OSWIN SO

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RESEARCH INTEREST

Safe Autonomous Systems; Stochastic Optimal Control; Discrete Diffusion Models; Constrained Optimization; Machine Learning; Reinforcement Learning; Robotics

EDUCATION

Massachusetts Institute of Technology May 2024 -
Doctor of Philosophy in Aeronautics and Astronautics *Advisor:* Chuchu Fan

Massachusetts Institute of Technology Aug. 2022 - May 2024
Master of Science in Aeronautics and Astronautics, GPA: 5.0 *Advisor:* Chuchu Fan

- Thesis: Safe Nonlinear Control Under Control Constraints via Reachability, Optimal Control and Reinforcement Learning

Georgia Institute of Technology Aug. 2018 - May 2022
Bachelor of Science in Computer Science, GPA: 4.0 *Advisor:* Evangelos Theodorou

- Thesis: Distributionally Robust Optimization Techniques for Stochastic Optimal Control

PUBLICATIONS

JOURNAL

[J5] Learning plasma dynamics and robust rampdown trajectories with predict-first experiments at TCV
A. M. Wang, A. Pau, C. Rea, **O. So**, C. Dawson, O. Sauter, M. D. Boyer, A. Vu, C. Galperti, C. Fan, A. Merle, Y. Poels, C. Venturini, F. Felici, S. Marchioni, TCV Team
Nature Communications, 2025. [pdf]

[J4] Active ramp-down control and trajectory design for tokamaks with neural differential equations and reinforcement learning
A. M. Wang, C. Rea, **O. So**, C. Dawson, D. T. Garnier, C. Fan
Communications Physics, 2025. [pdf]

[J3] GCBF+: A Neural Graph Control Barrier Function Framework for Distributed Safe Multi-Agent Control
S. Zhang*, **O. So***, K. Garg, C. Fan
IEEE Transactions on Robotics (TRO), 2025. [pdf]

[J2] Comment(s) on Control barrier functions for stochastic systems
O. So, C. Fan
Automatica, 2024. [pdf]

[J1] Learning safe control for multi-robot systems: Methods, verification, and open challenges
K. Garg, S. Zhang, **O. So**, C. Dawson, C. Fan
Annual Reviews in Control, 2024. [link]

CONFERENCE

[C17] Discrete Adjoint Matching
O. So, B. Karrer, C. Fan, Ricky T. Q. Chen, G.-H. Liu
International Conference on Learning Representations (ICLR), 2026. [pdf]

[C16] Solving Parameter-Robust Avoid Problems with Unknown Feasibility using Reinforcement Learning
O. So*, E. Y. Yu*, S. Zhang, M. Cleaveland, M. Black, C. Fan
International Conference on Learning Representations (ICLR), 2026. [pdf]

[C15] ReFORM: Reflected Flows for On-support Offline RL via Noise Manipulation
S. Zhang, **O. So**, H. M. S. Ahmad, E. Y. Yu, M. Cleaveland, M. Black, C. Fan
International Conference on Learning Representations (ICLR), 2026. [pdf]

[C14] Safety on the Fly: Constructing Robust Safety Filters via Policy Control Barrier Functions at Runtime
L. Knoedler*, **O. So***, Y. Ji, M. Black, Z. Serlin, P. Tsiotras, J. Alonso-Mora, C. Fan
IEEE Robotics and Automation Letters (RAL), 2025. [pdf]

[C13] Solving Multi-Agent Safe Optimal Control with Distributed Epigraph Form MARL
[Outstanding Student Paper Award, 0.6%]
S. Zhang*, **O. So***, M. Black, Z. Serlin, C. Fan
Robotics: Science and Systems (RSS), 2025. [pdf]

[C12] Safe Beyond the Horizon: Efficient Sampling-based MPC with Neural Control Barrier Functions
J. Yin*, **O. So***, C. Fan, P. Tsiotras
Robotics: Science and Systems (RSS), 2025. [pdf]

[C11] Discrete GCBF Proximal Policy Optimization for Multi-agent Safe Optimal Control
S. Zhang*, **O. So***, M. Black, C. Fan
International Conference on Learning Representations (ICLR), 2025. [pdf]

[C10] Solving Minimum-Cost Reach Avoid using Reinforcement Learning
O. So, C. Ge, C. Fan
Advances in Neural Information Processing Systems (NeurIPS), 2024. [pdf]

