THE UNIVERSITY OF TEXAS AT AUSTIN
Cockrell School of Engineering
Resume

FULL NAME: David Fridovich-Keil **TITLE:** Assistant Professor

DEPARTMENT: **Aerospace Engineering and Engineering Mechanics**

CONTACT INFORMATION

Department of Aerospace Engineering and Engineering Mechanics
The University of Texas at Austin
2617 Wichita Street, C0600
Austin, TX 78712
Email: dfk@utexas.edu

EDUCATION

University of California, Berkeley	Electrical Engineering & Computer Sciences	Ph.D.	2020
Princeton University	Electrical Engineering	B.S.E.	2015

CURRENT AND PREVIOUS ACADEMIC POSITIONS

Assistant Professor, The University of Texas at Austin	August 2021 - present
Post-Doctoral Researcher, Stanford University	September 2020 - June 2021
Post-Doctoral Researcher, University of California, Berkeley	June 2020 - August 2020

OTHER PROFESSIONAL EXPERIENCE

Advisor, AeroVect Technologies Inc. August 2023 - present
Motion planning, prediction, and control for autonomous vehicles.

Software Engineering Intern, Nuro Inc. Summer 2018
Motion planning and prediction algorithm development for autonomous vehicles.

Software Engineering Intern, Applied Science & Technology Research Institute Summer 2014
Image processing for consumer electronics.

Embedded Systems Intern, Sentinel Photonics Summer 2013
Signal processing for lightweight, high-precision gas sensing.

HONORS AND AWARDS

NSF CAREER Award	2024
Demetri Angelakos Memorial Achievement Award	2020
Robotics: Science & Systems Pioneer	2019
Top Reviewer at NeurIPS	2019
Outstanding Graduate Student Instructor	2018
Charles Ira Young Memorial Prize	2015
G. David Forney Jr. Prize	2015
James Hayes-Edger Palmer Prize	2015
NSF Graduate Research Fellowship	2015

MEMBERSHIPS IN PROFESSIONAL AND HONORARY SOCIETIES

Member, The Institute of Electrical and Electronics Engineers (IEEE)
Member, The American Institute of Aeronautics and Astronautics (AIAA)

PROFESSIONAL SOCIETY/GOVERNMENT SERVICE AND TECHNICAL COMMITTEES

Outside Committees

IEEE Technical Committee on Aerospace Controls 2023-present

Conference Activities: Organizer

International Automated Vehicle Validation Conference (IAVVC), Local Arrangements Chair 2023

Workshop on Autonomous Systems for Strategic Advantage 2023

Workshop on Strategic, Multi-Agent Interaction, Conference on Robot Learning (CoRL) 2022

Robotics: Science & Systems (RSS) Workshop on Robust Autonomy 2019-2021

Conference Activities: Editor

Associate Editor, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2024

Associate Editor, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2023

Associate Editor, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2022

Conference Activities: Program Committee

Uncertainty in Artificial Intelligence (UAI) 2023

Distributed Autonomous Robotic Systems (DARS) 2022

IFAC Workshop on Cyber-Physical Human Systems (CPHS) 2022

Uncertainty in Artificial Intelligence (UAI) 2022

Learning for Dynamics and Control (L4DC) 2022

Conference Activities: Session Chair

IEEE International Automated Vehicle Validation Conference (IAVVC) 2023

Other Activities

Panel Moderator, "AI Learning in Dynamic, Uncertain, and Adversarial Environments,"
UT Austin Defense Research Symposium 2024

OTHER PROFESSIONAL HIGHLIGHTS

Funding Panels and Proposal Review Activity

NSF CPS 2023

Canadian NSERC 2022

Other Funding Activities

Panelist for "Navigating the CPS CAREER Proposal," NSF CPS Aspiring PIs meeting 2024

Conference and Journal Review Activities

Automatica

AIAA Journal of Guidance, Control, and Dynamics

International Journal of Robotics Research

IEEE Transactions on Automatic Control

IEEE Transactions on Robotics

IEEE Transactions on Intelligent Vehicles

Optimization Methods and Software

Robotics: Science & Systems

IEEE Robotics and Automation Letters

IEEE International Conference on Robotics and Automation

IEEE Conference on Decision and Control

IEEE Conference on Control Technology and Applications

Learning for Dynamics and Control

American Control Conference

Advances in Neural Information Systems

International Conference on Learning Representations

PLOS ONE

PUBLICATIONS

Refereed Journal Publications in Rank as Assistant Professor[1]

