Tyler Westenbroek

Curriculum Vitae

Postdoctoral Scholar
University of Texas at Austin
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Current Position

Feb 2023–Present	**Postdoctoral Scholar**, *Oden Institute for Computational and Engineering Sciences, University of Texas at Austin*. Hosts: Ufuk Topcu and David Fridovich-Keil

Education

2016–Feb 2023	**PhD, Computer Science and Electrical Engineering**, *University of California, Berkeley*. Advisor: Shankar Sastry Thesis: Robust Machine Learning for the Control of Real-World Robotic Systems
2012–2016 :	**BS, Systems Engineering**, *Washington University in Saint Louis*. Advisor: Humberto Gonzalez *Summa Cum Laude*

Teaching Experience

2021	**Optimization: Models and Applications**, *UC Berkeley*. Graduate Student Instructor for Professor Laurent El Ghaoui Held discussion section, designed course material
2020	**Nonlinear Systems: Analyisis, Stability, Control**, *UC Berkeley*. Graduate Student Instructor for Professor Claire Tomlin Designed new discussion section, taught several lectures
2014-2016	**Engineering Mathematics**, *Washington University*. Teaching Assistant for Professor Martha Hastings Held office hours, taught several lectures
2015	**Discrete Math and Logic**, *Washington University*. Teaching Assistant for Professor Benjamin Moseley Held office hours, designed course material

Publication List

Preprints and Manuscripts Under Preparation

2023	Dan Pfommer, Max Simchowitz, **Tyler Westenbroek**, Nikolai Matni, and Stephen Tu. The power of learned locally linear models for nonlinear policy optimization. *Submitted to International Conference on Machine Learning*, 2023.
2022	**Tyler Westenbroek**, Max Simchowitz, Michael I Jordan, and S Shankar Sastry. On the stability of receding horizon control: A geometric perspective. *In Preparation for Transactions on Automatic Control*, 2022.
2022	**Tyler Westenbroek**, Mohsin Sarwari, Fernando Castañeda, Anand Siththaranjan, Claire J. Tomlin, Koushil Sreenath, and S. Shankar Sastry. Reinforcement learning with simple models and low-level feedback controllers. *Under Submission Robotics and Automation Letters*, 2022.
2022	**Tyler Westenbroek**, Fernando Castaneda, Ayush Agrawal, Shankar Sastry, and Koushil Sreenath. Lyapunov design techniques for efficient fine-tuning strategies. *In Preperation for Transactions on Robotics*, 2022.

Journal Articles

2019 **Tyler Westenbroek**, Roy Dong, Lillian J Ratliff, and S Shankar Sastry. Competitive statistical estimation with strategic data sources. *IEEE Transactions on Automatic Control*, volume 65, pages 1537–1551. IEEE, 2019.

Conference Papers

2022 **Tyler Westenbroek**, Anand Siththaranjan, Mohsin Sarwari, Claire J Tomlin, and Shankar S Sastry. On the computational consequences of cost function design in nonlinear optimal control. *56th Annual Conference on Decision and Control*, 2022.

2022 **Tyler Westenbroek**, Fernando Castaneda, Ayush Agrawal, Shankar Sastry, and Koushil Sreenath. Lyapunov design for robust and efficient robotic reinforcement learning. *Conference on Robot Learning*, 2022.

2021 **Tyler Westenbroek**, Xiaobin Xiong, S Shankar Sastry, and Aaron D Ames. Smooth approximations for hybrid optimal control problems with application to robotic walking. *IFAC-PapersOnLine*, volume 54, pages 181–186. Elsevier, 2021.

2021 **Tyler Westenbroek**, Max Simchowitz, Michael I Jordan, and S Shankar Sastry. On the stability of nonlinear receding horizon control: a geometric perspective. In *2021 60th IEEE Conference on Decision and Control (CDC)*, pages 742–749. IEEE, 2021.

2021 **Tyler Westenbroek**, Ayush Agrawal, Fernando Castañeda, S Shankar Sastry, and Koushil Sreenath. Combining model-based design and model-free policy optimization to learn safe, stabilizing controllers. *IFAC-PapersOnLine*, volume 54, pages 19–24. Elsevier, 2021.

2020 **Tyler Westenbroek**, Eric Mazumdar, David Fridovich-Keil, Valmik Prabhu, Claire J Tomlin, and S Shankar Sastry. Adaptive control for linearizable systems using on-policy reinforcement learning. In *2020 59th IEEE Conference on Decision and Control (CDC)*, pages 118–125. IEEE, 2020.

2020 **Tyler Westenbroek**, David Fridovich-Keil, Eric Mazumdar, Shreyas Arora, Valmik Prabhu, S Shankar Sastry, and Claire J Tomlin. Feedback linearization for uncertain systems via reinforcement learning. In *2020 IEEE International Conference on Robotics and Automation (ICRA)*, pages 1364–1371. IEEE, 2020.

2020 **Tyler Westenbroek**, Fernando Castañeda, Ayush Agrawal, S Shankar Sastry, and Koushil Sreenath. Learning min-norm stabilizing control laws for systems with unknown dynamics. In *2020 59th IEEE Conference on Decision and Control (CDC)*, pages 737–744. IEEE, 2020.

