

Jacob D. Abernethy

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Research Profile

Machine learning theory; online learning and sequential decision-making; optimization; learning in games and game theory; market design; and the dynamics of learning and decision-making systems, with recent work on the theoretical and algorithmic foundations of modern AI systems.

At Google Research, part of the ML Theory team, with work spanning Gemini, large-scale pretraining and LSP, transformer reasoning, model sparsity, and optimization for large-scale AI systems.

Appointments and Education

Google Research — Research Scientist December 2022–present

Major contributor to the Gemini Large-Scale Pretraining team, January 2025–present.

Georgia Institute of Technology, School of Computer Science — Associate Professor March 2020–present

20% appointment since December 2022.

Georgia Institute of Technology, School of Computer Science — Assistant Professor August 2017–February 2020

University of California, Berkeley — PhD in Computer Science 2011

Advisor: Peter L. Bartlett.

Toyota Technological Institute at Chicago — MS in Computer Science 2006

Massachusetts Institute of Technology — BS in Mathematics 2002

Commonwealth of Massachusetts — General Educational Development (GED) 1998

Leadership and Public Impact

BlueConduit — Co-founder and Board Member August 2019–present

Co-founded with Eric Schwartz to develop data and software tools for lead-service-line inventory and replacement, and to support water utilities with software solutions to infrastructure challenges.

In8, Inc. — Co-founder March–December 2017

Co-founded with Elad Hazan to develop machine-learning systems for autonomous-vehicle control; acquired by Google in December 2017.

Developed statistical and machine-learning tools with Eric Schwartz and the Michigan Data Science Team to identify homes likely to have hazardous lead service lines during the Flint water crisis. The work informed field operations and grew into BlueConduit, which supports water utilities with lead-service-line inventory and replacement.

Current Researchers and Recent Alumni

Guanghui Wang 2021–present

PhD student in Machine Learning; co-advised with Vidya Muthukumar. Apple Scholar in AI/ML, 2025.

John Lazarsfeld August 2026–present

ARC Postdoctoral Fellow; hosted with Vidya Muthukumar and Juba Ziani.

Tyler LaBonte 2026

Co-advised with Vidya Muthukumar; NDSEG and NSF Graduate Research Fellow. Dissertation: Generalization in Dynamic Environments: Foundations and Algorithms. Senior Researcher, Microsoft Research AI Frontiers.

Yeo Joon Youn 2024

Co-advised with Vidya Muthukumar. Dissertation: Advanced Quantization Techniques for Communication Efficiency and Privacy in Federated Learning, and Memory-efficient Fine-tuning of LLMs. AI Engineer, LinkedIn.

Zihao Hu 2023

Research Assistant Professor, Department of Mathematics, HKUST.

Bhuvesh Kumar 2023

Co-advised with Jamie Morgenstern. Research Scientist, Snap Research.

Selected Sponsored Research

National Science Foundation — Collaborative Research: CIF: Medium: An Algorithmic Theory of Hamiltonian Dynamics for Sampling, Optimization, and Games August 2024–July 2028

Principal Investigator · \$399,998 intended total

National Science Foundation — RI: Small: Training Modularized Learning Systems September 2019–September 2022

Principal Investigator · \$465,000

Google — Development of Sequential Optimization Algorithms for Machine Learning 2018

Principal Investigator · \$100,000 unrestricted gift

Apple Inc. — Research Gift — Jacob Abernethy/Guanghui Wang — Apple Scholars August 2025–August 2032

Principal Investigator · \$111,631.30

Selected Publications

Sánchez Vargas, F., Potluri, S. R., **Abernethy, J. D.**, & Benítez, M. E. (2026). CapuchinAI 1.0: Development of a machine learning-based touchscreen paradigm to test cognition in wild capuchins. *American Journal of Primatology*. Published online July 28, 2026. DOI: 10.1002/ajp.70194.

Wang, G., Hu, Z., Gentile, C., Muthukumar, V., & **Abernethy, J. D.** (2025). Faster margin maximization rates for generic and adversarially robust optimization methods . *Mathematical Programming* . Published online October 9, 2025. DOI: 10.1007/s10107-025-02283-4.

Wang, J.-K., **Abernethy, J. D.**, & Levy, K. Y. (2024). No-regret dynamics in the Fenchel game: a unified framework for algorithmic convex optimization . *Mathematical Programming*, 205 (1–2), 203–268.

Youn, Y., Kumar, B., & **Abernethy, J. D.** (2023). Accelerated federated optimization with quantization . *IEEE Data Engineering Bulletin*, 46 (1), 79–123.

Wang, G., Syed, U., Schapire, R. E., & **Abernethy, J. D.** (2026). Multi-distribution learning: from worst-case optimality to lexicographic min-max optimality . *37th International Conference on Algorithmic Learning Theory (ALT 2026)* . Accepted.

Pan, L., Ganesh, V., **Abernethy, J. D.**, Esposito, C., & Lee, W. (2025). Can transformers reason logically? A study in SAT solving . *Proceedings of the 42nd International Conference on Machine Learning, PMLR 267* , 47632–47671.

Pan, L., Esposito, C., **Abernethy, J. D.**, Ganesh, V., & Lee, W. (2025). Symbolic constraint-solving capabilities of transformer large language models . *Proceedings of the 1st GENZERO Workshop: Revolutionizing Autonomous Systems with Generative AI* , 147–154. DOI: 10.1007/978-981-95-1050-4_18.

Hu, Z., Wang, G., Wang, X., Wibisono, A., **Abernethy, J. D.**, & Tao, M. (2024). Extragradient type methods for Riemannian variational inequality problems . *Proceedings of AISTATS 2024, PMLR 238* , 2080–2088.

Abernethy, J. D., Schapire, R. E., & Syed, U. (2024). Lexicographic optimization: algorithms and stability . *Proceedings of AISTATS 2024, PMLR 238* , 2503–2511.

Abernethy, J. D., Agarwal, A., Marinov, T. V., & Warmuth, M. K. (2024). A mechanism for sample-efficient in-context learning for sparse retrieval tasks . *Proceedings of ALT 2024, PMLR 237* , 3–46.

Luo, F., Liu, L., Wang, G. G., Kumar, V., Ashton, M. S., **Abernethy, J. D.**, et al. (2023). Artificial intelligence for climate smart forestry: a forward looking vision . *Proceedings of IEEE CogMI 2023* , 1–10. DOI: 10.1109/CogMI58952.2023.00011.

Hu, Z., Wang, G., & **Abernethy, J. D.** (2023). Minimizing dynamic regret on geodesic metric spaces . *Proceedings of COLT 2023, PMLR 195* , 4336–4383.

Abernethy, J. D., Candelon, F., Evgeniou, T., Gupta, A., & Lostonlen, Y. (2024). Bring human values to AI . *Harvard Business Review*, March–April 2024 .

Havrilla, A., Hughes, E., Samvelyan, M., & **Abernethy, J. D.** (2025). SPARQ: Synthetic problem generation for reasoning via quality-diversity algorithms . *arXiv preprint arXiv:2506.06499* .

Selected Honors and Service

- **Best Student Paper Award, ACM SIGKDD** (2018), for *ActiveRemediation: The Search for Lead Pipes in Flint, Michigan*.
- **IBM Research Pat Goldberg Memorial Best Paper Award** and **COLT Best Student Paper Award** (2008), for *Competing in the Dark*.
- Program Co-Chair, COLT 2020; Senior Area Chair, NeurIPS 2021, 2022, and 2026; Senior Area Chair, ICML 2025 and 2026.