

OSWIN SO

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RESEARCH INTEREST

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

EDUCATION

Massachusetts Institute of Technology

Doctor of Philosophy in Aeronautics and Astronautics

May 2024 -

Advisor: [Chuchu Fan](#)

Massachusetts Institute of Technology

Master of Science in Aeronautics and Astronautics, GPA: 5.0

Aug. 2022 - May 2024

Advisor: [Chuchu Fan](#)

- [Thesis](#): Safe Nonlinear Control Under Control Constraints via Reachability, Optimal Control and Reinforcement Learning

Georgia Institute of Technology

Bachelor of Science in Computer Science, GPA: 4.0

Aug. 2018 - May 2022

Advisor: [Evangelos Theodorou](#)

- [Thesis](#): Distributionally Robust Optimization Techniques for Stochastic Optimal Control

PUBLICATIONS

JOURNAL

17. [[Automatica'24](#)] [Oswin So](#), [Chuchu Fan](#). “Comment(s) on *Control barrier functions for stochastic systems*.” *Automatica*, 2024. [[pdf](#)]
16. [[ARC'24](#)] [Kunal Garg](#), [Songyuan Zhang](#), [Oswin So](#), [Charles Dawson](#), [Chuchu Fan](#). “Learning safe control for multi-robot systems: Methods, verification, and open challenges.” *Annual Reviews in Control* 57, 2024. [[link](#)]

CONFERENCE

15. [[NeurIPS'24](#)] [Oswin So](#), [Cheng Ge](#), [Chuchu Fan](#). “Solving Minimum-Cost Reach Avoid using Reinforcement Learning.” *Neural Information Processing Systems*, 2024. [[pdf](#)]
14. [[ICRA'24](#)] [Oswin So](#), [Zachary Serlin](#), [Makai Mann](#), [Jake Gonzales](#), [Kwesi Rutledge](#), [Nicholas Roy](#), [Chuchu Fan](#). “How to Train Your Neural Control Barrier Function: Learning Safety Filters for Complex Input-Constrained Systems.” *IEEE International Conference on Robotics and Automation*, 2024. [[pdf](#)]
13. [[RSS'23](#)] [Oswin So](#), [Chuchu Fan](#). “Solving Stabilize-Avoid Optimal Control via Epigraph Form and Deep Reinforcement Learning.” *Robotics: Science and Systems*, 2023. [[pdf](#)]
12. [[ICRA'23](#)] [Oswin So](#), [Paul Drews](#), [Thomas Balch](#), [Velin Dimitrov](#), [Guy Rosman](#), [Evangelos A Theodorou](#). “MPOGames: Efficient Multimodal Partially Observable Dynamic Games.” *IEEE International Conference on Robotics and Automation*, 2023. [[pdf](#)]
11. [[NeurIPS'22](#)] [Guan-Horng Liu](#), [Tianrong Chen*](#), [Oswin So*](#), [Evangelos A Theodorou](#). “Deep Generalized Schrodinger Bridge.” *Neural Information Processing Systems*, 2022. [[pdf](#)]

10. [NeurIPS ML4PS'22] [Oswin So](#), Gongjie Li, Evangelos A Theodorou, Molei Tao. “Data-driven discovery of non-Newtonian astronomy via learning non-Euclidean Hamiltonian.” *Neural Information Processing Systems, Machine Learning and the Physical Sciences*, 2022. [\[pdf\]](#)
9. [RSS'22] Marcus A Pereira, Augustinos D Saravanos, [Oswin So](#), Evangelos A Theodorou. “Decentralized Safe Multi-agent Stochastic Optimal Control using Deep FBSDEs and ADMM.” *Robotics: Science and Systems*, 2022. [\[pdf\]](#)
8. [ICRA'22] [Oswin So](#), Ziyi Wang, Evangelos A Theodorou. “Maximum Entropy Differential Dynamic Programming.” *IEEE International Conference on Robotics and Automation*, 2022. [\[pdf\]](#)
7. [RSS'21] Ziyi Wang*, [Oswin So*](#), Jason Gibson, Bogdan Vlahov, Manan S Gandhi, Guan-Hong Liu, Evangelos A Theodorou. “Variational Inference MPC using Tsallis Divergence.” *Robotics: Science and Systems*, 2021. [\[pdf\]](#)
6. [L4DC'21] Ziyi Wang, [Oswin So](#), Keuntaek Lee, Evangelos A Theodorou. “Adaptive Risk Sensitive Model Predictive Control with Stochastic Search.” *Learning for Dynamics and Control*, 2021. [\[pdf\]](#)

IN SUBMISSION

5. Luzia Knoedler*, [Oswin So*](#), Yin Ji, Mitchell Black, Zachary Serlin, Panagiotis Tsiotras, Javier Alonso-Mora, Chuchu Fan. “RPCBF: Constructing Safety Filters Robust to Model Error and Disturbances via Policy Control Barrier Functions.” [\[pdf\]](#)
4. Songyuan Zhang*, [Oswin So*](#), Mitchell Black, Chuchu Fan. “Discrete GCBF Proximal Policy Optimization for Multi-agent Safe Optimal Control.” [\[pdf\]](#)
3. Songyuan Zhang*, [Oswin So*](#), Mitchell Black, Zachary Serlin, Chuchu Fan. “Decentralized Epigraph Form Reinforcement Learning for Multi-agent Safe Optimal Control.” [\[pdf\]](#)
2. Allen M Wang, [Oswin So](#), Charles Dawson, Darren T Garnier, Cristina Rea, Chuchu Fan. “Active Disruption Avoidance and Trajectory Design for Tokamak Ramp-downs with Neural Differential Equations and Reinforcement Learning.” [\[pdf\]](#)
1. Songyuan Zhang, [Oswin So](#), Kunal Garg, Chuchu Fan. “GCBF+: A Neural Graph Control Barrier Function Framework for Distributed Safe Multi-Agent Control.” [\[pdf\]](#)

EXPERIENCES

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| <p>Toyota Research Institute (Cambridge, MA)
<i>Research Intern</i></p> <ul style="list-style-type: none"> • Project: Efficient Multimodal Partially Observable Dynamic Games | <p>May 2022 - July 2022</p> |
| <p>Aurora Innovation (Pittsburgh, PA)
<i>Motion Planning Intern</i></p> <ul style="list-style-type: none"> • Project: Cost function learning for autonomous driving. | <p>May 2021 - July 2021</p> |
| <p>Amazon Robotics (Boulder, CO)
<i>Software Development Engineer Intern</i></p> <ul style="list-style-type: none"> • Project: LiDAR scan matching for improving docking of autonomous robots. | <p>May 2020 - July 2020</p> |

Greenzie (Atlanta, GA)

May 2019 - July 2019

Robotics Engineer Intern

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

HONORS AND AWARDS

Yao T. Li (1938) Fellowship

2022

INVITED TALKS

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.

SELECTED PRESS COVERAGE

- “A step toward safe and reliable autopilots for flying”, by Adam Zewe, *MIT News*, 2024. [\[link\]](#)