

# VAIBHAV CHOUDHARY

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## EDUCATION

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### **Boston University**

*2021-present*

Ph.D. in Electrical Engineering

**Awards:** The Distinguished Electrical Engineering Fellowship

GPA: 3.8

**Relevant Coursework:** Statistical Foundations of Learning Theory, Stochastic Processes, Machine Learning, Computational Imaging and Inverse Problems

### **North Carolina State University**

*2019-2021*

MS in Electrical Engineering, Focus on Computational Intelligence & Signal Processing

GPA: 4

**Relevant Coursework:** Neural Networks, Computer Vision, Data Science, Optimization Theory

## RESEARCH EXPERIENCE

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### **Deep Learning Methods for Inverse Problems in Computational Imaging**

*Advised by Dr. Vivek Goyal, Boston University*

- Coordinate Learning interpolation algorithms based on Neural Radiance Fields to perform a 3-dimensional reconstruction on Tomographic data obtained from a Scanning Electron Microscope.
- Algorithm design for a Mixture Model Fitting on the data for detecting features on images obtained from an Scanning Electron Microscope using the Expectation Maximization Algorithm.

### **Microscope Imaging using DNA-Nanoscope**

*Advised by Dr. Dror Baron, North Carolina State University*

- Novel Bottom up imaging technique that labels nanoscale materials with DNA barcodes and measures pairwise distance between them.
- 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
- Modified the ExpVec EDM algorithm, which is being used in the current model, 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.

## WORK EXPERIENCE

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### **Graduate Teaching Assistant**

September 2022-Present

*Boston University*

*Learning from Data*

- Teaching tutorial classes, leading discussion sessions, and grading exams for a graduate level course in Machine Learning.

### **Graduate Teaching Assistant**

August 2020-November 2020

*North Carolina State University*

*Data Science*

- Delivery of Course Material including setting tests, home-works and Class Projects for a graduate level course in Probability Theory and Data Science.

### **Machine Learning and Computer Vision intern**

December 2018 - January 2018

*Singularity Automation*

- 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.

## PROJECTS

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### **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 Ukiyoe 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 I2C along with firmware for bitbanging the protocols on the PRU.

## TECHNICAL SKILLS

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- Python, MATLAB, PyTorch, Scikit-Learn, Numpy