[C9] How to Train Your Neural Control Barrier Function: Learning Safety Filters for Complex Input-Constrained Systems
O. So, Z. Serlin, M. Mann, J. Gonzales, K. Rutledge, N. Roy, C. Fan
IEEE International Conference on Robotics and Automation (ICRA), 2024. [pdf]

[C8] Solving Stabilize-Avoid Optimal Control via Epigraph Form and Deep Reinforcement Learning
O. So, C. Fan
Robotics: Science and Systems (RSS), 2023. [pdf]

[C7] MPOGames: Efficient Multimodal Partially Observable Dynamic Games
O. So, P. Drews, T. Balch, V. Dimitrov, G. Rosman, E. A. Theodorou
IEEE International Conference on Robotics and Automation (ICRA), 2023. [pdf]

[C6] Deep Generalized Schrodinger Bridge
G.-H. Liu, T. Chen*, **O. So***, E. A. Theodorou
Advances in Neural Information Processing Systems (NeurIPS), 2022. [pdf]

[C5] Data-driven discovery of non-Newtonian astronomy via learning non-Euclidean Hamiltonian
O. So, G. Li, E. A. Theodorou, M. Tao

Neural Information Processing Systems, Machine Learning and the Physical Sciences, 2022. [pdf]

[C4] Decentralized Safe Multi-agent Stochastic Optimal Control using Deep FBSDEs and ADMM
M. A. Pereira, A. D. Saravanos, **O. So**, E. A. Theodorou
Robotics: Science and Systems (RSS), 2022. [pdf]

[C3] Maximum Entropy Differential Dynamic Programming
O. So, Z. Wang, E. A. Theodorou
IEEE International Conference on Robotics and Automation (ICRA), 2022. [pdf]

[C2] Variational Inference MPC using Tsallis Divergence
Z. Wang*, **O. So***, J. Gibson, B. Vlahov, M. S. Gandhi, G.-H. Liu, E. A. Theodorou
Robotics: Science and Systems (RSS), 2021. [pdf]

[C1] Adaptive Risk Sensitive Model Predictive Control with Stochastic Search
Z. Wang, **O. So**, K. Lee, E. A. Theodorou
Learning for Dynamics and Control (L4DC), 2021. [pdf]

IN SUBMISSION

S1 Bellman Value Decomposition for Task Logic in Safe Optimal Control
W. Sharpless*, **O. So***, D. Hirsch, S. Herbert, C. Fan
In Submission. [pdf]

EXPERIENCES

Meta (FAIR) (New York City, NY) May 2025 - August 2025
Research Scientist Intern

- Project: Discrete Adjoint Matching
- Mentor: Guan-Horng Liu, Ricky T. Q. Chen

Toyota Research Institute (Cambridge, MA) May 2022 - July 2022
Research Intern

- Project: Efficient Multimodal Partially Observable Dynamic Games
- Mentor: Paul Drews

Aurora Innovation (Pittsburgh, PA) May 2021 - July 2021
Motion Planning Intern

- Project: Cost function learning for autonomous driving.
- Mentor: Paul Vernaza

Amazon Robotics (Boulder, CO) May 2020 - July 2020
Software Development Engineer Intern

- Project: LiDAR scan matching for improving docking of autonomous robots.

Greenzie (Atlanta, GA) May 2019 - July 2019
Robotics Engineer Intern

- Project: Communication and control of autonomous lawn mowing robots.

HONORS AND AWARDS

Fellowships

MathWorks Fellow 2024
Yao T. Li (1938) Fellowship 2022

Awards

Outstanding Paper Award Finalist, RSS 2025
Outstanding Student Paper Award, RSS 2025

INVITED TALKS

2. "Policy Optimization under Specifications with Reinforcement Learning." MAE 248: Safety for Autonomous Systems, UCSD (Virtual), 2025. [link]

1. "Solving Stabilize-Avoid Optimal Control via Epigraph Form and Deep Reinforcement Learning." Safe RL Seminar, Virtual, 2023.

ACADEMIC SERVICES

- **Journal Reviewer**: Artificial Intelligence, Automatica, IEEE Transactions on Robotics (T-RO), IEEE Control Systems Letters (L-CSS), IEEE Robotics and Automation Letters (RA-L).
- **Conference Reviewer**: RSS, ICRA, IROS, NeurIPS, ICLR.

SELECTED PRESS COVERAGE

- "MIT engineers help multirobot systems stay in the safety zone", by Jennifer Chu, *MIT News*, 2025. [link]
- "A step toward safe and reliable autopilots for flying", by Adam Zewe, *MIT News*, 2024. [link]