Yutong Wang

Eric and Wendy Schmidt AI in Science Postdoctoral Fellow
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Research Interests

Theory and efficient computations for multiclass classification when the number of labels is extremely large
Overparametrized learning and benign overfitting
Quantization techniques in deep learning
AI and ML for science: computational biology, deep learning for spectroscopy, and ecology

Professional Experience

Eric and Wendy Schmidt AI in Science Postdoctoral Fellow Jan 2023 - Present
University of Michigan, Ann Arbor
Advisors: Qing Qu, Wei Hu

Postdoctoral Research Fellow Sep 2022 - Jan 2023
University of Michigan, Ann Arbor

Education

PhD, Electrical & Computer Engineering Sep 2016 - Aug 2022
University of Michigan, Ann Arbor
Thesis: *Classification via Multiple Hyperplanes: Loss functions, Overparametrization, and Interpolation.* [Link]
Advisor: Prof. Clayton Scott

MA, Mathematics Sep 2014 - Jun 2016
University of California, Davis

BSE, Electrical Engineering (Minor in Mathematics) Sep 2010 - Apr 2014
University of Michigan, Ann Arbor

Publications

[1] **Yutong Wang** and Clayton Scott. "On Classification-Calibration of Gamma-Phi Losses". In: *Conference on Learning Theory*. [Link]. 2023.

[2] **Yutong Wang** and Clayton Scott. "Consistent Interpolating Ensembles via the Manifold-Hilbert Kernel". In: *Neural Information Processing Systems*. [Link]. 2022.

[3] **Yutong Wang** Jianxin Zhang and Clayton Scott. "Learning from Label Proportions by Learning with Label Noise". In: *Neural Information Processing Systems*. [Link]. 2022.

[4] **Yutong Wang** and Clayton Scott. "VC dimension of partially quantized neural networks in the overparametrized regime". In: *International Conference on Learning Representations*. [Link]. 2022.

[5] **Yutong Wang** and Clayton Scott. "An exact solver for the Weston-Watkins SVM subproblem". In: *International Conference on Machine Learning*. [Link]. 2021.

[6] **Yutong Wang** and Clayton Scott. "Weston-Watkins Hinge Loss and Ordered Partitions". In: *Neural Information Processing Systems*. [Link]. 2020.

[7] Tasha Thong, **Yutong Wang**, Michael Brooks, Christopher Lee, Clayton Scott, Laura Balzano, Max Wicha, and Justin Colacino. "Hybrid stem cell states: insights into the relationship between mammary development and breast cancer using single-cell transcriptomics". In: *Frontiers in Cell and Developmental Biology* 8 (2020). [Link], p. 288.

Preprints

[8] **Yutong Wang** and Clayton Scott. "Unifying Binary and Multiclass Margin-Based Classification". [arXiv], Submitted to *Journal of Machine Learning Research*. 2023.

[9] Pengyu Li*, **Yutong Wang***, Xiao Li, and Qing Qu. "Neural Collapse in Multi-label Learning with Pick-all-label Loss". [arXiv], Submitted to *International Conference on Learning Representations*. 2024.

[10] **Yutong Wang**, Rishi Sonthalia, and Wei Hu. "Near-Interpolators: Rapid Norm Growth and the Trade-Off between Interpolation and Generalization". Accepted to *NeurIPS 2023 Workshop Mathematics of Modern Machine Learning (M3L)*. Submitted to *International Conference on Artificial Intelligence and Statistics*. 2024.

[11] Zhiwei Xu, **Wang, Yutong**, Spencer Frei, Gal Vardi, and Wei Hu. "Benign Overfitting and Grokking in ReLU Networks for XOR Cluster Data". [arXiv]. Accepted to *NeurIPS 2023 Workshop Mathematics of Modern Machine Learning (M3L)*. Submitted to *International Conference on Learning Representations*. 2024.

[12] Jiyi Chen, Pengyu Li, **Wang, Yutong**, Pei-Cheng Ku, and Qing Qu. "Accelerating Deep Learning in Reconstructive Spectroscopy with Device-Informed Data Simulation". Submitted to *International Conference on Acoustics, Speech, and Signal Processing*. 2024.

[13] James Boyko, Nathan Fox, **Wang, Yutong**, Yiluan Song, and Yu Zhou. "Monitoring Plant-Pollinator Networks by Integrating Museum Data, Citizen Science and Computer Vision". In preparation. Poster at *2023 U-M Data Science and AI Summit*.

[14] Joseph Cohen, Andreas Rauch, Jennifer Li, Bernardo Modenesi, James Boyko, **Wang, Yutong**, Eunshin Byon, and Xun Huan. "Sparse Modeling of Wavelet Features for Fault Classification and Regression in Spacecraft Propulsion Systems". In preparation. Poster at *Asia Pacific Conference of the Prognostics and Health Management Society 2023*.

