YIQING XU

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My research focuses on *translating* human objectives into signals for robotic optimization. I design *inverse reinforcement learning (IRL) algorithms* and develop *compositional and hierachical structures as intermediate representations* to better align robotic agents with human goals, enabling them to understand and assist people more effectively.

Keywords: Inverse Reinforcement Learning, Imitation Learning, Goal Specification for Robotics, Neuro-Symbolic Representation.

RESEARCH HIGHLIGHT

My latest work, "Set It Up!", addresses the challenge of grounding the under-specified instructions, such as "set up a Chinese dining table for two", for tabletop arrangement tasks. We introduce a neuro-symbolic framework that integrates semantic inference from large language models with geometric reasoning from pre-trained diffusion models of basic object relationships.

I'm excited to extend this neuro-symbolic framework to a wider range of robotic tasks, such as generating complex 3D structures from simple sub-units and effectively chaining skills through compositional skill functions.

EDUCATION

National University of Singapore Aug, 2020 - Dec, 2025 (Expected)
Ph.D in Computer Science, advised by *Prof. David Hsu* GPA: 5.00

National University of Singapore Aug, 2016 - Jun, 2020
B.A. in Computer Science GPA: 4.61
B.A. in Applied Mathematics GPA: 4.79

RESEARCH EXPERIENCE

Visiting Ph.D Student Sep, 2023 - Feb, 2024
CSAIL MIT, Prof. Leslie Kaelbling and Prof. Tomás Lozano-Pérez

Developed *"Set It Up!"*, a neuro-symbolic system that interprets and optimizes under-specified instructions for tabletop arrangements. Published at RSS 2024.

SELECTED PUBLICATIONS / PREPRINTS

1. "Set It Up!": Functional Object Arrangement with Compositional Generative Models [Link]
   Y. Xu, J. Mao, Y. Du, T. Lozano-Pére, L. Kaelbling, D. Hsu
   Robotics: Science and Systems (RSS), 2024

2. On the Effective Horizon for Inverse Reinforcement Learning [Link]
   Y. Xu, F. Doshi-Velez, D. Hsu
   In submission.

3. Differentiable Particles for General-Purpose Deformable Object Manipulation [Link]
   S. Chen, Y. Xu, C. Yu, L. Lin, D. Hsu
   In submission.

4. Grounding Common-sense Objective for Tabletop Object Rearrangement [Link]
   Y. Xu, D. Hsu
   Robotics: Science and Systems (RSS), 2023, Lang2Rob Workshop

5. Learning Reward for Physical Skills using Large Language Models [Link]
   Y. Zeng, Y. Xu
   Conference on Robot Learning (CoRL), 2023, the 2nd Lang2Rob Workshop

6. Benchmarking Deformable Object Manipulation with Differentiable Physics [Link]
   S. Chen, Y. Xu*, C. Yu*, L. Lin, D. Hsu*
   International Conference on Learning Representations (ICLR): **Notable Top 5%**, 2023

7. Receding Horizon Inverse Reinforcement Learning [Link]
   Y. Xu, W. Gao, D. Hsu
   Advances in Neural Information Processing Systems (NeurIPS), 2022

8. Coach: Cooperative robot teaching [Link]
   C. Yu, Y. Xu, L. Lin, D. Hsu
   Conference on Robot Learning (CoRL), 2022

PROFESSIONAL SERVICE

Workshop Organizer

- Task Specification Workshop at RSS 2024 [Website] July 2024
- Second LEAP Workshop at CoRL 2024 [Website] November 2024

Reviewer: ICRA, RSS, AAMAS, AAAI, NeurIPS, ICLR, ICML

SKILLS

Python, Jax, Java, Mujoco, IssacSim