Sara Fridovich-Keil

Sutterfield Family Early Career Professor

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Academic Employment

Georgia Institute of Technology June 2025–present

Assistant Professor, School of Electrical and Computer Engineering

Stanford University June 2023–May 2025

NSF Mathematical Sciences Postdoctoral Research Fellow in Electrical Engineering

- Mentors: Mert Pilanci, Gordon Wetzstein

Education

University of California, Berkeley 2018–2023

PhD in Electrical Engineering and Computer Sciences

- Dissertation: Photorealistic Reconstruction from First Principles
- Advisor: Benjamin Recht
- Committee: Angjoo Kanazawa, Laura Waller, Rebecca Roelofs (Google Brain)

Princeton University 2014–2018

Bachelor of Science in Electrical Engineering, *summa cum laude*

- Advisor: Peter J. Ramadge
- Certificates (Minors): Applications of Computing, Robotics and Intelligent Systems

Research

My current research focus is at the intersection of signal processing, optimization, and machine learning, particularly for solving inverse problems in computational imaging. My research includes both applied and theoretical aims to improve the quality, computational and memory efficiency, interpretability, and reliability of reconstruction methods. I am also interested in improving our understanding of how neural networks work, so that they can be made more efficient and more robust to distribution shifts.

Publications

Conferences

- N. Kim*, N. Moeini*, J. Romberg, and **S. Fridovich-Keil**, "3D Field of Junctions: A Noise-Robust, Training-Free Structural Prior for Volumetric Inverse Problems," *ECCV*, 2026.
- A. Kheirandish*, J. Hong*, and **S. Fridovich-Keil**, "KLIP: localized distribution shift detection via KL-divergence with diffusion priors in Inverse Problems," *CVPR*, 2026.
- **S. Fridovich-Keil** and M. Pilanci, "A Recovery Guarantee for Sparse Neural Networks," *ICLR*, 2026.
- R. Sanda, A. Aali, A. Johnston, E. Reis, J. Singh, G. Wetzstein, and **S. Fridovich-Keil**, "Patch-Based Diffusion for Data-Efficient, Radiologist-Preferred MRI Reconstruction," *Machine Learning for Health (ML4H)*, 2025.
- N. Kim and **S. Fridovich-Keil**, "Grids Often Outperform Implicit Neural Representations at Compressing Dense Signals," *NeurIPS*, 2025.
- N. Kim and **S. Fridovich-Keil**, "Towards Distribution-Shift Uncertainty Estimation for Inverse Problems with Generative Priors," *IEEE International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP)*, 2025.
- I. Sivgin*, **S. Fridovich-Keil***, G. Wetzstein, and M. Pilanci, "Geometric Algebra Planes: Convex Implicit Neural Volumes," *ICML*, 2025.
- Y. Lin*, X.-Y. Pan*, **S. Fridovich-Keil**, and G. Wetzstein, "ThermalNeRF: Thermal Radiance Fields," *IEEE International Conference on Computational Photography (ICCP)*, 2024.
- A. Mai, D. Verbin, F. Kuester, and **S. Fridovich-Keil**, "Neural Microfacet Fields for Inverse Rendering," *ICCV*, 2023.

- **S. Fridovich-Keil***, G. Meanti*, F. Warburg, B. Recht, and A. Kanazawa, "K-Planes: Explicit Radiance Fields in Space, Time, and Appearance," *CVPR*, 2023.
- **S. Fridovich-Keil**, B. Bartoldson, J. Diffenderfer, B. Kailkhura, and P.-T. Bremer, "Models Out of Line: A Fourier Lens on Distribution Shift Robustness," *NeurIPS*, 2022.
- V. Vasudevan, B. Caine, R. Gontijo Lopes, **S. Fridovich-Keil**, and R. Roelofs, "When Does Dough Become a Bagel? Analyzing the Remaining Mistakes on ImageNet," *NeurIPS*, 2022.
- **S. Fridovich-Keil**, R. Gontijo Lopes, and R. Roelofs, "Spectral Bias in Practice: The Role of Function Frequency in Generalization," *NeurIPS*, 2022.
- **S. Fridovich-Keil***, A. Yu*, M. Tancik, Q. Chen, B. Recht, and A. Kanazawa, "Plenoxels: Radiance Fields Without Neural Networks," *CVPR*, 2022.
- M. Tancik*, P. Srinivasan*, B. Mildenhall*, **S. Fridovich-Keil**, N. Raghavan, U. Singhal, R. Ramamoorthi, J. Barron, and R. Ng, "Fourier Features Let Networks Learn High Frequency Functions in Low Dimensional Domains," *NeurIPS*, 2020.
- V. Shankar, A. Fang, W. Guo, **S. Fridovich-Keil**, L. Schmidt, J. Ragan-Kelley, and B. Recht, "Neural Kernels Without Tangents," *ICML*, 2020.
- R. Roelofs*, **S. Fridovich-Keil***, J. Miller, V. Shankar, M. Hardt, B. Recht, and L. Schmidt, "A Meta-Analysis of Overfitting in Machine Learning," *NeurIPS*, 2019.
- **S. Fridovich-Keil** and P. J. Ramadge, "Contact Surface Area: A Novel Signal for Heart Rate Estimation in Smartphone Videos," *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, 2018.

