Jiayi (Joanna) Li

Contact Information

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Research Interests

My research is in mathematical machine learning. I am interested in the optimization and generalization behaviors of neural networks, seeking to understand the representation capacity and algorithm bias on different architectures. In particular, I am interested in applying and developing algebro-geometric tools to machine learning theory.

Education

University of California Los Angeles
Ph.D. Statistics, 2019 – present
Thesis advisor: Prof. Guido Montúfar

The University of Hong Kong and **Stony Brook University, New York**
B.S. Mathematics, pure Mathematics concentration
Thesis advisor: Prof. Robert Lazarsfeld

Professional Experience

Institute for Mathematical and Statistical Innovation, Chicago, IL, USA
Long-term participant, September 2023 – December 2023
Program: Algebraic Statistics and Our Changing World

MPI for Mathematics in the Sciences, Leipzig, Germany
Visiting researcher, July 2023 – September 2023
Research area: Mathematical Machine Learning

Simons Institute for the Theory of Computing, Berkeley, CA, USA
Short-term visitor, August 2022
Program: Summer Cluster: Deep Learning Theory

Honors and Awards

University of California Los Angeles
Summer Mentored Research Fellowship, 2022
ACM-W Scholarship, 2020
Cathay Bank Scholarship, 2020
Stony Brook University
William Lowell Putnam Competition, school team, 2017, 2018
MSRI Travel Fund, 2017
The University of Hong Kong
Overseas Research Fellowship, 2016
Undergraduate Research Fellowship, 2015

Presentations

1. *Geometry of Polynomial Neural Networks*, Special Session: Applications of Algebra and Geometry, AMS 2024 Spring Central Sectional Meeting, April 2024

2. *Geometry of Polynomial Neural Networks*, Applied Algebra Seminar, Department of Mathematics, University of Wisconsin-Madison, December 2023

3. *Gradient Descent in Optimization*, SCALE Seminar, UCLA, November 2023

4. *Algebraic Structures in Terminal Phase of Neural Network Training*, Institute for Mathematical and Statistical Innovation, October 2023

5. *Neural Collapse Beyond Unconstrained Feature Models*, Deep Learning Theory Seminar, UCLA, September 2023

6. *Mathematical Machine Learning: Theory and Beyond*, SCISS Workshop, UCLA, July 2023

Publications

Research articles

1. Kaie Kubjas, **Jiayi Li**, Maximillian Weismann. *Geometry of polynomial neural networks*, preprint.

2. Shuang Liang, Renata Turkes, **Jiayi Li**, Nina Otter, Guido Montufar. "*Pull-back Geometry of Persistent Homology Encodings*", preprint.

3. **Jiayi Li**, Yuantong Li, Xiaowu Dai. "*Discussion: Estimating means of bounded random variables by betting" by Waudby-Smith and Ramdas*", Journal of the Royal Statistical Society: Series B (JRSSB), 2023.

4. Dejun Guo, Xu Jin, Dan Shao, **Jiayi Li**, Yang Shen, Huan Tan "*Image-Based Regulation of Mobile Robots without Pose Measurements*", IEEE Control Systems Letters (L-CSS), vol. 6, pp. 2156-2161, 2022.

5. Guruprasad Raghavan, **Jiayi Li**, and Matt Thomson. "*Geometric algorithms for predicting resilience and recovering damage in neural networks*", preprint.

6. Ziqi Huang, Yang Shen, **Jiayi Li**, Marcel Fey, Christian Brecher. "*A Survey on AI-Driven Digital Twins in Industry 4.0: Smart Manufacturing and Advanced Robotics*", Sensors, 2021.

Editorial articles

1. **Jiayi Li**, "*Computational Creativity: Bridging Art and Computer Science* ". XRDS 29, 4 (Summer 2023), pp. 5-6, 2023.

2. **Jiayi Li**, Karan Ahuja, "*Making with a Sustainable Purpose: an Interview with Matthew L. Mauriello*". XRDS 27, 4 (Summer 2021), pp. 38-41, 2021.

3. **Jiayi Li**, Yingfei Wang "*An Interview with Owen McCall from TREECYCLE*". XRDS 27, 4 (Summer 2021), pp. 42-45, 2021.

