VAIBHAV CHOUDHARY

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EDUCATION

Boston University   *2021-present*
Ph.D. in Electrical Engineering
Awarded the Distinguished Electrical Engineering Fellowship
GPA: 3.8

North Carolina State University   *2019-2021*
MS in Electrical Engineering, Focus on Computational Intelligence & Signal Processing
GPA: 4

CURRENT RESEARCH EXPERIENCE

Deep Learning Methods for Inverse Problems
Advised by Dr. Vivek Goyal, Boston University

· Current research is focused on developing an Deep Learning based Inverse Model for inverting a Scanning Electron Microscope Simulator called JMONSEL. The model currently uses AUTOMAP to perform Manifold learning on a synthetic dataset generated from the simulator.
· Algorithm design for a Mixture Model Fitting and Statistical Analysis on the simulation data to improve imaging resolution for feature detection.

Ultra-Fine Microscopic Imaging using DNA-Nanoscope
Advised by Dr. Dror Baron, Dr. Yue Lu & Dr. Nikhil Gopalakrishnan

· Novel Bottom up imaging technique that labels nanoscale materials with DNA barcodes and measures pairwise distance between them. The current model then uses this information to generate an image.
· Designed a new statistical algorithm incorporating all the thousands of pairwise distance measurements between the targets to improve the quality of the image of the underlying molecule as opposed to the current approach which only chooses one distance value between a pair discarding all the other information.
· Modified the ExpVec EDM algorithm, which is being used in the current paper, to handle a multi-dimensional Euclidean Distance Matrix.
· Optimal solution for the prediction of the relative positions of the target is found by passing the output of the algorithm above through a Maximum Aposterior Estimation procedure to improve the results further.

PROJECTS

Laplacian Blob Detector

· Designed a Blob Detection algorithm utilizing a Laplacian Scale Space and Non-Max Suppression. Optimized for faster Run-times to get the highest grading in the course.

ADMM Optimization based on Lasso and Ridge Regression

· Programmed Lasso and Ridge Regression using the Alternate Direction Method of Multiplier Optimization. Achieved twice as fast convergence rate as compared to scikit-learn on the diabetes data-set.

Collection Style Transfer using Cycle-GANs

· Developed a Cycle-GAN based Style Transfer algorithm in PyTorch. Style transfer between different artist's such as Monet, Van Gogh and Ukiyoee was achieved.
· Implemented Cycle Loss and Identity Loss along with parameter fine-tuning to get better results than a pre-trained Cycle-GAN for summer to winter transfer in just 50 epochs of training.

Bit banging SPI, I2C on the Programmable Real Time Unit on Beaglebone Black

· The project aimed at providing extra serial interfaces to the BeagleBone Black with out buying expensive hardware controllers or wasting valuable CPU cycles. Funded under Google Summer of Code
· The project involved writing Master Controller Drivers for both SPI and I2Calong with firmware for bitbanging the protocols on the PRU.

TEACHING & INDUSTRIAL EXPERIENCE

Graduate Teaching Assistant August 2020-November 2020
ECE-592, Special Topics in Electrical Engineering: Data Science *Raleigh, NC*

· Delivery of Course Material including setting tests, home-works and Class Projects for a graduate level course in Machine Learning and Data Science.
· Responsible for the assessment process on all graded components and provided timely and appropriate feedback to all the students.
· Mentored Students to help them achieve all the learning objectives.

Singularity Automation December 2018 - January 2018
Intern for Machine Learning and Computer Vision *Bangalore, Karnataka*

· Worked on running and optimizing the Tiny YOLO model for Intel MoVidius and Raspberry PI
· Track Person of Interest in frame using Tiny YOLO and Intersection over Union to perform a Probabilistic Analysis. This was further used to generate velocity vectors and analyzed for suspicious movement to raise alarm.

Bharti Airtel
Software & Networking Engineering Intern; Senior Executive *Gurugram, Haryana*

· Wrote Python scripts to automate router login and program them according to traffic requirements.
· Awarded a Full Time Position and a Letter of Recommendation by Airtel based on my performance in my internship.
· Full time role for for planning, installing and Programming Routers for Precision Time Protocol Phase Implementation in the Airtel Network and ensure its compliance to Telecom standards. Accuracy of 50 parts per Billion for frequency synchronization & 1.5 microseconds for time synchronization

TECHNICAL SKILLS

· Python, C++, MATLAB, PyTorch, Scikit-Learn

RELEVANT COURSEWORK

· Statistical Foundations of Learning Theory, Neural Networks, Computer Vision, Stochastic Processes, Learning from Data