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   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

17. [**Automatica'24**] <u>Oswin So</u>, Chuchu Fan. "Comment(s) on *Control barrier functions for stochastic systems*." *Automatica*, 2024. [pdf]

16. [**ARC'24**] Kunal Garg, Songyuan Zhang, <u>Oswin So</u>, 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**] <u>Oswin So</u>, Cheng Ge, Chuchu Fan. "Solving Minimum-Cost Reach Avoid using Reinforcement Learning." *Neural Information Processing Systems*, 2024. [pdf]

14. [**ICRA'24**] <u>Oswin So</u>, 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**] <u>Oswin So</u>, Chuchu Fan. "Solving Stabilize-Avoid Optimal Control via Epigraph Form and Deep Reinforcement Learning." *Robotics: Science and Systems*, 2023. [pdf]

12. [**ICRA'23**] <u>Oswin So</u>, 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*, <u>Oswin So</u>*, Evangelos A Theodorou. "Deep Generalized Schrodinger Bridge." *Neural Information Processing Systems*, 2022. [pdf]

10. [**NeurIPS ML4PS'22**]   <u>Oswin So</u>, 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, <u>Oswin So</u>, Evangelos A Theodorou. "Decentralized Safe Multi-agent Stochastic Optimal Control using Deep FBSDEs and ADMM." *Robotics: Science and Systems*, 2022. [pdf]

8. [**ICRA'22**]   <u>Oswin So</u>, Ziyi Wang, Evangelos A Theodorou. "Maximum Entropy Differential Dynamic Programming." *IEEE International Conference on Robotics and Automation*, 2022. [pdf]

7. [**RSS'21**] Ziyi Wang*, <u>Oswin So</u>*, 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]

6. [**L4DC'21**] Ziyi Wang, <u>Oswin So</u>, 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*, <u>Oswin So</u>*, 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*, <u>Oswin So</u>*, Mitchell Black, Chuchu Fan. "Discrete GCBF Proximal Policy Optimization for Multi-agent Safe Optimal Control." [pdf]

3. Songyuan Zhang*, <u>Oswin So</u>*, Mitchell Black, Zachary Serlin, Chuchu Fan. "Decentralized Epigraph Form Reinforcement Learning for Multi-agent Safe Optimal Control." [pdf]

2. Allen M Wang, <u>Oswin So</u>, 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, <u>Oswin So</u>, Kunal Garg, Chuchu Fan. "GCBF+: A Neural Graph Control Barrier Function Framework for Distributed Safe Multi-Agent Control." [pdf]

EXPERIENCES

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

- Project: Efficient Multimodal Partially Observable Dynamic Games

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

- Project: Cost function learning for autonomous driving.

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

MathWorks Fellow	2024
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]