J1 H. *Khan* and D. Fridovich-Keil, "Leadership inference for multi-agent interactions," *Robotics and Automation Letters*, vol. 9, pp. 4671–4678, March 2024 pdf

J2 R. S. *Thakkar*, A. S. Samyal, D. Fridovich-Keil, Z. Xu, and U. Topcu, "Hierarchical control for cooperative teams in competitive autonomous racing," *IEEE Transactions on Intelligent Vehicles*, Accepted February 2024 pdf

J3 R. S. *Thakkar*, A. S. Samyal, D. Fridovich-Keil, Z. Xu, and U. Topcu, "Hierarchical control for head-to-head autonomous racing," *Journal of Field Robotics*, vol. 4, pp. 46–69, February 2024 pdf

J4 L. Peters, A. Bajcsy, C.-Y. Chiu, D. Fridovich-Keil, F. Laine, L. Ferranti, and J. Alonso-Mora, "Contingency games for multi-agent interaction," *Robotics and Automation Letters*, vol. 9, pp. 2208–2215, January 2024 pdf

J5 L. Peters, V. Rubies-Royo, C. J. **Tomlin**, L. Ferranti, J. Alonso-Mora, C. Stachniss, and D. Fridovich-Keil, "Online and offline learning of player objectives from partial observations in dynamic games," *International Journal of Robotics Research*, vol. 42, pp. 917–937, June 2023 pdf

J6 F. Laine, D. Fridovich-Keil, C.-Y. Chiu, and C. **Tomlin**, "The computation of approximate generalized feedback Nash equilibria," *SIAM Journal on Optimization*, vol. 33, no. 1, pp. 294–318, 2023 pdf

J7 Y. Yu, J. *Salfity*, D. Fridovich-Keil, and U. Topcu, "Inverse matrix games with unique quantal response equilibrium," *Control Systems Letters*, vol. 7, pp. 643–648, October 2022 pdf

Refereed Journal Publications in Submission

SJ1 A. *López* and D. Fridovich-Keil, "Decomposing Control Lyapunov Functions for Efficient Reinforcement Learning," *Robotics and Automation Letters*, Submitted March 2024 pdf

SJ2 J. *Im*, Y. Yu, D. Fridovich-Keil, and U. Topcu, "Coordination in Noncooperative Multiplayer Matrix Games via Reduced Rank Correlated Equilibria," *Control Systems Letters*, Submitted March 2024 pdf

SJ3 J. Li, S. Sojoudi, C. **Tomlin**, and D. Fridovich-Keil, "The Computation of Approximate Feedback Stackelberg Equilibria in Multi-Player Nonlinear Constrained Dynamic Games," *SIAM Journal on Optimization*, Submitted January 2024 pdf

SJ4 S. Chen, Y. E. Bayiz, D. Fridovich-Keil, and U. Topcu, "Relationship design for socially-aware behavior in static games," *Journal of Autonomous Agents and Multi-Agent Systems*, Submitted December 2023 pdf

[1] Underlines identify myself, *italics* mark students and postdocs I supervise(d) or co-supervise(d) at UT, and **bold** marks PhD and postdoc advisors. Asterisks* indicate equal contribution.

Refereed Journal Publications Prior to Joining UT Austin

PJ1 E. Rolf*, D. Fridovich-Keil*, M. Simchowitz, B. Recht, and C. J. **Tomlin**, "A successive-elimination approach to adaptive robotic sensing," *IEEE Transactions on Robotics*, vol. 37, pp. 34–47, July 2020 pdf

PJ2 D. Fridovich-Keil*, A. Bajcsy*, J. F. Fisac, S. L. Herbert, S. Wang, A. D. Dragan, and C. J. **Tomlin**, "Confidence-aware motion prediction for real-time collision avoidance," *International Journal of Robotics Research*, vol. 29, June 2019 pdf

