

HANCHENG MIN

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Institute of Natural Sciences & School of Mathematical Sciences
Shanghai Jiao Tong University

EDUCATION

Johns Hopkins University , Baltimore, MD	<i>Sep. 2018 – Jul. 2023</i>
Ph.D., Electrical and Computer Engineering	
University of Pennsylvania , Philadelphia, PA	<i>Sep. 2016 – May. 2018</i>
Master of Science in Engineering, Electrical and Systems Engineering	
Tongji University , Shanghai, China	<i>Sep. 2012 – Jul. 2016</i>
Bachelor of Engineering, Automation	

ACADEMIC APPOINTMENTS

Tenure-track Associate Professor	<i>Sep. 2025 – Present</i>
Institute of Natural Sciences and School of Mathematical Sciences	
Shanghai Jiao Tong University	
Postdoctoral Researcher	<i>Aug. 2023 – Jul. 2025</i>
Vidal-lab, Electrical and Systems Engineering, Advisor: René Vidal	
University of Pennsylvania	
Graduate Research Assistant	<i>Sep. 2018 – Jul. 2023</i>
NetD-lab, Electrical and Computer Engineering, Advisor: Enrique Mallada, René Vidal	
Johns Hopkins University	
Graduate Research Assistant	<i>Jun. 2017 – May. 2018</i>
Kod*lab, Electrical and Systems Engineering, Mentor: Ömür Arslan	
University of Pennsylvania	

PROJECTS

Grant awarded

- **NSFC** Theory of Latent Representation in Deep Learning with Applications, 2026-2029
- **SJTU** Institute of Natural Sciences Startup Fund, 2025

Grant as contributor

- **NSF-Simons** Collaborative Research: Transferable, Hierarchical, Expressive, Optimal, Robust, Interpretable Networks, 2021-2024
- **NSF** HDR TRIPODS: Institute for the Foundations of Graph and Deep Learning, 2021-2023
- **ONR** MURI: Control and Learning Enabled Verifiable Robust AI, 2021-2025

AWARDS AND HONORS

AI x Science Postdoctoral Fellowship, Data Driven Discovery Initiative at Penn	<i>Nov. 2024</i>
MINDS Data Science Spring Fellowship 2021	<i>Jan. 2021</i>
MINDS Data Science Fellowship 2019/2020	<i>Nov. 2019</i>
ICRA 2018 Best Paper in Multirobot Nominee	<i>Mar. 2018</i>

PUBLICATIONS

Preprints

- [P2] **H. Min**, L. E. MacDonald, and R. Vidal, "On the convergence, implicit bias and edge of stability of gradient descent in deep learning," Mar. 2026, Revised.
- [P1] **H. Min**, S. Tarmoun, R. Vidal, and E. Mallada, "Convergence and implicit bias of gradient flow on overparametrized linear networks," 2023, arXiv:2105.06351.

Journals

- [J5] **H. Min**, R. Pates, and E. Mallada, "A frequency domain analysis of slow coherency in networked systems," *Automatica*, vol. 174, p. 112184, 2025.
- [J4] Z. Xu, **H. Min**, S. Tarmoun, E. Mallada, and R. Vidal, "A local Polyak-Lojasiewicz and descent lemma of gradient descent for overparameterized linear models," *Transactions on Machine Learning Research (TMLR)*, 2025.
- [J3] Y. Jiang, **H. Min**, and B. Zhang, "Oscillations-aware frequency security assessment via efficient worst-case frequency Nadir computation," *Electric Power Systems Research (EPSR)*, vol. 234, pp. 110656–110664, 2024, also in PSCC 2024.
- [J2] A. Castellano, **H. Min**, J. A. Bazerque, and E. Mallada, "Learning to act safely with limited exposure and almost sure certainty," *IEEE Transactions on Automatic Control (TAC)*, vol. 68, no. 5, pp. 2979–2994, May 2023.
- [J1] **H. Min**, F. Paganini, and E. Mallada, "Accurate reduced order models for coherent heterogeneous generators," *IEEE Control Systems Letters (L-CSS)*, vol. 5, no. 5, pp. 1741–1746, Nov. 2021, also in ACC 2021.