2020 Eric Mazumdar, **Tyler Westenbroek**, Michael I Jordan, and S Shankar Sastry. High confidence sets for trajectories of stochastic time-varying nonlinear systems. In *2020 59th IEEE Conference on Decision and Control (CDC)*, pages 4275–4280. IEEE, 2020.

2020 Fernando Castañeda, Mathias Wulfman, Ayush Agrawal, **Tyler Westenbroek**, Shankar Sastry, Claire Tomlin, and Koushil Sreenath. Improving input-output linearizing controllers for bipedal robots via reinforcement learning. In *Learning for Dynamics and Control*, pages 990–999. PMLR, 2020.

2019 **Tyler Westenbroek**, Xiaobin Xiong, Aaron D Ames, and S Shankar Sastry. Optimal control of piecewise-smooth control systems via singular perturbations. In *2019 IEEE 58th Conference on Decision and Control (CDC)*, pages 3046–3053. IEEE, 2019.

2018 **Tyler Westenbroek**, Humberto Gonzalez, and S Shankar Sastry. A new solution concept and family of relaxations for hybrid dynamical systems. In *2018 IEEE Conference on Decision and Control (CDC)*, pages 743–750. IEEE, 2018.

2017 **Tyler Westenbroek**, Roy Dong, Lillian J Ratliff, and S Shankar Sastry. Statistical estimation with strategic data sources in competitive settings. In *2017 IEEE 56th Annual Conference on Decision and Control (CDC)*, pages 4994–4999. IEEE, 2017.

2016 Bo Li, Yehan Ma, **Tyler Westenbroek**, Chengjie Wu, Humberto Gonzalez, and Chenyang Lu. Wireless routing and control: a cyber-physical case study. In *2016 ACM/IEEE 7th International Conference on Cyber-Physical Systems (ICCPS)*, pages 1–10. IEEE, 2016.

Recent Invited Presentations

1. Asilomar Conference on Signals, Systems, and Computers, *Principled Cost Function Design for Reinforcement Learning via Geometric Control Theory, 2022*
2. UT Austin CAR Seminar, *Design Principles for Learning-enabled Control of Modern Robotic Systems, 2022*
3. UC Berkeley Semiautonomous Seminar, *Design Principles for Learning-enabled Control of Modern Robotic Systems, 2022*
4. Berkeley Artificial Intelligence Research (BAIR) Seminar Series, *Design Principles for Learning-enabled Control of Modern Robotic Systems, 2022*
5. DARPA Assured Autonomy Program, *Principled Cost Function Design for Reinforcement Learning via Geometric Control Theory, 2022*
6. VeHiCal Annual Meeting, *Principled Cost Function Design for Reinforcement Learning via Geometric Control Theory, 2022*
7. Nonlinear Systems: Analysis, Stability, and Control (Course as UC Berkeley), *Towards a Qualitative Theory for Nonlinear Reinforcement Learning*, 2022

Research Mentorship

2020-present **Anand Siththaranjan**, *(Now PhD Student at UC Berkeley)*.
Fundamental Limitations of Reinforcement Learning

2021-present **Mohsin Sarwari**, *(Currently Applying for Grad School)*.
Reinforcement Learning with Simple Models

2020-present **Fernando Castaneda**, *(PhD Student at UC Berkeley)*.
Learning with Control Lyapunov Functions

2021 **Ashwin Vangipuram**, *(Now Masters Student at Stanford)*.
Hierarchical Reinforcement Learning

2021 **Valmik Prabhu**, *(PhD Student at UC Berkeley)*.
Learning with Geometric Control Architectures

2020 **Michael Estrada**, *(Now at Waymo)*.
Learning for Non-Minimum-Phase Systems

2019 **Shreyas Arora**, *(Now Undergrad at UCSD)*.
Learning Feedback-Linearizing Controllers

External Reviewing Responsibilities

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1. IEEE Conference on Decision and Control
2. IEEE Transactions on Automatic Control
3. IEEE Robotics and Automation Letters
4. IEEE Transactions on Control of Network Systems
5. IEEE International Conference on Robotics and Automation.
6. Conference on Robot Learning
7. IEEE Systems and Control Letters
8. Learning for Dynamics and Control
9. IEEE/RSJ International Conference on Intelligent Robots and Systems

Referees

1. S. Shankar Sastry
   Position: Professor, Electrical Engineering and Computer Sciences, UC Berkeley
   Relationship: Graduate Advisor
   Email: *sastry@eecs.berkeley.edu*

2. Ufuk Topcu
   Position: Professor, Aerospace Engineering, UT Austin
   Relationship: Postdoctoral Advisor
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3. Claire J. Tomlin
   Position: Department Chair, Electrical Engineering and Computer Sciences, UC Berkeley
   Relationship: Coauthor
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4. Koushil Sreenath
   Position: Associate Professor, Mechanical Engineering, UC Berkeley
   Relationship: Coauthor
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5. David Fridovich-Keil
   Position: Assistant Professor, Aerospace Engineering, UT Austin
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