Journals

- J. Hong, C.-Y. Chiu, **S. Fridovich-Keil**, and G. Chou, "PolyMerge: Compressing 3D Gaussian Splats with Polytope Coverings for Provably Safe Resource-Constrained Navigation," *Robotics and Automation Letters (RAL)*, 2026.
- **S. Fridovich-Keil**, F. Valdivia, G. Wetzstein, B. Recht, and M. Soltanolkotabi, "Gradient Descent Provably Solves Nonlinear Tomographic Reconstruction," *IEEE Transactions on Information Theory*, 2026.
- M. Lou, K. Verchand, **S. Fridovich-Keil**, and A. Pananjady, "Accurate, Provable, and Fast Nonlinear Tomographic Reconstruction: A Variational Inequality Approach," *SIAM Journal on Imaging Sciences*, 2026.
- S. Patel*, **S. Fridovich-Keil***, S. A. Rasmussen, and J. L. Fridovich-Keil, "DAB-Quant: An Open-Source Digital System for Quantifying Immunohistochemical Staining with 3,3'-Diaminobenzidine (DAB)," *PLoS ONE*, 2022.

Workshops

- N. Kim*, N. Moeini*, J. Romberg, and **S. Fridovich-Keil**, "3D Field of Junctions: A Noise-Robust, Training-Free Structural Prior for Low-Dose CT," *Vision-Based Industrial Inspection Across Modalities (at CVPR)*, 2026.
- N. Kim and **S. Fridovich-Keil**, "Uncertainty Quantification for Inverse Problems with Generative Priors under Distribution Shift," *Statistical Frontiers in LLMs and Foundation Models (at NeurIPS)*, 2024.
- A. Ghosh, G. Wetzstein, M. Pilanci, and **S. Fridovich-Keil**, "Volumetric Reconstruction Resolves Off-Resonance Artifacts in Static and Dynamic PROPELLER MRI," *International Society for Magnetic Resonance in Medicine (ISMRM)*, 2024.
- V. Tran, R. Cao, **S. Fridovich-Keil**, and L. Waller, "Multiplexed Pixels: Light Field Camera with Overlapping Views for High-Resolution 3D Reconstruction," *Computational Cameras and Displays (at CVPR)*, 2023.
- **S. Fridovich-Keil**, B. Bartoldson, J. Diffenderfer, B. Kailkhura, and P.-T. Bremer, "Models Out of Line: A Fourier Lens on Distribution Shift Robustness," *Principles of Distribution Shift (at ICML)*, 2022.
- V. Vasudevan, B. Caine, R. Gontijo Lopes, **S. Fridovich-Keil**, and R. Roelofs, "When Does Dough Become a Bagel? Analyzing the Remaining Mistakes on ImageNet," *Shift Happens (at ICML)*, 2022.
- R. Roelofs*, **S. Fridovich-Keil***, J. Miller, V. Shankar, M. Hardt, L. Schmidt, and B. Recht, "A Meta-Analysis of Overfitting in Machine Learning," *Understanding and Improving Generalization in Deep Learning (at ICML)*, 2019.

- **S. Fridovich-Keil** and B. Recht, "Choosing the Step Size: Intuitive Line Search Algorithms with Efficient Convergence," *Optimization for Machine Learning (co-located with NeurIPS)*, 2019.

Awards (Selected)

- Sutterfield Family Early Career Professorship, Georgia Tech, 2025
- NSF Mathematical Sciences Postdoctoral Research Fellowship, 2023
- Demetri Angelakos Memorial Achievement Award, UC Berkeley, 2022
- NSF Graduate Research Fellowship Program, 2019
- G. David Forney, Jr. Prize for signals research in communication sciences, systems, and signals at Princeton, 2018
- Tau Beta Pi Prize for service to Princeton's School of Engineering and Applied Science, 2018
- Barry M. Goldwater Scholarship for undergraduate research, 2016

Invited Presentations (Selected)

