

# Yilun (Evelyn) Hao

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## EDUCATION

**Stanford University**, Stanford, CA Sep 2021 - Jun 2023(Expected)

Master of Science (GPA: 4.012/4.3) Major in Computer Science

Core courses: Machine Learning, Decision Making Uncertainty, Safe and Interactive Robotics

**University of California, San Diego**, La Jolla, CA

Aug 2017 - Jun 2021

Bachelor of Science (GPA: 3.907/4.0) Major in Computer Science Minor in Mathematics

Honors: Provost Honors, Magna Cum Laude

## PUBLICATIONS (\* denotes equal contribution)

Master:

- **Yilun Hao\***, Ruinan Wang\*, Zhangjie Cao, Zihan Wang, Yuchen Cui, Dorsa Sadigh, “Masked Imitation Learning: Discovering Environment-Invariant Modalities in Multimodal Demonstrations”, Under Review for *IEEE Conference on Robotics and Automation (ICRA)*, 2023 [Paper](#)
- Ruohan Zhang\*, Dhruva Bansal\*, **Yilun Hao\***, Ayano Hiranaka, Jialu Gao, Chen Wang, Roberto Martín-Martín, Li Fei-Fei, Jiajun Wu, “A Dual Representation Framework for Robot Learning with Human Guidance”, *Proceedings of the 6th Conference on Robot Learning (CoRL)*, 2022 [Conference Paper](#) (Also accepted with Spotlight talk at *CoRL 2022 Workshop on Aligning Robot Representations with Human*)
- Zihan Wang\*, Zhangjie Cao\*, **Yilun Hao**, Dorsa Sadigh, “Weakly Supervised Correspondence Learning”, *IEEE Conference on Robotics and Automation (ICRA)*, 2022 [Conference Paper](#)
- Zhangjie Cao, **Yilun Hao**, Mengxi Li, Dorsa Sadigh “Learning Feasibility to Imitate Demonstrators with Different Dynamics”, *Proceedings of the 5th Conference on Robot Learning (CoRL)*, 2021 [Conference Paper](#)

Undergraduate:

- Justin Morris, **Yilun Hao**, Saransh Gupta, Behnam Khaleghi, Baris Aksanli, Tajana Rosing “Stochastic-HD: Leveraging Stochastic Computing on the Hyper-Dimensional Computing Pipeline”, *Frontiers in Neuroscience*, 2022 [Journal Paper](#)
- **Yilun Hao**, Saransh Gupta, Justin Morris, Behnam Khaleghi, Baris Aksanli, and Tajana Rosing “Stochastic-HD: Leveraging Stochastic Computing on Hyper-Dimensional Computing”, *IEEE International Conference on Computer Design (ICCD)*, 2021 [Conference Paper](#)
- Justin Morris, **Yilun Hao**, Saransh Gupta, Ranganathan Ramkumar, Jeffrey Yu, Mohsen Imani, Baris Aksanli, Tajana Rosing, “Multi-label HD Classification in 3D Flash”, *IEEE/IFIP International Conference on VLSI and System-on-Chip (VLSI-SoC)*, 2020. (Invited Paper) [Conference Paper](#)
- Justin Morris, Roshan Fernando, **Yilun Hao**, Mohsen Imani, Baris Aksanli, Tajana Rosing, “Locality-based Encoder and Model Quantization for Efficient Hyper-Dimensional Computing”, *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, 2020 [Journal Paper](#)

## RESEARCH EXPERIENCE

**Stanford Vision and Learning Lab (SVL)**

Mar 2022 – Current

Research Assistant supervised by Prof. Fei-Fei Li and Prof. Jiajun Wu

Stanford University

### Learning from Suboptimal Demonstrations with Human Evaluative Feedback

- Working on leveraging sparse human evaluative feedback to better learn from suboptimal demonstrations

### A Dual Representation Framework for Robot Learning with Human Guidance

- Noticed that human guidance is an expensive resource for robot learning, and learning can be more efficient if equipped with a high-level, symbolic representation
- Proposed a dual representation framework that includes one for learning policies with low-level state representation, and one for high-level human internal state representation using symbolic scene graphs
- Designed and implemented Dual Representation-based Preference Learning (DRPL) which builds upon scene graph-based trajectory segmentation and selection and allows efficient reward learning from chosen trajectory segments