Conferences

- [C21] L. E. MacDonald, L. Palma, Z. Xu, **H. Min**, S. Tarmoun, and R. Vidal, "Convergence rates for gradient descent on the edge of stability for overparametrised least squares," in *Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2025.
- [C20] **H. Min** and R. Vidal, "Understanding incremental learning with closed-form solution to gradient flow on overparametrized matrix factorization," in *IEEE Conference on Decision and Control (CDC)*, Dec. 2025.
- [C19] **H. Min**, Z. Zhu, and R. Vidal, "Neural collapse under gradient flow on shallow ReLU networks for orthogonally separable data," in *Conference on Neural Information Processing Systems (NeurIPS)*, Dec. 2025.
- [C18] F. Tian, T. Ding, J. Luo, **H. Min**, and R. Vidal, "Voyaging into perpetual dynamic scenes from a single view," in *IEEE/CVF International Conference on Computer Vision (ICCV)*, Oct. 2025.
- [C17] **H. Min** and R. Vidal, "Gradient flow provably learns robust classifiers for orthonormal GMMs," in *International Conference on Machine Learning (ICML)*, Jul. 2025.

- [C16] J. Luo, T. Ding, K. H. R. Chan, **H. Min**, C. Callison-Burch, and R. Vidal, "Concept Lancet: Image editing with compositional representation transplant," in *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, Jun. 2025.
- [C15] Z. Xu, **H. Min**, J. Luo, S. Tarmoun, L. E. MacDonald, E. Mallada, and R. Vidal, "Understanding the learning dynamics of LoRA: A gradient flow perspective on low-rank adaptation in matrix factorization," in *International Conference on Artificial Intelligence and Statistics (AISTATS)*, May 2025.
- [C14] **H. Min** and R. Vidal, "Can implicit bias imply adversarial robustness?" In *International Conference on Machine Learning (ICML)*, Jul. 2024.
- [C13] Y. Jiang, **H. Min**, and B. Zhang, "Oscillations-aware frequency security assessment via efficient worst-case frequency Nadir computation," in *Power Systems Computation Conference (PSCC)*, Jun. 2024.
- [C12] **H. Min**, E. Mallada, and R. Vidal, "Early neuron alignment in two-layer ReLU networks with small initialization," in *International Conference on Learning Representations (ICLR)*, May 2024.
- [C11] A. Castellano, **H. Min**, J. A. Bazerque, and E. Mallada, "Learning safety critics via a non-contractive binary Bellman operator," in *Asilomar Conference on Signals, Systems, and Computers (ACSSC)*, Nov. 2023.
- [C10] **H. Min**, R. Vidal, and E. Mallada, "On the convergence of gradient flow on multi-layer linear models," in *International Conference on Machine Learning (ICML)*, Jul. 2023.
- [C9] **H. Min** and E. Mallada, "Learning coherent clusters in weakly-connected network systems," in *Learning for Dynamics and Control Conference (L4DC)*, Jun. 2023.
- [C8] **H. Min** and E. Mallada, "Spectral clustering and model reduction for weakly-connected coherent network systems," in *American Control Conference (ACC)*, May 2023.
- [C7] Z. Xu, **H. Min**, S. Tarmoun, E. Mallada, and R. Vidal, "Linear convergence of gradient descent for finite width over-parametrized linear networks with general initialization," in *International Conference on Artificial Intelligence and Statistics (AISTATS)*, Apr. 2023.
- [C6] A. Castellano, **H. Min**, J. A. Bazerque, and E. Mallada, "Reinforcement learning with almost sure constraints," in *Learning for Dynamics and Control Conference (L4DC)*, Mar. 2022.
- [C5] **H. Min**, S. Tarmoun, R. Vidal, and E. Mallada, "On the explicit role of initialization on the convergence and implicit bias of overparametrized linear networks," in *International Conference on Machine Learning (ICML)*, Jul. 2021.
- [C4] **H. Min**, F. Paganini, and E. Mallada, "Accurate reduced-order models for heterogeneous coherent generators," in *American Control Conference (ACC)*, Jun. 2021.
- [C3] **H. Min** and E. Mallada, "Dynamics concentration of tightly-connected large-scale networks," in *IEEE Conference on Decision and Control (CDC)*, Dec. 2019.
- [C2] **H. Min**, F. Paganini, and E. Mallada, "Accurate reduced order models for coherent synchronous generators," in *Allerton Conference on Communication, Control, and Computing (Allerton)*, Sep. 2019.
- [C1] O. Arslan, **H. Min**, and D. E. Koditschek, "Voronoi-based coverage control of pan/tilt/zoom camera networks," in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2018.