- "Bounding Compression Error of Signal Parameterizations, and Diagnosing Failure Modes of Diffusion Posterior Samplers" at Brown University ICERM workshop on Mathematics of 3D Reconstruction, July 2026
- "When, why, and how do diffusion posterior samplers fail? A finite-sample lens" at IEEE International Workshop on Computational Cameras and Displays, June 2026
- "Bounding Compression Error of Signal Parameterizations" at CVPR workshop on 4D World Models, June 2026
- "3D Field of Junctions: A Noise-Robust, Training-Free Structural Prior for Volumetric Inverse Problems" at Electronic Imaging, March 2026
- "Volume Representations for Inverse Problems" at Optica COSI, August 2025
- "Accurate, Provable, and Fast Nonlinear Tomographic Reconstruction" at SampTA, July 2025
- "Volume Representations for Inverse Problems" at ICCP, July 2025
- "Accurate, Provable, and Fast Nonlinear Tomographic Reconstruction" at INFORMS APS Conference, July 2025
- "Volume Representations for Inverse Problems" at CVPR workshop on neural fields, June 2025
- "Accurate, Provable, and Fast Nonlinear Tomographic Reconstruction" at NIST, April 2025
- "White-Box Computational Imaging" at Georgia Tech Research Institute, February 2025
- "Geometric Algebra Planes: Convex Implicit Neural Volumes" at MIT, November 2024
- "Thermal Radiance Fields: Regularization for Sensor Fusion" at SIAM Conference on Mathematics of Data Science, October 2024
- "ThermalNeRF: Thermal Radiance Fields" at IMSI Workshop on Computational Imaging, August 2024
- "Gradient Descent Provably Solves Nonlinear Tomographic Reconstruction" at INFORMS Optimization Society, March 2024
- "White-Box Computational Imaging: Measurements to Images to Insights" at UC Berkeley Photobears Seminar, Berkeley, January 2024
- "White-Box Computational Imaging: Measurements to Images to Insights" at Stanford Center for Image Systems Engineering (SCIEN) Seminar, Stanford, January 2024
- "Gradient Descent Provably Solves Nonlinear Tomographic Reconstruction" at the Joint Mathematics Meeting Special Session on Mathematics of Computer Vision, January 2024
- "Photorealistic Reconstruction from First Principles" at UC San Diego, Pixel Café Seminar, San Diego, December 2023
- "Photorealistic Reconstruction from First Principles" at Lawrence Livermore National Lab, July 2023
- "3D Modeling: Machine Learning Meets Signal Processing" at UC Berkeley Learning Theory Seminar, July 2022
- "Spectral Bias in Practice" at Shanghai Jiao Tong University AI + Math Seminar, December 2021
- "Spectral Bias in Practice" at Google Brain Deep Phenomena Research Seminar, November 2021
- "Spectral Bias in Practice" at Google Brain Reliable Deep Learning Seminar, November 2021

- "Fourier Features and Kernels: A First Step Towards Machine Learning in Medium Dimensions" at Aerospace Corporation Data Science and AI Seminar, August 2020

Teaching

- Foundations of Computational Imaging (Georgia Tech ECE 8803), Spring 2027
- Mathematical Foundations of Machine Learning (Georgia Tech ECE 7750), Fall 2026
- Introduction to Signal Processing (Georgia Tech ECE 2026), Spring 2026
- Foundations of Computational Imaging (Georgia Tech ECE 8803), Fall 2025; new graduate-level special topics class, awarded CIOS Honor Roll
- Graduate Student Instructor, Computability and Complexity (Berkeley CS 172), Spring 2021
- Graduate Student Instructor, Statistical Learning Theory (Berkeley EECS 281A), Fall 2019
- Teaching Assistant, Building Real Systems (Princeton ELE 302, "Car Lab"), 2018
- McGraw Center Head Tutor, Mathematics (Princeton), 2015–2018

Mentoring

I have had the privilege to work with wonderful students and postdocs.

Current Mentees

- Kent Gauen, IC postdoctoral fellow at Georgia Tech
- Ben Burns, PhD student at Georgia Tech
- Namhoon Kim, PhD student at Georgia Tech
- Jihoon Hong, PhD student at Georgia Tech (co-advised with Glen Chou)
- Alireza Kheirandish, PhD student at Georgia Tech
- Quang Nguyen, PhD student at Georgia Tech
- Merve Kocabas, visiting masters student at Georgia Tech
- Sungwon Jeong, masters student at Georgia Tech
- Aditya Pandey, masters student at Georgia Tech

Past Mentees

- Sarvesh Sundaram, masters student at Georgia Tech (now at Cigna)
- Umut Zengin, masters student at Georgia Tech (now at MathWorks)

Professional Service (Selected)

- IEEE Transactions on Computational Imaging, associate editor
- IEEE Signal Processing Society Computational Imaging Technical Committee, member for 3-year term 2025–2027
- NeurIPS 2026, Atlanta satellite location program chair
- ICIP 2026, area chair
- ICASSP 2026, area chair
- CVPR 2026 VISION workshop co-organizer
- ICLR 2026 DeLTa workshop co-organizer
- ICCP 2025, area and session chair
- Sampling Theory and Applications (SampTA 2025), special session co-organizer
- Conference on Parsimony and Learning (CPAL 2025), local chair
- NSF CISE panelist

Career Development

- EECS Rising Stars, hosted by Georgia Tech, November 2023
- Duke Engineering Future Faculty of Innovation and Excellence (DEFINE), October 2023
- NextProf Nexus Workshop, hosted by Georgia Tech College of Engineering, August 2023
- Rising Stars in Computational and Data Sciences, hosted by UT Austin Oden Institute, April 2023

- Cornell ORIE Young Researchers Workshop, October 2022

Industry Experience

- Google Brain Research Internship and Student Researcher, 2021–2022
- Google Software Engineering Internship, Android team, 2018
- Google Software Engineering Internship, Geo team, 2017
- Microsoft Imagine Cup World Finalist, team Pulse Pal, 2017
- Google Engineering Practicum Internship, 2016