Yansong Li

Curriculum Vitae

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RESEARCH INTERESTS

Reinforcement Learning; Learning Theory; Game Theory; Optimization and Control; Large Language Model in Decision-Making

PROJECT EXPERIENCES

Combining model-based & model-free reinforcement learning.   09/2020-Now
Project Organizer & Corresponding Author
We developed two algorithms that leverage gradient information from an estimated model to accelerate model-free training. The experiments were conducted on an additive nonlinear system with a linear estimated model and in the `mujoco` environment with a Gaussian estimated model. The results show the SOTA performance and have been published in *L4DC*. Ongoing research is under review for *AAAI* and *ICLR*.

AI agent that can effectively collaboration with human   11/2021-2024/05
Project Organizer & Corresponding Author
To enable effective collaboration between AI agents and humans, we utilize stochastic game theory and Stackelberg game formulation. In this setting, human agents are not assumed to be rational, and their utility functions are unknown. Based on these assumptions, we develop two algorithms: one for Stackelberg games and another for stochastic games, both designed to facilitate AI-human collaboration. Experiments are conducted in the Overcooked-AI environment. The results have been published in the *ACC* and the *AAMAS*. Additionally, two papers extending this formulation to partial observations are available as open-access preprints and are currently under review.

LLM for end-to-end autonomous driving   05/2024-Now
Coauthor
Developed a hybrid system that leverages a large language model (LLM) to provide high-level instructions at low frequency, enhancing the generalization capability of a high-frequency onboard controller running on an iPhone for autonomous driving. This design mitigates the high-latency challenges of LLMs, making our experiments the first real-world implementation of LLMs in this context. The results have been published in the *CORL*. Ongoing research has been submitted to *CVPR* and is currently under review.

EDUCATION

Ph.D. in Department of Electrical and Computer Engineering 06/2025
University of Illinois Chicago, Chicago, IL
Advisor: Shuo Han
Thesis: *TBD*

Bachelor in Department of Mathematics 07/2020
Southern University of Science and Technology, Shenzhen, China

PUBLICATIONS

The symbol ∗ represents the corresponding author. The order of names on the paper indicates the authors' contributions.

Preprints

[1] Yansong Li, Zeyu Dong, Ertai Luo, Yu Wu, Shuo Wu, and Shuo Han, *When to trust your data: Enhancing dyna-style model-based reinforcement learning with data filter*, 2024. arXiv: 2410.12160 [cs.LG].

[2] Yansong Li*, Zeyu Dong, and Shuo Han, "Bayes-Optimal, Robust, and Distributionally Robust Policies for Uncertain MDPs," *preprint*, Oct. 2024. DOI: 10.25417/uic.27138990.v1.

[3] Yansong Li*, Zeyu Dong, and Shuo Han, "Removing Redundant Partner Policies May Be Unnecessary for Ad Hoc Teamwork," *preprint*, Oct. 2024. DOI: 10.25417/uic.27139116.v1.

Peer-Reviewed Conference Publications

[1] Zeyu Dong, Yimin Zhu, Yansong Li, Kevin Mahon, and Yu Sun*, "Generalizing end-to-end autonomous driving in real-world environments using zero-shot LLMs," in *8th Annual Conference on Robot Learning*, 2024.

[2] Yansong Li* and Shuo Han, "Efficient collaboration with unknown agents: Ignoring similar agents without checking similarity," in *Proceedings of the 23rd International Conference on Autonomous Agents and Multiagent Systems, AAMAS 2024, Auckland, New Zealand, May 6-10, 2024*, Mehdi Dastani, Jaime Simão Sichman, Natasha Alechina, and Virginia Dignum, Eds., International Foundation for Autonomous Agents and Multiagent Systems / ACM, 2024, pp. 2363–2365. DOI: 10.5555/3635637.3663161.

[3] Yansong Li* and Shuo Han, "Solving strongly convex and smooth stackelberg games without modeling the follower," in *American Control Conference, ACC 2023, San Diego, CA, USA, May 31 - June 2, 2023*, IEEE, 2023, pp. 2332–2337. DOI: 10.23919/ACC55779.2023.10156010.

[4] Yansong Li* and Shuo Han, "Accelerating model-free policy optimization using model-based gradient: A composite optimization perspective," in *Learning for Dynamics and Control Conference, L4DC 2022, 23-24 June 2022, Stanford University, Stanford, CA, USA*, Roya Firoozi, Negar Mehr, Esen Yel, Rika Antonova, Jeannette Bohg, Mac Schwager, and Mykel J. Kochenderfer, Eds., ser. Proceedings of Machine Learning Research, vol. 168, PMLR, 2022, pp. 304–315.

CONTRIBUTIONS TO OPEN SOURCE PROJECTS

1. Contributor to `TeXmacs/Mogan`: A WYSIWYG editor that can type equations 10 times faster than LaTeX. See "A quick tour of TeXmacs" for a 3 mins short introduction.

2. Main Developer of `Goldfish Scheme`: A `Scheme` compiler based on `S7 Scheme` and `C++`. This compiler matches the speed and simplicity of `S7 Scheme` while offering improved support for the Microsoft Windows system. In `Goldfish Scheme`, we have implemented the complete set of features from R7RS and included many functionalities inspired by the `Python` standard library. `Goldfish Scheme` will be the foundation for `TeXmacs/Mogan` in the future.

TEACHING EXPERIENCE

Southern University of Science and Technology:
MA213-16   Calculus I (Tutorial, Fall 2020)
MA101B   Mathematical Analysis (Tutorial, Spring 2019)

PROFESSIONAL SERVICE

Reviewer

    Conferences
International Conference on Learning Representations (ICLR)
IEEE Conference on Decision and Control (CDC)
International Conference on Identification, Information and Knowledge in the Internet of Things (IIKI)

INVITED TALKS

1. "Bayes-Optimal, Robust, and Distributionally Robust Policies for Uncertain MDPs", RINGS informal seminar, Rutgers University-New Brunswick, 08/2024.

2. "Efficient Collaboration with Unknown Agents: Ignoring Similar Agents without Checking Similarity", Digital Economy Lecture, Beijing Normal University & Hong Kong Baptist University United International College, 10/2023.

3. "Solving Strongly Convex and Smooth Stackelberg Games Without Modeling the Follower", 2023 American Control Conference, San Diego, 06/2023.