PJ3 R. Dobbe, O. Sondermeijer, D. Fridovich-Keil, D. Arnold, D. Callaway, and C. J. **Tomlin**, "Towards distributed energy services: Decentralizing optimal power flow with machine learning," *IEEE Transactions on Smart Grid*, vol. 11, pp. 1296–1306, August 2019 pdf

Refereed Conference Proceedings in Rank as Assistant Professor

C1 B. *Barkley*, A. Zhang, and D. Fridovich-Keil, "An investigation of time reversal symmetry in reinforcement learning," in *International Conference on Learning for Dynamics & Control (L4DC)*, Accepted March 2024 pdf

C2 M. O. Karabag, S. Smith, D. Fridovich-Keil, and U. Topcu, "Encouraging Inferable Behavior for Autonomy: Repeated Bimatrix Stackelberg Games with Observations," in *American Control Conference*, Accepted January 2024 pdf

C3 T. Wolf, D. Fridovich-Keil, and B. A. Jones, "Mutual information-based trajectory planning for cislunar space object tracking using successive convexification," in *AIAA SCITECH Forum*, January 2024 pdf

C4 J. Li, C.-Y. Chiu, L. Peters, F. *Palafox*, M. Karabag, J. Alonso-Mora, S. Sojoudi, C. **Tomlin**, and D. Fridovich-Keil, "Scenario-game ADMM: A parallelized scenario-based solver for stochastic noncooperative games," in *IEEE Conference on Decision and Control (CDC)*, December 2023 pdf

C5 S. Chen, Y. Yu, D. Fridovich-Keil, and U. Topcu, "Soft-Bellman Equilibrium in Affine Markov Games: Forward Solutions and Inverse Learning," in *IEEE Conference on Decision and Control (CDC)*, December 2023 pdf

C6 A. Patil, Y. *Zhou*, D. Fridovich-Keil, and T. Tanaka, "Risk-minimizing two-player zero-sum stochastic differential game via path integral control," in *IEEE Conference on Decision and Control (CDC)*, December 2023 pdf

C7 T. *Westenbroek*, J. *Levy*, and D. Fridovich-Keil, "Enabling efficient, reliable real-world reinforcement learning with approximate physics-based models," in *Conference on Robot Learning*, November 2023 pdf

C8 J. Sun, S. Kousik, D. Fridovich-Keil, and M. **Schwager**, "Connected autonomous vehicle motion planning with video predictions from smart, self-supervised infrastructure," in *IEEE International Conference on Intelligent Transportation Systems (ITSC)*, September 2023 pdf

C9 J. Li, C.-Y. Chiu, L. Peters, S. Sojoudi, C. J. **Tomlin**, and D. Fridovich-Keil, "Cost inference for feedback dynamic games from noisy partial state observations and incomplete trajectories," in *International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, June 2023 pdf

C10 P. Washington, D. Fridovich-Keil, and M. **Schwager**, "GrAVITree: Graph-based approximate value function in a tree," in *American Control Conference (ACC)*, June 2023 pdf

C11 Y. Yu, S. Chen, D. Fridovich-Keil, and U. Topcu, "Cost design in atomic routing games," in *American Control Conference (ACC)*, June 2023 pdf

C12 S. Agarwal, D. Fridovich-Keil, and S. P. Chinchali, "Robust forecasting for robotic control: A game-theoretic approach," in *IEEE International Conference on Robotics and Automation (ICRA)*, June 2023 pdf

C13 M. O. Karabag, D. Fridovich-Keil, and U. Topcu, "Alternating direction method of multipliers for decomposable saddle-point problems," in *2022 58th Annual Allerton Conference on Communication, Control, and Computing*, IEEE, September 2022 pdf

C14 J. Sun, S. Kousik, D. Fridovich-Keil, and M. **Schwager**, "Self-supervised traffic advisors: Distributed, multi-view traffic prediction for smart cities," in *IEEE International Conference on Intelligent Transportation Systems (ITSC)*, October 2022 pdf