Services

Reviewer for

ICML, ICLR, Stat, Algebraic Statistics (AStat)

Editor for

ACM XRDS

Editor-in-Chief	2022 – present
Lead Editor	2022
Feature Editor	2021

Outreach

Westwood Village Rotary Club, Invited Speaker	2023
UCLA Statistics Club, Mentor	2022 – present
Society of Women in Statistics, Chair	2022 – present

Events Organized

Distinguished Women in Statistics and Data Science Workshop, Women in Industry Symposium, Los Angeles, CA	10/17/2023
Distinguished Women in Statistics and Data Science Workshop, Women in Academia Symposium, Los Angeles, CA	05/23/2023

Teaching Experience

Instructor, Department of Statistics, University of California Los Angeles
Math Camp for Master in Applied Statistics students — Fall, 2021-2023

Teaching Associate, MSOL, University of California Los Angeles
ENGR 200 "*Program Management Principles for Engineers and Professionals*"
Instructors: Leslie Lackman (UCLA) — Winter, 2021-2024
ENGR 202 "*Reliability, Maintainability, and Supportability*"
Instructor: Myron Hecht (The Aerospace Corporation) — Spring, 2021-2023
ENGR 203 "*System Architecture*"
Instructor: Steven Silverman (UCLA) — Summer, 2021-2023
ENGR 205 "*Model-Based System Engineering*"
Instructor: Myron Hecht (The Aerospace Corporation) — Fall, 2021-2023
ENGR 116 "*Statistics for Management Decisions*"
Instructors: Hamed Mamani (U Washington), Lara Dolecek (UCLA)
Alireza Mehrnia (UCLA) — Summer, 2023

Teaching Assistant, Department of Statistics, University of California Los Angeles
STATS 13 "*Intro to Statistical Methods for Life and Health Sciences*"
Instructor: Guani Wu (UCLA) — Summer, 2021

Conferences & Seminars Attended

[IPAM2024] EnCORE Workshop on Computational vs Statistical Gaps in Learning and Optimization	02/26-03/01, 2024
[IMSI2023] Bayesian Statistics and Statistical Learning	12/11-12/15, 2023
[IMSI2023] Algebraic Economics	11/06-11/10, 2023
[IMSI2023] Algebraic Statistics for Ecological and Biological Systems	10/09-10/13, 2023
[IMSI2023] Apprenticeship Week: Varieties from Statistics	10/02-10/06, 2023
[IMSI2023] Invitation to Algebraic Statistics and Applications	09/18-09/23, 2023
[MPI MIS + UCLA†] Math Machine Learninig Seminar Series	01/01-11/30, 2023
[DLT2022] Summer Cluster: Deep Learning Theory, Berkeley, CA	08/01-08/05, 2022
[AS2022] Algebraic Statistics Conference 2022, Honolulu, HI	05/16-05/20, 2022
[LMS2022†] LMS Invited Lecture Series 2022: The Mathematics of Deep Learning	02/28-03/04, 2022
[BIRS2021†] Banff International Research Station Workshop: Geometry & Learning from Data	10/24-10/29, 2021
[DeepMath2020†] Mathematical Theory of Deep Neural Network	11/05-11/06, 2020
[UC Irvine†] Frontiers in Machine Learning for the Physical Sciences	10/26, 2020
[MDCCSA†] IAS Missing Data Challenges in Computation, Statistics and Applications	09/08-09/11, 2020
[Bernoulli-IMS 2020†] Bernoulli-IMS One World Symposium 2020	08/24-08/28, 2020
[Simons Institute for the Theory of Computing†] Probability, Geometry, and Computation in High Dimensions Boot Camp	08/19-08/28, 2020
[CMI-HIMR 2020†] Clay Mathematics Institute-Heilbronn Institute for Mathematical Research Integrable Probability Summer School	07/27-07/31, 2020
[MSML 2020†] Mathematical and Scientific Machine Learning	07/20-07/24, 2020
[ICML 2020†] 37^{th} International Conference on Machine Learning	07/12-07/18, 2020
[COLT 2020†] 33^{rd} International Conference on Learning Theory	07/09-07/12, 2020
[STOC 2020†] Theoretical Computer Science (TCS) Workshop	06/25, 2020
[ICLR 2020†] International Conference on Learning Representations	04/26-05/01, 2020
[Simons Institute for the Theory of Computing] Foundations of Deep Learning, Berkeley, CA	05/23-08/09, 2019
[IPAM 2019] Geometry and Learning from Data in 3D and Beyond	03/11-06/14, 2019
[SOCAMS 2019] Southern Calif. Applied Mathematics Symposium	04/27, 2019
[SCMLS 2019] Southern Calif. Machine Learning Symposium	03/15, 2019

Grants Awarded	**Travel and Registration Grants**	
	The Institute for Mathematical and Statistical Innovation	2023
	Simons Institute for the Theory of Computing	2022
	Algebraic Statistics Conference	2022
	International Conference on Machine Learning	2020, 2021
	International Conference on Learning Representations	2020, 2021
	PyData LA	2019
	Mathematical Sciences Research Institute (now SLMath)	2017
Professional Memberships	American Statistical Association	
	Institute of Mathematical Statistics	
	Association for Computing Machinery	
References	Available upon request.	