Thesis

- [T2] H. Min, "Exploiting structural properties in the analysis of high-dimensional dynamical systems," Ph.D. Thesis, Johns Hopkins University, 2023.
- [T1] H. Min, "On balancing event and area coverage in mobile sensor networks," Master's Thesis, University of Pennsylvania, 2018.

TEACHING

Instructor

- *Artificial Intelligence Basics* (Spring 2026; undergrad), Shanghai Jiao Tong University
- *Mathematical Analysis (Honor) II: Recitation* (Spring 2026; undergrad), Shanghai Jiao Tong University
- *Mathematical Analysis (Honor) I: Recitation* (Fall 2025; undergrad), Shanghai Jiao Tong University

Teaching Assistant

- *Foundations of Reinforcement Learning* (Fall 2020, Fall 2021, Fall 2022; grad), Johns Hopkins University
- *Control Systems*, (Spring 2022; undergrad), Johns Hopkins University
- *Networked Dynamical Systems*, (Fall 2019; grad), Johns Hopkins University
- *edX Course: Robotics: Locomotion and Engineering* (Spring 2018), Penn Engineering Online Learning

Internship Mentor

- *Army Educational Outreach Program (AEOP) High School Internship Mentor* (June-Aug 2024), University of Pennsylvania

ADVISING AND MENTORING

Advising

- **Xuhang Zhang** *Undergrad, Class 2022, Shanghai Jiao Tong University*
Undergrad Thesis: Detection and mitigation of LLM hallucination based on uncertainty quantification
- **Shi Dong** *Undergrad, Class 2022, Shanghai Jiao Tong University*
Undergrad Thesis: Understanding neural collapse in multi-layer ReLU networks
- **Shiyi Shen** *Undergrad, Class 2022, Sichuan University*
Undergrad Thesis: LoRA fine-tuning with sparse regularizations

Mentoring

- **Fengrui Tian** *Ph.D. Student, University of Pennsylvania*
Department of Computer and Information Science. Advisor: René Vidal
Research Project: 3D dynamical scene generation
- **Prisha Shroff** *High School Intern, Hamilton High School*
Army Educational Outreach Program (AEOP) High School Intern at University of Pennsylvania
Research Project: Orthogonal matching pursuit for interpretable image classification
- **Salma Tarmoun** *Ph.D. Student, University of Pennsylvania*
Department of Mathematics. Advisor: René Vidal
Research Project: Gradient descent dynamics in attention models
- **Ziqing Xu** *Ph.D. Student, University of Pennsylvania*
Wharton Statistics and Data Science. Advisor: René Vidal
Research Projects: Convergence of gradient descent on linear networks; Convergence analysis of LoRA
- **Agustín Castellano** *Ph.D. Student, Johns Hopkins University*
Department of Electrical and Computer Engineering. Advisor: Enrique Mallada
Research Project: Reinforcement learning with almost sure safety

PROFESSIONAL SERVICES

Area Chair

International Conference on Learning Representations (ICLR), 2026;
International Conference on Artificial Intelligence and Statistics (AISTATS), 2026

Technical Reviewer

- *Journals:*
IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI);
Journal of Machine Learning Research (JMLR);
Transactions on Machine Learning Research (TMLR);
IEEE Transactions on Automatic Control (TAC);
Automatica;
- *Conferences:*
International Conference on Machine Learning (ICML), 2022-2026;
Conference on Neural Information Processing Systems (NeurIPS), 2021-2025;
International Conference on Learning Representations (ICLR), 2022-2025;
International Conference on Artificial Intelligence and Statistics (AISTATS), 2025;
IEEE Decision and Control (CDC), 2023,2025;
American Control Conference (ACC), 2022;

