ADITYANARAYANAN (ADIT) RADHAKRISHNAN

Email: aradha@mit.edu ⋄ Website: aditradha.com
Massachusetts Insitute of Technology, Broad Institute of MIT and Harvard

APPOINTMENTS

MIT Mathematics Cambridge, MA, USA.

- Assistant Professor — July 2025

Broad Institute of MIT and Harvard Cambridge, MA, USA.

- Associate Member — July 2025
- Eric and Wendy Schmidt Center Postdoctoral Fellow — June 2024

Harvard University Cambridge, MA, USA.

- Associate in Applied Mathematics — August 2024
- George F. Carrier Postdoctoral Fellow, School of Engineering and Applied Sciences — September 2023

EDUCATION

Massachusetts Institute of Technology Cambridge, MA, USA.

- Ph.D. Candidate, Electrical Engineering and Computer Science — June 2023
  Thesis: Foundations of Machine Learning: Over-parameterization and Feature Learning
  Thesis Advisor: Caroline Uhler
- M.Eng., Electrical Engineering and Computer Science — June 2017
  Thesis: Theory and application of neural and graphical models in early cancer diagnostics
  Thesis Advisor: Caroline Uhler
- B.S. in Mathematics and Electrical Engineering and Computer Science — June 2016
  Thesis: Combinatorial Analysis of Markov Equivalence Classes
  Thesis Advisor: Caroline Uhler

RESEARCH INTERESTS

Machine Learning: Feature learning, kernels, representation learning, infinite-width neural networks;
Computational Biology: Genomics, multi-modal data integration, genetic discovery.

JOURNAL PUBLICATIONS

1. R. J. Carlson, J.J. Patten, G. Stefanakis, B. Y. Soong, **A. Radhakrishnan**, A. Singh, N. Thakur, G. K. Amarasinghe, N. Hacohen, C. F. Basler, D. Leung, C. Uhler, R. A. Davey, P. C. Blainey. *Single-cell image-based genetic screens systematically identify regulators of Ebola virus subcellular infection dynamics.* Nature Microbiology 10, pages 1989-2002 (2025). Available at Nature Microbiology.
2. D. Paysan*, **A. Radhakrishnan***, G.V. Shivashankar, and C. Uhler. *Image2Reg: Linking chromatin images to gene regulation using genetic perturbation screens.* Cell Systems Vol. 16, Issue 6 (2025). Available at Cell Systems.
3. **A. Radhakrishnan**, M. Belkin, and D. Drusvyatskiy. *Linear Recursive Feature Machines provably recover low-rank matrices.* Proceedings of the National Academy of Science 122, Article 13 (2025). Available at PNAS.
4. **A. Radhakrishnan***, D. Beaglehole*, P. Pandit, and M. Belkin. *Mechanism for feature learning in neural networks and backpropagation-free machine learning models.* Science (2024). Available at Science.

5. **A. Radhakrishnan***, S. Friedman*, S. Khurshid, K. Ng, P. Batra, S. Lubitz, A. Philippakis, C. Uhler. *A cross-modal autoencoder framework learns holistic representations of cardiovascular state.* Nature Communications 14, Article 2436 (2023). Available at Nature Communications.

6. **A. Radhakrishnan**, M. Belkin, and C. Uhler. *Wide and deep neural networks achieve optimality for classification.* Proceedings of the National Academy of Science 120, Article 14 (2023). Available at PNAS.

7. **A. Radhakrishnan***, M. Ruiz Luyten*, N. Prasad, and C. Uhler. *Transfer learning with kernel methods.* Accepted in Nature Communications (2023). Available at Nature Communications.

8. **A. Radhakrishnan**, G. Stefanakis, M. Belkin, C. Uhler. *Simple, fast, and flexible framework for matrix completion with infinite width neural networks.* Proceedings of the National Academy of Science 119, Article 16 (2022). Available at PNAS.

9. A. Belyaeva*, L. Cammarata*, **A. Radhakrishnan***, C. Squires, K.Yang, G.V. Shivashankar, C. Uhler. *Causal network models of SARS-CoV-2 expression and aging to identify candidates for drug repurposing.* Nature Communications 12, Article 1024 (2021). Available at Nature Communications.

10. K. Yang, A. Belyaeva, S. Venkatachalapathy, K. Damodaran, **A. Radhakrishnan**, A. Katcoff, G.V. Shivashankar, C. Uhler. *Multi-domain translation between single-cell imaging and sequencing data using autoencoders.* Nature Communications 12, Article 31 (2021). Available at Nature Communications.

