

# OSWIN SO

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## RESEARCH INTEREST

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

## EDUCATION

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**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

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### JOURNAL

17. [T-RO'24] Songyuan Zhang\*, [Oswin So\\*](#), Kunal Garg, Chuchu Fan. "GCBF+: A Neural Graph Control Barrier Function Framework for Distributed Safe Multi-Agent Control." [\[pdf\]](#)
16. [Automatica'24] [Oswin So](#), Chuchu Fan. "Comment(s) on *Control barrier functions for stochastic systems*." *Automatica*, 2024. [\[pdf\]](#)
15. [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

14. [NeurIPS'24] [Oswin So\\*](#), Cheng Ge\*, Chuchu Fan. "Solving Minimum-Cost Reach Avoid using Reinforcement Learning." *Neural Information Processing Systems*, 2024. [\[pdf\]](#)
13. [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. [\[pdf\]](#)
12. [RSS'23] [Oswin So](#), Chuchu Fan. "Solving Stabilize-Avoid Optimal Control via Epigraph Form and Deep Reinforcement Learning." *Robotics: Science and Systems*, 2023. [\[pdf\]](#)
11. [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. [\[pdf\]](#)

10. [NeurIPS'22] Guan-Horng Liu, Tianrong Chen\*, Oswin So\*, Evangelos A Theodorou. "Deep Generalized Schrodinger Bridge." *Neural Information Processing Systems*, 2022. [\[pdf\]](#)
9. [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. [\[pdf\]](#)
8. [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. [\[pdf\]](#)
7. [ICRA'22] Oswin So, Ziyi Wang, Evangelos A Theodorou. "Maximum Entropy Differential Dynamic Programming." *IEEE International Conference on Robotics and Automation*, 2022. [\[pdf\]](#)
6. [RSS'21] Ziyi Wang\*, Oswin So\*, Jason Gibson, Bogdan Vlahov, Manan S Gandhi, Guan-Horng Liu, Evangelos A Theodorou. "Variational Inference MPC using Tsallis Divergence." *Robotics: Science and Systems*, 2021. [\[pdf\]](#)
5. [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

4. 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." [\[pdf\]](#)
3. Songyuan Zhang\*, Oswin So\*, Mitchell Black, Chuchu Fan. "Discrete GCBF Proximal Policy Optimization for Multi-agent Safe Optimal Control." [\[pdf\]](#)
2. Songyuan Zhang\*, Oswin So\*, Mitchell Black, Zachary Serlin, Chuchu Fan. "Decentralized Epigraph Form Reinforcement Learning for Multi-agent Safe Optimal Control." [\[pdf\]](#)
1. 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." [\[pdf\]](#)

## EXPERIENCES

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

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MathWorks Fellow

2024

Yao T. Li (1938) Fellowship

2022

## INVITED TALKS

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

## ACADEMIC SERVICES

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- **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

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