* denotes equal contribution.

Technical Reports

[15] **Wang, Yutong**, Tasha Thong, Venkatesh Saligrama, Justin Colacino, Laura Balzano, and Clayton Scott. "A gene filter for comparative analysis of single-cell RNA-sequencing trajectory datasets". [bioRxiv]. 2019.

Grants

• **NSF CISE Medium, Award # 2312842** 2023

Collaborative Research: RI: Medium: Principles for Optimization, Generalization, and Transferability via Deep Neural Collapse,

Budget: $1,200,000, Period Covered: 10/01/2023 - 09/30/2026

PI: Zhihui Zhu, Co-PI: Jeremias Sulam, Co-PI: Qing Qu, Senior Personnel: **Yutong Wang**

• **Schmidt Futures AI Collaboration Fund, Submitted** 2023
Biodiversity Monitoring of Plant-Pollinator Networks via Efficient Computer Vision,
Budget: $25,000
PI: **Yutong Wang**, Co-PI: James Boyko, Co-PI: Nathan Fox, Co-PI: Yiluan Song, Co-PI: Yu Zhou

Presentations

Benign Overfitting and Grokking in ReLU Networks for XOR Cluster Data
The Interplay between Learning, Optimization, and Statistics, 2023 INFORMS Annual Meeting.
John Wright's group meeting (Sept 2023)

Closed-form Solutions of Learning Dynamics for Two-layer Nets for Collapsed Orthogonal Data
Third Workshop on Seeking Low-Dimensionality in Deep Neural Networks (SLowDNN). [Link]

Consistent Interpolating Ensembles
Workshop on the Theory of Overparameterized Machine Learning (TOPML 2022). [Link]
AI seminars at Boston University (Mar 2022).
Misha Belkin's group meeting (Jan 2022).

Weston-Watkins Hinge Loss and Ordered Partitions
RIKEN seminar on Learning theory of loss functions (Nov 2021)
MCAIM Graduate Seminar, University of Michigan (Oct 2020)

Domain adaptation for spatial and dissociated gene expression data
Learning Meaningful Representations of Life (LMRL) Workshop at NeurIPS. [Link]

Awards and Honors

UM Postdoctoral Association Conference Award	2023
NeurIPS Scholar Award	2022
Honorable Mention for Outstanding Graduate Student Instructors and Instructional Aides	2021
NIH-sponsored travel award for NeurIPS Conference workshop	2019
NeurIPS 2019 Conference workshop: "Learning Meaningful Representations of Life"	
The Rollin M. Gerstacker Foundation Fellowship	2016
Dean's List	7 times
University Honors	4 times

Teaching Experience

Group leader Summer 2023
Midwest Research Experience for Graduates [link]
Advised four PhD students early in their programs on machine learning research over the course of two weeks.

Group leader assistant Summer 2022
Michigan Research Experience for Graduates [link]
Advised five PhD students early in their programs on machine learning research over the course of two weeks.

Graduate student instructor Winter 2021
University of Michigan, Ann Arbor, EECS 598 Statistical Learning Theory
Received ECE GSI Honorable Mention for my teaching efforts.

Guest lecturer Fall 2021
University of Michigan, Ann Arbor, SW 508 Essentials of Social Welfare Policy
Lecture topic: Fairness in machine learning and its impact on social policy. Course instructor: Rita Xiaochen Hu.

Teaching assistant Winter 2015 - Spring 2016
University of California, Davis
Courses taught: MAT 21C Calculus: Partial Derivatives and Series, Winter 2015, Fall 2015, Winter 2016, and Winter 2016. MAT 21D Vector Analysis, Fall 2014, and Spring 2016.

Professional Services

Reviewer (conferences)
Conference on Learning Theory (COLT) 2023, Neural Information Processing Systems (NeurIPS) 2023, International Conference on Learning Representations (ICLR) 2023 Workshop on Domain Generalization, International Conference on Machine Learning (ICML) 2020

Reviewer (journals)
Proceedings of the National Academy of Sciences (PNAS) of the United States of America, IEEE Transactions on Signal Processing, Journal of Machine Learning Research (JMLR)

Curriculum Committee Member
Development of instructional materials for future cohorts of Schmidt AI in Science postdocs

Co-organizer for AI in Science & Engineering Day link
Responsibilities include developing agenda and inviting speakers

Judge for Michigan Student Symposium for Interdisciplinary Statistical Sciences (MSSISS) 2023. link

Group leader for NeurIPS 2022 High School Outreach Program at New Orleans. link

Tutor at STEM Café at Women's Resources and Research Center, UC Davis 2015-2016
Volunteered as a tutor in calculus, probability and combinatorics.

Community Service

Volunteer for Ann Arbor Meals on Wheels 2022-2023
Once a week meal delivery for older adults in Ann Arbor.