11. **A. Radhakrishnan**, M. Belkin, and C. Uhler. *Overparameterized neural networks implement associative memory.* Proceedings of the National Academy of Science 117, Article 44 (2020). Available at PNAS.

12. **A. Radhakrishnan**, L. Solus, and C. Uhler. *Counting Markov equivalence classes for DAG models on trees.* Discrete Applied Mathematics 244 (2018), pp. 170-185. Available at Discrete Applied Mathematics.

13. **A. Radhakrishnan***, K. Damodaran*, A. Soylemezoglu, C. Uhler and G.V. Shivashankar. *Machine learning for nuclear mechano-morphometric biomarkers in cancer diagnosis.* Scientific Reports 7, Article 17946 (2017). Available at Scientific Reports.

CONFERENCE AND WORKSHOP PUBLICATIONS

1. N. Mallinar, D. Beaglehole, L. Zhu, **A. Radhakrishnan**, P. Pandit, M. Belkin. *Emergence in non-neural models: grokking modular arithmetic via average gradient outer product.* ICML, **Oral Presentation** (2025). Available at arXiv:2407.20199.

2. L. Zhu, C. Liu, **A. Radhakrishnan**, M. Belkin. *Catapults in sgd: spikes in the training loss and their impact on generalization through feature learning.* ICML (2024). Available at arXiv:2306.04815.

3. L. Zhu, C. Liu, **A. Radhakrishnan**, M. Belkin. *Quadratic models for understanding neural network dynamics.* ICLR (2024). Available at arXiv:2205.11787.

4. E. Nichani*, **A. Radhakrishnan***, C. Uhler. *Increasing depth leads to U-shaped test risk in over-parameterized convolutional networks.* Workshop on Over-parameterization: Pitfalls and Opportunities in ICML (2021). Available at arXiv:2010.09610.

5. **A. Radhakrishnan***, E. Nichani*, D. Bernstein, C. Uhler. *On alignment in deep linear neural networks.* Workshop on Over-parameterization: Pitfalls and Opportunities in ICML (2021). Available at arXiv:2003.06340.

6. **A. Radhakrishnan**, M. Belkin, C. Uhler. *Local quadratic convergence of stochastic gradient descent with adaptive step size.* Workshop on Beyond first-order methods in ML systems in ICML (2021). Available via workshop link.

7. **A. Radhakrishnan**, M. Belkin, and C. Uhler. *Memorization in overparameterized autoencoders.* ICML Workshop on Identifying and Understanding Deep Learning Phenomena (2019). Available at arXiv:1810.10333.

8. **A. Radhakrishnan**, C. Durham, A. Soylemezoglu, and C. Uhler. *Patchnet: Interpretable neural networks for image classification.* NeurIPS ML4H Workshop (2018). Available at arXiv:1705.08078.

9. **A. Radhakrishnan**, L. Solus, and C. Uhler. *Counting Markov equivalence classes by number of immoralities.* Proceedings of the Thirty-Third Conference on Uncertainty in Artificial Intelligence (UAI) (2017). Available at arXiv:1611.07493.

PREPRINTS

1. C. Cai*, **A. Radhakrishnan***, C. Uhler. *Synthetic lethality screening with Recursive Feature Machines.* Preprint available at bioRxiv:2023.12.03.569803v1.
2. S. Jain*, **A. Radhakrishnan***, and C, Uhler. *A mechanism for producing aligned latent spaces with autoencoders.* Preprint available at arXiv:2106.15456.
3. **A. Radhakrishnan**, M. Belkin, C. Uhler. *Linear convergence of generalized mirror descent with time-dependent mirrors.* Preprint available at arXiv:2009.08574.

ALL HONORS AND AWARDS

1. George F. Carrier Postdoctoral Fellowship 2023
2. First prize for ITA graduation day talk 2023
3. Rising Stars in Data Science, UChicago 2022
4. Broad Institute Eric and Wendy Schmidt Center Graduate Fellowship 2021-2023
5. Best Poster Award at MIT Statistics and Data Science Conference 2022
6. Outstanding Reviewer Award at International Conference on Learning Representations 2021
7. Best Poster Award at Genomes & AI: From Packing to Regulation 2019
8. Phi Beta Kappa Honor Society Inductee (MIT) 2016

SUMMER RESEARCH PROGRAMS

1. Simons Institute - Deep Learning Theory Workshop and Summer School Summer 2022
2. Simons Institute - Foundations of Deep Learning Summer 2019

TEACHING

1. Instructor: *Tutorial on infinite width neural networks and feature learning*, KIT Fall 2023.
2. Instructor: *6.S088, Modern Machine Learning: Simple Methods that Work*, MIT Winter 2022, 2023.
   Link to online lecture notes.
3. Teaching Assistant: *Deep Learning Theory Summer School*, Princeton Summer 2021.
4. Teaching Assistant: *6.042, Math for Computer Science*, MIT Fall 2016.
5. Instructor for MIT Splash: *Introduction to Python*, MIT Fall 2012.

