated data extraction process leading to speedup by 3 weeks.

Industry Experience

Graduate Signal Processing Algorithm Intern — May 2022 – Aug 2022
Hughes Network Systems — *Germantown, MD*

- Optimising the transmit modulator module of the return channel subsystem in next gen ASIC.
- Designed an efficient **Polyphase filtering** system for a 30 % reduction in MIPS.
- Deployed the system on a **FPGA** ensuring the transmit module runs **under 10ns** which is 50 % faster than previous implementation
- Reduced demodulation noise to within **0.5 % margin** of theoretical limit in presence of phase & time offsets

Technical Projects

Underwater SLAM Detection | *MATLAB, Python, OpenCV, C++* May 2022

- Headed the image processing efforts for **color correction** and **contrast enhancement** in underwater data.
- Adopted the use of fundamental and deep learning techniques such as **U-Nets, Dark Channel Prior and WaterGAN**.
- Improved the accuracy of the **SLAM trajectory** by upto 25 % w.r.t ground truth with upto 12 % more keypoints being detected.

Image Inpainting for object removal | *Python, Tensorflow, OpenCV* May 2022

- Formulated and Implemented an **end-to-end Object extraction and Inpainting system**
- Adopted deep learning techniques such as **YOLO** and **Mask-RCNN** for extraction.
- Used both deep learning and statistical graphics based techniques such as **Deep Image Priors, Fourier Convolutions, Exemplar Matching** for inpainting.

Face Classifier and Digit Recognize | *MATLAB, Python* Nov 2021

- Implemented KNN, Bayes Classifier, SVM and Boosted SVM, MDA and PCA from scratch to help in face classification problem
- Implemented LeNets and custom CNNs with experiments on various losses and solvers to evaluate performance.
- Used Xception and Inception-v3 to perform transfer learning on 10 Monkey Dataset.

Constructing an optimised BPSK TX/RX system | *MATLAB* Nov 2021

- Implemented a BPSK TX/RX system
- Performed major optimisations like tabular implementation, interpolation for DFT blocks and a fixed point receiver from scratch reducing MIPS by over 50 % while maintaining near similar BER and FERs.

Technical Skills

Languages and Frameworks	Python, MATLAB, C
Frameworks/Libraries	Tensorflow, Pytorch, OpenCV

Teaching Experience

ENEE439D: Design Experience in Machine Learning	Spring 2023
ENEE439D: Design Experience in Machine Learning	Spring 2022
DATA603: Principles of Machine Learning	Fall 2021

Honors and Awards

First Class with Distinction	DTU, 2021
Rank 1 Academic Scholarship	DTU, 2020-2021
Department High Achiever (*Awarded to the best 3 students out of 180*)	DTU, 2019-2021
Excellent Undergraduate Intern	Bharat Electronics, 2019
Merit Certificate in Mathematics	Ministry of Education, Govt. of India, 2017