University Service

- Pre-evaluation Admission Committee Member: UPenn ESE PhD Student Search Dec. 2023

PRESENTATIONS

Talks

- **Dec. 2025:** Understanding incremental learning with closed-form solution to gradient flow on over-parameterized matrix factorization
64th IEEE Conference on Decision and Control, Rio de Janeiro, Brazil
- **Nov. 2025:** Learning Dynamics in the Feature Learning Regime: Implicit Bias, Neural Collapse, and Robustness
Workshop on Recent Advances in Optimization, Control and AI, New York University Shanghai, Shanghai.
Hosts: Shuyang Ling, Mathieu Lauriere
- **Jul. 2025:** Simplicity Bias in Shallow Neural Networks
School of Data Science, The Chinese University of Hong Kong, Shenzhen. Host: Yan Jiang, Tongxin Li
- **Jan. 2025:** Learning Dynamics, Implicit Bias, and Robustness of Shallow Neural Networks
School of Data Science, The Chinese University of Hong Kong, Shenzhen.
- **Jan. 2025:** Learning Dynamics, Implicit Bias, and Robustness of Overparametrized Networks
Institute of Natural Sciences, Shanghai Jiao Tong University
- **Oct. 2024:** Learning Dynamics, Implicit Bias, and Robustness of Shallow Neural Networks
"AI + MATH" Colloquia, Virtual, Shanghai Jiao Tong University. Host: Zhiqin Xu
- **Nov. 2023:** Early Neuron Alignment in Two-layer ReLU Networks with Small Initialization
DeepMath 2023, Johns Hopkins University
- **Jun. 2023:** Spectral Clustering and Model Reduction for Weakly-Connected Coherent Network Systems
American Control Conference 2023, San Diego, CA
- **Jan. 2023:** Exploiting Structural Properties in the Analysis of High-dimensional Dynamical Systems
University of Michigan. Host: Necmiye Ozay
- **Jan. 2023:** Learning Coherent Clusters in Weakly-Connected Network Systems
ROSEI Summit, Johns Hopkins University

- **Jun. 2022:** Convergence and Implicit Bias of Gradient Flow on Overparametrized Linear Networks
RSRG Seminar, California Institute of Technology. Hosts: Adam Wierman, Steven Low
- **Jun. 2022:** Convergence and Implicit Bias of Gradient Flow on Overparametrized Linear Networks
Semiautonomous seminar, UC Berkeley. Hosts: Chinmay Maheshwari, Shankar Sastry
- **Mar. 2022:** Convergence and Implicit Bias of Gradient Flow on Overparametrized Linear Networks
MINDS Retreat, Johns Hopkins University
- **Jan. 2022:** Convergence and Implicit Bias of Gradient Flow on Overparametrized Linear Networks
2022 TRIPDS Winter School on Interplay between AI and Dyn. Sys., Virtual
- **May. 2021:** Accurate Reduced Order Models for Coherent Heterogeneous Generators
American Control Conference 2021, Virtual.
- **Dec. 2019:** Dynamics Concentration of Tightly-Connected Large-Scale Networks
58th IEEE Conference on Decision and Control, Nice, France. Dec. 2019

REFERENCES

Enrique Mallada

Ph.D. Advisor

Associate Professor, Electrical and Computer Engineering
Johns Hopkins University, Baltimore, MD

René Vidal

Postdoc Advisor

Rachleff University Professor, Electrical and Systems Engineering
University of Pennsylvania, Philadelphia, PA

Fernando Paganini

Professor, Electrical and Telecommunications Engineering
Universidad ORT Uruguay, Montevideo, Uruguay

Eduardo Sontag

University Distinguished Professor, Electrical and Computer Engineering
Northeastern University, Boston, MA

Hamed Hassani

Associate Professor, Electrical and Systems Engineering
University of Pennsylvania, Philadelphia, PA

Necmiye Ozay

Chen-Luan Family Faculty Development Professor, Electrical and Computer Engineering
University of Michigan, Ann Arbor, MI