Kiran Vodrahalli

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Summary

I primarily study machine learning and theoretical computer science, with a focus on the foundations of machine learning, optimization, and statistics as well as their applications in natural language understanding, neuroscience, robotics, and economics. I am interested in research opportunities involving the application of algorithms and statistics, particularly to scientific inquiry and artificial intelligence.

Currently, I am interested in methods for **resource-efficient** machine learning: especially in terms of space-constrained learning and model compression, and in particular as these can be applied to language modeling and reinforcement learning.

I am also very excited about understanding how learning agents can be manipulated via modifications to their learning environment, from the perspective of understanding the economic incentives for **designing environments** which extract data from agents (The Platform Design Problem), and also from the perspective of the agents, who may behave strategically and may have privacy and fairness concerns. I am generally interested in multi-agent learning in games and new concepts of efficient-to-reach equilibria in settings involving learning agents, as well as incentives and strategic behavior more broadly in machine learning.

Education

Columbia University, September 2017 — June 2022 (planned)
Ph.D. in Computer Science
Advisors: Professor Daniel Hsu, Professor Alex Andoni
Thesis Topic: Resource-constrained machine learning
Areas: Theoretical machine learning, algorithms, algorithmic game theory, statistics
Affiliations: Columbia Data Science Institute, Machine Learning Group, Theory of Computation Group

Princeton University, September 2012 — June 2017
A.B. Mathematics (cum laude), M.S.E. Computer Science
Master's Thesis: Temporally Dependent Mappings Between fMRI Responses and Natural Language Descriptions of Natural Stimuli
Advisors: Professor Sanjeev Arora, Professor Ken Norman
Affiliations: Unsupervised Learning Group, ML Theory Group, Princeton Neuroscience Institute, Computational Memory Lab

Research

Note that * indicates co-authorship. In theory publications, the citation order is alphabetical by last name.

Conference Proceedings

The Platform Design Problem. Christos Papadimitriou*, **Kiran Vodrahalli***, Mihalis Yannakakis*. Oral Presentation. WINE Conference on Web and Internet Economics, December 2021. Spotlight Oral Presentation (top 10%) and Poster at Strategic ML Workshop, NeurIPS 2021. Oral Presentation at NetEcon Workshop, EC 2021.

The Logical Options Framework. Brandon Araki, Xiao Li, **Kiran Vodrahalli**, Jonathan DeCastro, J. Micah Fry, Daniela Rus. (Long) Oral Presentation and Poster. International Conference on Machine Learning (ICML), July 2021.

Deep Bayesian Nonparametric Learning of Rules and Plans from Demonstrations with a Learned Automaton Prior. Brandon Araki, **Kiran Vodrahalli**, Thomas Leech, Cristian Ioan Vasile, Mark Donahue, Daniela Rus. Spotlight Presentation and Poster. AAAI Conference on Artificial Intelligence, February 2020.

Privacy Accounting and Quality Control in the Sage Differentially Private ML Platform. Mathias Lécuyer, Riley Spahn, **Kiran Vodrahalli**, Roxana Geambasu, Daniel Hsu. Oral Presentation. Symposium on Operation Systems Principles, October 2019.

Learning to Plan with Logical Automata. Brandon Araki*, **Kiran Vodrahalli***, Thomas Leech, Cristian Ioan Vasile, Mark Donahue, Daniela Rus. Spotlight Presentation and Poster. Robotics: Science and Systems, June 2019. Spotlight Oral Presentation and Poster at NeurIPS 2018 Infer2Control Workshop.

Attribute-Efficient Learning of Monomials over Highly-Correlated Variables. Alex Andoni*, Rishabh Dudeja*, Daniel Hsu*, **Kiran Vodrahalli***. Oral Presentation. Algorithmic Learning Theory, March 2019.

A Large Self-Annotated Corpus for Sarcasm. Mikhail Khodak, Nikunj Saunshi, **Kiran Vodrahalli**. Poster. Language Resources and Evaluation, May 2018.

A Compressed Sensing View of Unsupervised Text Embeddings, Bag-of-n-Grams, and LSTMs. Sanjeev Arora*, Mikhail Khodak*, Nikunj Saunshi*, **Kiran Vodrahalli***. Poster. International Conference on Learning Representations, April 2018. Oral Presentation and Poster at ICML 2018 Workshop on Theory of Deep Learning. Poster at ACL 2018 Workshop on Representation Learning for NLP.

A Temporal Decay Model for Mapping between fMRI and Natural Language Annotations. **Kiran Vodrahalli**, Cathy Chen, Viola Mocz, Christopher Baldassano, Uri Hasson, Sanjeev Arora, Kenneth A. Norman. Poster. Cognitive Computational Neuroscience, September 2017.

Journal Proceedings

Learning and Planning with Logical Automata. Brandon Araki, **Kiran Vodrahalli**, Thomas Leech, Cristian-Ioan Vasile, Mark Donahue, Daniela Rus. Autonomous Robots, August 2021.

Mapping between fMRI responses to movies and their natural language annotations. **Kiran Vodrahalli**, Po-Hsuan Chen, Yingyu Liang, Christopher Baldassano, Janice Chen, Christopher Honey, Uri Hasson, Peter Ramadge, Kenneth A. Norman, Sanjeev Arora. Neuroimage, June 2017. Oral Presentation and Poster at NeurIPS 2016 Workshop on Representation Learning in Artificial and Biological Networks. Oral Presentation and Poster at ICML 2016 Workshop on Multi-View Representation Learning.

Invited Talks

Google Learning Theory Group, Virtual, October 2021.

Google Brain, Virtual, August 2021.

Yahoo Research, New York, NY, August 2019.

Princeton Neuroscience Institute, Princeton, NJ, September 2017.

Teaching

Columbia University

Courses

Fall 2018: TA for COMS 6998 — Computation and the Brain (graduate)

Princeton University

Courses

Spring 2017: TA for COS 511 — Theoretical Machine Learning (graduate)

Fall 2016: TA for COS 397 — Independent Work Seminar in NLP

Spring 2014: Grader for COS 226 — Intro Algorithms

Fall 2013 — 2014: COS Lab TA for COS 126, 226, 217 — Intro Algorithms and Systems

Mentorship

Summer 2021: Advisor for Algorithmic Game Theory Undergraduate Theory Seminar, and designed the seminar syllabus.

Spring 2017: Advised the junior independent work of Cathy Chen (COS '18) and Viola Mocz (NEU '18) in neuroscience with Professor Ken Norman

Spring 2014 — Fall 2016: Seminar Leader for the NLP-ML Reading Group with Dr. Christiane Fellbaum

Service

Reviewing

Reviewer for ICLR 2021; NeurIPS 2021, 2020; ICML 2021, 2020 (Top 33% Reviewer in 2020, Expert Reviewer in 2021); NeuroImage 2017.

Awards

Spotlight at Strategic ML Workshop at NeurIPS 2021

Selected as one of four ($\approx$ top 10%) speakers to give a spotlight presentation in addition to a poster.

Spotlight Prize at New York Academy of Sciences Annual ML Symposium (2019, 2020)

Selected as one of ten ($\approx$ top 10%) speakers to give a spotlight presentation in addition to a poster.

NSF Graduate Research Fellowship Award

Awarded March 2016 for Computer Science in the subfield Machine Learning.

Industry Experience

Google Brain, Student Researcher (Fall 2021)

Part-time employment at Google Brain as a student researcher.

Google Brain, Research Intern (Summer 2021)

Research internship on training deep neural networks with resource constraints.