MENTORSHIP

Mentored 8 undergraduate and master's students at MIT.

1. Cathy Cai, BS 2020-
2. Divya Nori, BS 2022-2023
3. Ishika Shah, BS 2020-2021
4. Max Ruiz Luyten, BS, now at Meta 2020-2021
5. George Stefanakis, BS + MEng, now at NVIDIA 2019-2021
6. Neha Prasad, MEng, now at Valo 2019-2020

7. Eshaan Nichani, BS + MEng, now Ph.D. student at Princeton 2018-2020
8. Ali Soylemezoglu, BS + MEng, now at Microsoft 2016-2017

ACADEMIC SERVICE

Reviewer for Annals of Statistics, JASA, PNAS, NeurIPS, ICML, ICLR, IEEE Transactions on Medical Imaging.

INVITED TALKS

1. University of California, San Diego Computer Science seminar 2025
2. Harvard School of Public Health and Dana-Farber Cancer Institute Data Science Colloquium 2025
3. Information Theory and Algorithms 2025
4. MIT Mathematics seminar 2025
5. University of Michigan, Biostatistics seminar 2025
6. Broad Institute Retreat 2024
7. INFORMS, Advances in Deep Learning Theory 2024
8. SIAM Conference on Mathematics of Data Science 2024
9. IPAM Workshop on Theory and Practice in Deep Learning 2024
10. DIMACS Workshop on Modeling Randomness in Neural Network Training 2024
11. Eric and Wendy Schmidt Center Scientific Advisory Board 2024
12. Lawrence Livermore National Laboratory 2024
13. University of Washington Optimization Seminar 2024
14. Stanford Biomedical Data Science Seminar 2024
15. Columbia University Biomedical Informatics Seminar Series 2023
16. Novo Nordisk Foundation Center workshop on multimodal data integration 2023
17. INFORMS, Statistical and Machine Learning Methods in Healthcare 2023
18. Apple Seminar 2023
19. KIT Workshop on Deep Learning 2023
20. Broad Symposium: Ladders to Cures 2023
21. Amazon Science Seminar 2023
22. IBM Research AI Seminar 2023
23. Broad Scientific Counsel 2023
24. Cosyne Workshop on Attractors 2023
25. ITA Graduation Day 2023
26. MIT LIDS Student Conference 2023
27. Broad Institute Retreat 2022
28. UChicago Rising Stars 2022
29. INFORMS, Data-Driven Healthcare: From Predictions to Decisions 2022
30. SIAM MDS, Algebraic Geometry and Machine Learning Minisymposium 2022
31. Workshop on the Theory of Overparameterized Machine Learning 2022

32. Guest Lecture for 6.881: Tissue vs. Silicon in Machine Learning 2021
33. ML Collective, Deep Learning: Classics and Trends 2021
34. Phillips Exeter Academy, Biology Club Speaker Series 2021
35. Broad Institute, Machine Learning for Healthcare Seminar 2021
36. CompCancer Graduate Program Invited Lecture 2021
37. Max Delbrück Center for Molecular Medicine System's Biology Lecture Series 2021
38. MILA Biology + AI Reading Group Invited Lecture 2021
39. Broad Institute Cell Circuits and Epigenomics Virtual Seminar Series 2020
40. Machine Learning at MIT Lecture Series 2020
41. Algebra, Statistics, and Optimization Seminar at MIT 2020
42. NVIDIA ASUG Executive Exchange: Reimagine Your Business with AI 2018
43. MIT Student Colloquium for Undergraduates Lecture Series 2015

IN THE NEWS

1. Schmidt Center scientists develop a robust machine learning approach for virtual drug screening and other applications ; Link to Article.
2. MIT News: A machine-learning approach to finding treatment options for Covid-19 ; Link to Article.

INDUSTRY EXPERIENCE

Manifold Valley - Machine Learning Advisor July 2022-

- Provide guidance to CEO and machine learning team regarding model development.

App Orchid - Principal Data Scientist August 2017-May 2019

Primary Responsibilities Include:

- Developing machine learning IP.
- Designing solution architecture for AI related customer problems (domains include Insurance, Health Care, Energy & Utilities).
- Serving as pre-sales technical advisor to present products and solutions to customers. Managing solution life-cycle directly with customers.