C15 C.-Y. Chiu and D. Fridovich-Keil, "GTP-SLAM: Game-theoretic priors for simultaneous localization and mapping in multi-agent scenarios," in *IEEE Conference on Decision and Control (CDC)*, December 2022 pdf

C16 L. Peters, D. Fridovich-Keil, L. Ferranti, C. Stachniss, J. Alonso-Mora, and F. Laine, "Learning mixed strategies in trajectory games," in *Robotics: Science and Systems (RSS)*, July 2022 pdf

C17 D. R. Anthony, D. P. Nguyen, D. Fridovich-Keil, and J. F. Fisac, "Back to the future: Efficient, time-consistent solutions in reach-avoid games," in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2022 pdf

C18 J. Li, D. Fridovich-Keil, S. Sojoudi, and C. **Tomlin**, "Augmented Lagrangian method for instantaneously constrained reinforcement learning problems," in *IEEE Conference on Decision and Control (CDC)*, December 2021 pdf

Refereed Conference Publications: In Submission

SC1 F. *Palafox**, J. Milzman*, D. H. *Lee*, R. *Park*, and D. Fridovich-Keil, "Smooth information gathering in two-player noncooperative games," in *IEEE Conference on Decision and Control (CDC)*, Submitted March 2024

SC2 Y. Yu, A. Thorpe, J. Milzman, D. Fridovich-Keil, and U. Topcu, "Sensing resource allocation against data-poisoning attacks in traffic routing," in *IEEE Conference on Decision and Control (CDC)*, Submitted March 2024

SC3 J. *Hsin*, S. Agarwal, A. Thorpe, L. Sentis, and D. Fridovich-Keil, "Symbolic Regression on Sparse and Noisy Data with Gaussian Processes," in *IEEE Conference on Decision and Control (CDC)*, Submitted March 2024 pdf

SC4 X. *Liu**, L. Peters*, J. Alonso-Mora, U. Topcu, and D. Fridovich-Keil, "Auto-Encoding Bayesian Inverse Games," in *Robotics: Science and Systems (RSS)*, Submitted February 2024 pdf

Refereed Conference Proceedings Prior to Joining UT Austin

PC1 L. Peters, D. Fridovich-Keil, V. Rubies-Royo, C. **Tomlin**, and C. Stachniss, "Inferring objectives in continuous dynamic games from noise-corrupted partial state observations," in *Robotics: Science and Systems (RSS)*, July 2021 pdf

PC2 D. Fridovich-Keil and C. J. **Tomlin**, "Approximate solutions to a class of reachability games," in *IEEE International Conference on Robotics and Automation (ICRA)*, June 2021 pdf

PC3 C.-Y. Chiu*, D. Fridovich-Keil*, and C. J. **Tomlin**, "Encoding defensive driving as a dynamic Nash game," in *IEEE International Conference on Robotics and Automation (ICRA)*, June 2021 pdf

PC4 F. Laine, D. Fridovich-Keil, C.-Y. Chiu, and C. J. **Tomlin**, "Multi-hypothesis interactions in game-theoretic motion planning," in *IEEE International Conference on Robotics and Automation (ICRA)*, June 2021 pdf

PC5 T. Westenbroek, E. Mazumdar, D. Fridovich-Keil, V. Prabhu, C. J. **Tomlin**, and S. S. Sastry, "Adaptive control for linearizable systems using on-policy reinforcement learning," in *IEEE Conference on Decision and Control (CDC)*, December 2020 pdf

PC6 D. Fridovich-Keil*, V. Rubies-Royo*, and C. J. **Tomlin**, "An iterative quadratic method for general-sum differential games with feedback linearizable dynamics," in *IEEE International Conference on Robotics and Automation (ICRA)*, June 2020 pdf

PC7 D. Fridovich-Keil, E. Ratner, L. Peters, A. D. Dragan, and C. J. **Tomlin**, "Efficient iterative linear-quadratic approximations for nonlinear multi-player general-sum differential games," in *IEEE International Conference on Robotics and Automation (ICRA)*, June 2020 pdf

PC8 L. Peters, D. Fridovich-Keil, C. J. **Tomlin**, and Z. Sunberg, "Inference-based strategy alignment for general-sum differential games," in *International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, May 2020 pdf