- Conducted experiments in three simulation tasks and two real-robot tasks with the Sawyer robot and showed that our algorithms lead to significant improvements in learning speed and performance

### **Stanford Intelligent and Interactive Autonomous Systems Group (ILIAD)**

Apr 2021 - Current

*Research Assistant supervised by Prof. Dorsa Sadigh*

Stanford University

#### **Goal-conditioned Behavioral Cloning from Human Gestures**

- Working on imitation learning conditioned on human hand gestures so that the user does not need to complete the tasks themselves to specify the goal

#### **Masked Imitation Learning: Discovering Environment-Invariant Modalities in Multimodal Demonstrations**

- Noticed that the extraneous data modalities in multimodal demonstrations can lead to state over-specification, which makes the learned policy not generalizable outside of the training data distribution
- Proposed Masked Imitation Learning (MIL) to address state over-specification by bi-level optimization to learn a binary mask to block specific modalities and only selectively use informative modalities
- Conducted experiments using the Robomimic dataset, MuJoCo environments, and a real Franka Panda arm and demonstrated that MIL outperforms baseline algorithms

#### **Weakly Supervised Correspondence Learning**

- Proposed a weakly supervised correspondence learning approach that trades off between strong supervision over strictly paired data and unsupervised learning with a regularizer over unpaired data
- Built Cross-morphology experiments with simulated Panda Robot with PyBullet, which showed that the proposed algorithm achieves much higher performance compared to prior methods

#### **Learning Feasibility to Imitate Demonstrators with Different Dynamics**

- Noticed that in real-world applications, it is necessary to be able to learn from demonstrations of different dynamics, and there may be some demonstrations that are not feasible in given dynamics
- Provided a novel algorithm, feasibility MDP, that calculates the feasibility score of different demonstrations that encourages the imitator to learn from more informative and more feasible demonstrations and disregard the far-from-feasible demonstrations
- Conducted experiments in simulated robot arm with Pybullet and real robot arm with a Franka Panda arm, which showed that our approach outperforms the baseline methods both in expected return and success rate

### **System Energy Efficiency Lab (SEE Lab)**

Apr 2019 - Jun 2021

*Research Assistant supervised by Prof. Tajana Rosing*

University of California, San Diego

- Designed and implemented machine learning algorithms with Hyperdimensional (HD) Computing to raise both the accuracy and efficiency of single-label& multi-label& image classification problem

## **WORKING EXPERIENCE**

**Stanford University** | Course Assistant in Computer Science Dept.

Jan 2022 - Apr 2021

- Worked as a course assistant for CS237B: Principles of Robot Autonomy II
- Held office hours weekly to help ten to fifteen students closely and answered questions in Ed
- Designed and evaluated homework and exams throughout the quarter

**University of California, San Diego** | Tutor in Computer Science Dept.

Jan 2021 - Jun 2021

- Tutored “Components & Design Techniques for Digital Systems” and “Introduction to Machine Learning”

**Golf AI** | Software Engineer

Jul 2020 – Sep 2020

- Designed and implemented an upgraded User Interface of the GolfAI application using SwiftUI
- Implemented the “Overview” page that gives feedback based on users’ swings and recommends practices

**University of California, San Diego** | Grader in Mathematics Dept.

Sep 2018 - Jun 2019

- Worked as grader of “Calculus&Analytic Geometry for Sci&Engnr” and “Intro to Differential Equations”

## **ACADEMIC SERVICES**

**Reviewer:** Conference on Robot Learning (CoRL), 2022

IEEE Transactions on Robotics (T-RO)

## **SKILLS**

**Programming:** Python, PyTorch, TensorFlow, C/C++, Java, Shell, MATLAB, Unix/Linux and vi/vim, Git, L<sup>A</sup>T<sub>E</sub>X

**Robotics:** MuJoCo, Pybullet, Franka Panda, Sawyer, ROS

**Algorithms:** Machine Learning, Imitation Learning, Reinforcement Learning, Computer Vision

**Language:** Chinese (native), English (GRE: 332+4.0 (V:162, Q:170, AW:4.0)), Japanese, French