

# Vignesh Subramanian

Email: vignesh.subramanian@berkeley.edu

Website: vignesh-subramanian.github.io    LinkedIn: vigneshs258    Google Scholar link

---

## WORK EXPERIENCE

### **PlusAI, Inc.**

Senior Research Engineer

September 2022 - Present

- Designed, implemented, trained and deployed a CNN-based model for vehicle turn indicator and brake light status detection, securing a patent for this idea
- Leading efforts to move towards a data-driven approach to prediction and planning by employing a transformer-based joint agent trajectory prediction model

### **Machine Learning Internship**

Plus, Cupertino

May - August 2021

- Worked on state of the art image based anchor-free object detection and tracking implementation in PyTorch

## EDUCATION

### **University of California, Berkeley**

August 2017 - August 2022

Doctor of Philosophy in Electrical Engineering and Computer Science

Grade Point Average: 4.0/4.0

**Research Adviser:** Prof. Anant Sahai

### **Indian Institute of Technology Bombay, India**

July 2010 - June 2015

Master of Technology in Electrical Engineering, specializing in Communication and Signal Processing

Bachelor of Technology in Electrical Engineering

Minor in Computer Science and Engineering

**Research Adviser:** Prof. Sibi Pillai, Prof. Rajbabu Velmurugan

Cumulative Performance Index: 9.86/10

## RESEARCH INTERESTS

Deep learning for autonomous driving systems, Perception, Motion Prediction, Machine Learning Theory, Machine learning applications in wireless communication and control

## PROGRAMMING SKILLS

Python, PyTorch, Tensorflow, C++, MATLAB

## SELECTED PUBLICATIONS

**Vignesh Subramanian**, Rahul Arya, Anant Sahai *Generalization for multiclass classification with overparameterized linear models*, Advances in Neural Information Processing Systems (**NeurIPS**), 2022

Vidya Muthukumar, Adhyyan Narang, **Vignesh Subramanian**, Mikhail Belkin, Daniel Hsu, Anant Sahai *Classification vs regression in overparameterized regimes: Does the loss function matter?*, Journal of Machine Learning Research (**JMLR**), 2020

**Vignesh Subramanian**, Moses Won, Gireeja Ranade *Learning a Neural-Network Controller for a Multiplicative Observation Noise System*, IEEE International Symposium on Information Theory (**ISIT**) , 2020

Vidya Muthukumar, Kailas Vodrahalli, **Vignesh Subramanian**, Anant Sahai: *Harmless interpolation of noisy data in regression*, IEEE Journal on Selected Areas in Information Theory (**JSAIT**), Special Issue on Deep Learning: Mathematical Foundations and Applications to Information Science, 2019

Anant Sahai, Joshua Sanz, **Vignesh Subramanian**, Caryn Tran, Kailas Vodrahalli *Blind interactive learning of modulation schemes: Multi-agent cooperation without co-design*, **IEEE Access**, Special Section: Artificial Intelligence for Physical-layer Wireless, 2019

## PROJECTS

### ***Generalization for Multiclass Classification***

*August 2021 - August 2022*

- Analyzed the multi-class classification loss of minimum-norm interpolating solutions in an asymptotic overparameterized setting where both the number of underlying features and the number of classes scale with the number of training points
- Proved that the multiclass problem is “harder” than the binary one due to the relatively fewer training examples per class in the multiclass setting

### ***Classification versus Regression for Minimum Norm Interpolating Solutions***

*August 2019 - August 2021*

- Analyzed the classification and regression loss of minimum norm interpolating solutions in the overparameterized setting.
- Related the classification error to statistical signal processing concepts of shrinkage and false-discovery and computed sharp upper and lower bounds for these quantities
- Showed the existence of a regime where asymptotically classification performs well but regression does not

### ***Harmless interpolation of Noisy Data for Regression***

*August 2019 - August 2020*

- Investigated the overparameterized regime in linear regression, where all solutions that minimize training error interpolate the data, including noise
- Characterized the fundamental generalization (mean-squared) error of any interpolating solution using the statistical signal processing concepts of shrinkage and false-discovery

### ***Machine learning for Physical Layer Wireless Communication***

*August 2018 - August 2022*

- Designed a blind interactive learning protocol for modulation schemes in the multi-agent setting without codesign
- Experimentally verified the universality and robustness of the protocol and showed that it achieves bit error rates similar to the optimal baseline

### ***Learning Stabilizing Control under Multiplicative Noise***

*July 2019 - January 2020*

- Explored use of neural networks to discover control strategies for stabilizing a system under multiplicative noise
- Proposed an architecture and training procedure tailored for the control problem that enables the network to generalize and output controls for rollouts longer than the training horizon
- Showed that the neural network based control strategy beats current best known strategies including optimal linear strategies

## AWARDS

- Recognized as an **Outstanding Graduate Student Instructor** for academic year 2019-2020 based on overall effectiveness
- Recipient of the **EECS Department Fellowship** awarded to promising first year graduate students for the academic year 2017-2018
- Awarded **Institute Gold Medal** for exemplary academic performance, 2015  
*Awarded for achieving Institute Rank 1 based on highest cumulative grade points among 400 students*
- Received **Institute Silver Medal** for outstanding academic record, 2015  
*Awarded for achieving Department Rank 1 based on highest cumulative point index among 67 students in the Electrical Engineering department*