PC9 T. Westenbroek*, D. Fridovich-Keil*, E. Mazumdar*, S. Arora, V. Prabhu, S. S. Sastry, and C. J. **Tomlin**, "Feedback linearization for unknown systems via reinforcement learning," in *IEEE International Conference on Robotics and Automation (ICRA)*, June 2020 pdf

PC10 V. Rubies-Royo, D. Fridovich-Keil, S. L. Herbert, and C. J. **Tomlin**, "A classification-based approach for approximate reachability," in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2019 pdf

PC11 S. L. Herbert*, A. Bajcsy*, D. Fridovich-Keil, J. F. Fisac, S. Deglurkar, A. D. Dragan, and C. J. **Tomlin**, "A scalable framework for real-time multi-robot, multi-human collision avoidance," in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2019 pdf

PC12 D. Fridovich-Keil*, J. F. Fisac*, and C. J. **Tomlin**, "Safely probabilistically complete real-time planning and exploration in unknown environments," in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2019 pdf

PC13 J. F. Fisac*, A. Bajcsy*, S. L. Herbert, D. Fridovich-Keil, S. Wang, C. J. **Tomlin**, and A. D. Dragan, "Probabilistically safe robot planning with confidence-based human predictions," in *Robotics: Science and Systems (RSS)*, June 2018 pdf

PC14 D. Fridovich-Keil*, S. L. Herbert*, J. F. Fisac, S. Deglurkar, and C. J. **Tomlin**, "Planning, fast and slow: A framework for adaptive real-time safe trajectory planning," in *IEEE International Conference on Robotics and Automation (ICRA)*, May 2018 pdf

PC15 R. Dobbe*, D. Fridovich-Keil*, and C. J. **Tomlin**, "Fully decentralized policies for multi-agent systems: An information theoretic approach," in *Advances in Neural Information Processing Systems (NeurIPS)*, pp. 2941–2950, December 2017 pdf

PC16 D. Fridovich-Keil, N. Hanford, M. P. Chapman, C. J. **Tomlin**, M. K. Farrens, and D. Ghosal, "A model predictive control approach to flow pacing for TCP," in *Allerton Conference on Communication, Control, and Compution*, pp. 988–994, October 2017 pdf

PC17 D. Fridovich-Keil, E. Nelson, and A. Zakhor, "AtomMap: A probabilistic amorphous 3D map representation for robotics and surface reconstruction," in *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3110–3117, June 2017 pdf

Software

W1 D. Fridovich-Keil, "ILQGames: Iterative linear-quadratic games," 2019

W2 D. Fridovich-Keil, "FaSTrack: Fast and safe tracking," 2018

INVITED ORAL PRESENTATIONS[2]

O1 April 2024, "Information-Aware Algorithms for Smooth Dynamic Games," GRASP seminar, Penn

O2 March 2024, "Inverse games: a MPEC by any other name...," Interactive Robotics Guest Lecture, CMU

O3 December 2023, "Dynamic Game Models for Multi-Agent Interactions: The Role of Information in Designing Efficient Algorithms," Workshop on Models and Algorithms for Path Planning, UT Austin

O4 December 2023, "Differential Games: A Brief History and Modern Developments," ASEN 6519 Guest Lecture, CU Boulder

O5 November 2023, "An Introduction to Trajectory Optimization," RBT 350 Guest Lecture, UT Austin

O6 October 2023, "Nested Optimization and Feedback Games," CMS 248 Guest Lecture, Caltech

O7 September 2023, "Regulating a Digitally-Transformed NAS: A Game-Theoretic Perspective," Workshop on Clean Slate Approaches to Crewed and Uncrewed Air Traffic Operations, UC Berkeley

[2]D. Fridovich-Keil was the sole presenter.

