

HAOCHENG YIN

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RESEARCH OVERVIEW

My research goal is to develop intelligent embodied agents that are **generalizable** on multiple tasks and **adaptable** across various environment domains in the physical world. To address this goal, my current work seeks to cover:

- Understanding the vision latent representations fine-tuned for robot control.
- Constructing the diffusion-based control module that generalizable from simulation to real world.
- Realizing composable generative models to form a world model.

Research Areas: Machine Learning, Robotics

EDUCATION

ETH Zürich

M.S. in Computer Science
Major in Machine Intelligence

Zürich, Switzerland

September 2021 - Present
GPA: 5.24/6.00

University of Illinois Urbana-Champaign (UIUC)

B.S. in Electrical Engineering
ZJU-UIUC Dual Bachelor's Degree Program

Urbana-Champaign, IL

September 2017 - May 2021
GPA: 3.94/4.00

Zhejiang University

B.Eng. in Electrical Engineering & Automation
ZJU-UIUC Dual Bachelor's Degree Program

Hangzhou, China

September 2017 - June 2021
GPA: 3.96/4.00

RESEARCH EXPERIENCE

Computational Robotics Lab, supervised by Prof. Heng Yang

Master Thesis: *Understand and Improve Diffusion Policy for Robot Control*
ICLR 2025 Submission (under review): *Control-oriented Clustering of Visual Latent Representation*

Harvard University

February 2024 - Present

Soft Robotics Lab, supervised by Prof. Robert Katzschmann

Research Project: *Learning Behavior Priors for Dexterous Manipulation*

ETH Zürich

December 2023

Optimization & Decision Intelligence Lab, supervised by Prof. Niao He

Research Project: *Bioplausible Meta Reinforcement Learning*

Research Project: *Inverse Reinforcement Learning from Suboptimal Demonstrations*

ETH Zürich

September 2022

AI for Healthcare Lab, supervised by Prof. Zuozhu Liu

Undergraduate Thesis: *Unsupervised Representation Learning on 3D Medical Images*

Zhejiang University

June 2021

RESEARCH PROJECTS

Control-oriented Clustering of Visual Latent Representation

ICLR 2025 submission (under review) supervised by Prof. Heng Yang

Harvard University

September 2024

- Discovered a control-oriented law of clustering similar to neural collapse in the visual representation space of an end-to-end image-based control pipeline trained from behavior cloning.
- Leveraged and validated such a law of clustering as an algorithmic tool to improve test-time performance when training a policy with a limited amount of expert demonstrations in both simulated and real-world planar pushing task.

Learning Behavior Priors for Human-Like Dexterous Manipulation

ETH Zürich

Semester project supervised by Prof. Robert Katzschmann

December 2023

- Proposed a new framework for RT-1 model that pretrains with out-of-distribution large offline human hand video dataset (ego4d) and fine-tunes with limited in-domain robotic hand video dataset.
- Constructed a low-dimensional dexterous dataset metric from raw human hand videos including estimated camera intrinsics (by COLMAP), human hand pose parameters (by FrankMocap) and camera movements (by ORBSLAM3).

Inverse Reinforcement Learning from Suboptimal Demonstrations

ETH Zürich

Semester project supervised by Prof. Niao He

September 2022

- Investigated and compared three inverse reinforcement learning algorithms: f -IRL, LOGEL and T-REX on suboptimal demonstrations in multiple MuJuCo simulated environments.
- Proposed an ablation study to test the robustness of T-REX model trained under SAC suboptimal policy.

Bioplausible Meta Reinforcement Learning

ETH Zürich

Semester project in course *Foundations of Reinforcement Learning*

January 2022

- Transferred a neuro-modulated framework from classification task to reinforcement learning.
- Migrated the neuro-modulated network as a gated function on the meta-learning policy network and update network parameters in bi-level optimization structure.

PUBLICATIONS

(* indicates equal contribution)

- [1] Han Qi*, Haocheng Yin*, and Heng Yang. “Control-oriented Clustering of Visual Latent Representation”. In: *arXiv preprint* (2024). arXiv: [2410.05063](https://arxiv.org/abs/2410.05063) [cs.LG].

TEACHING EXPERIENCE

ECE 365: Data Science and Engineering

University of Illinois Urbana-Champaign

Teaching Assistant

Spring 2021

ECE 385: Digital Systems Laboratory

Zhejiang University

Teaching Assistant

Fall 2020

AWARDS & HONORS

Swiss-European Mobility Programme (SEMP) Scholarship

ETH Zürich

Covered by Swiss State Secretariat for Education, Research and Innovation (SERI)

February 2024

High Honors at Graduation

University of Illinois Urbana-Champaign

Receive at least 3.80 GPA at graduation

May 2021

Dean's List in ECE Department
Top 3 GPA of the college class for 4 years

University of Illinois Urbana-Champaign
May 2021

Undergraduate Technology Innovation Award
Top 7% student research projects of all universities in Zhejiang, China

Government of Zhejiang Province
August 2020

Provincial Government Scholarship
Top 3% undergraduate students of all universities in Zhejiang, China

Government of Zhejiang Province
December 2018

Last updated: October 9, 2024