O8 September 2023, "Dynamic Game Models for Multi-Agent Interactions: The Role of Information in Designing Efficient Algorithms," Robotics Seminar, University of Illinois–Urbana Champaign

O9 July 2023, "Dynamic Game Models for Multi-Agent Interactions: The Role of Information in Designing Efficient Algorithms," Control-X Seminar, University of Washington

O10 June 2023, "Dynamic Game Models for Multi-Agent Interactions: The Role of Information in Designing Efficient Algorithms," Robotics Seminar, Northeastern University

O11 May 2023, "Dynamic Game Models for Multi-Agent Interactions: The Role of Information in Designing Efficient Algorithms," Robotics Seminar, TU Delft

O12 May 2023, "Dynamic Game Models for Multi-Agent Interactions: The Role of Information in Designing Efficient Algorithms," Robotics Seminar, Princeton University

O13 April 2023, "Dynamic Game Models for Multi-Agent Interactions: Forward and Inverse Solutions," Babuška Forum, Oden Institute, UT Austin

O14 November 2022, "Dynamic Game Models for Multi-Agent Interactions: Forward and Inverse Solutions," CMS/EC 248 Guest Lecture, Caltech

O15 October 2022, "Dynamic Game Models for Multi-Agent Interactions: Forward and Inverse Solutions," Nuro video

O16 September 2022, "Mixing Continuous Strategies: A Case Study in Trajectory Games," Allerton, UIUC

O17 May 2022, "Learning Mixed Strategies in Lifted Trajectory Games," Autonomy Talks, ETH Zürich video

O18 May 2022, "What is Feedback, Really?" EE290 Guest Lecture, UC Berkeley

O19 April 2022, "Learning to Compete: Efficient Solutions for Noncooperative Games," Texas Robotics Symposium, UT Austin

O20 April 2022, "Learning in Noncooperative Games: Efficient Algorithms and Open Challenges," Amazon Robotics

O21 November 2021, "A Brief Tour of Dynamic Games for Multi-Agent Modeling," Aerospace Engineering and Engineering Mechanics External Advisory Committee, UT Austin

O22 November 2021, "A Brief Tour of Dynamic Games for Multi-Agent Modeling," Aerospace Engineering Department Seminar, CU Boulder

O23 October 2021, "A Brief Tour of Dynamic Games for Multi-Agent Modeling," Control, Autonomy, and Robotics Seminar, UT Austin

O24 July 2021, "A Brief Tour of Dynamic Games for Multi-Agent Modeling," Workshop on Perception and Control for Autonomous Navigation in Crowded, Dynamic Environments, Robotics: Science & Systems video

O25 July 2021, "A Brief Tour of Dynamic Games for Multi-Agent Modeling," Semiautonomous Seminar, UC Berkeley.

O26 July 2021, Robotics Research Debate, Robotics: Science & Systems Pioneers Workshop.

O27 April 2021, "Parallelizable Methods for Multimodal Stochastic Optimal Control," NASA ULI Joint Meeting, Stanford.

O28 2019, "A Scalable Framework for Real-Time Multi-Robot, Multi-Human Collision Avoidance," Connected and Automated Vehicles, University of Michigan.

O29 2019, "Iterative Linear Quadratic Approximations for Nonlinear Differential Games," Robotic Manipulation and Interaction, UC Berkeley.

O30 2019, "Iterative Linear Quadratic Approximations for Nonlinear Multi-Player General-Sum Differential Games," Berkeley Artificial Intelligence Lab, UC Berkeley.

O31 2019, "Toward Robust Autonomy in Multi-Agent Safety-Critical Systems," DARPA Assured Autonomy Program, Northrop Grumman.

O32 2019, "Toward Robust Autonomy in Uncertain Safety-Critical Systems," Nuro.

O33 2019, "Toward Robust Autonomy in Uncertain Safety-Critical Systems," Postmates X.

David Fridovich-Keil, Assistant Professor
The University of Texas at Austin
Department of Aerospace Engineering and Engineering Mechanics

Dr. David Fridovich-Keil is the Director of the Control and Learning for Autonomous Robotics (CLeAR) Laboratory, a core member of the Texas Robotics consortium, and an affiliated member of the Oden Institute for Computational Engineering and Sciences. He received his B.S.E. in Electrical Engineering from Princeton University and his Ph.D. in Electrical Engineering & Computer Sciences from the University of California, Berkeley. His research spans optimal control, dynamic game theory, learning for control and robot safety. Fridovich-Keil is the recipient of an NSF Graduate Research Fellowship and an NSF CAREER Award.