

Yang Hu

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EDUCATION

B.S. of Computer Science and Technology 2018 ~ 2022 (expected)
Tsinghua University, Beijing, PRC (GPA: 3.95; rank: 1 / 54)

- Affiliation: Institute of Interdisciplinary Information Sciences (IIIS), known as “Yao Class”.

RESEARCH INTERESTS

My research interests lie in the science of intelligent systems and decision making, such as optimal control theory, reinforcement learning and optimization. I am particularly interested in studying and improving the efficiency and complexity of RL and control algorithms, and in combining learning with control in unknown systems.

HONORS AND AWARDS

Undergraduate:

National Scholarship for Undergraduates 2019 & 2021

- The highest honor for undergraduates (1 student per grade per department).

First-class Scholarship at Tsinghua (in memory of Nanxiang Jiang) 2020

- The highest honor for junior-year students at Tsinghua (1 junior student per department).

Silver Medal of “Yao Award” at IIIS, Tsinghua 2021

- Awarded to outstanding senior students at “Yao Class” (1 gold, 2 silver, 4 bronze).

Second-class Scholarship for Freshmen 2018

Scholarship for the Cultivation of Outstanding Talents 2018 ~ 2021

High school:

First Prize of National Mathematical Olympiad (First Round) 2016 & 2017

First Prize of National Olympiad in Informatics in Provinces (NOIP) 2015 & 2017

Silver Medal of Russian Mathematical Olympiad (10th Grade, Final Round) 2017

RESEARCH EXPERIENCE

Undergraduate Research Assistant Sept. 2019 ~ Dec. 2020

IIIS, Tsinghua University (Advisor: Prof. Chongjie Zhang)

- Focus on the empirical side of Reinforcement Learning.
- In the project, I helped to implement and improve algorithms in multi-agent reinforcement learning (MARL), and design an efficient distributed architecture for MARL.

Undergraduate Research Assistant July 2020 ~ Dec. 2020

IIIS, Tsinghua University (Advisor: Prof. Yang Yu)

- Focus on the social-economical applications of Reinforcement Learning.
- In the project (see [2]), we design a novel DDPG-based algorithm that learns optimal pandemic-control policies to solve the problem of inter-regional collaborative pandemic control, and discuss sociological implications of collaborative behavior in multi-agent settings.

Research Internship (remote)**Jan. 2021 ~ present****CMS, California Institute of Technology** (Advisor: Prof. Adam Wierman)

- Focus on optimal control theory, esp. Model Predictive Control (MPC).
- Prove novel theoretical performance guarantees for MPC in linear time-varying (LTV) systems.
- In the project (see [1]), we provide the first theoretical performance guarantees (i.e., input-to-state stability, dynamic regret and competitive ratio) for MPC controllers in LTV systems with general well-conditioned costs. We introduce a new perturbation-based analysis framework that is general for analysis of controllers, and reveal a new reduction from MPC to SOCO.

Research Internship (remote)**Aug. 2021 ~ present****ECE, Carnegie Mellon University** (Advisor: Prof. Guannan Qu, co-advisor: Prof. Adam Wierman)

- Focus on optimal control theory, esp. the stabilization of linear systems.
- In the project (see [3]), we study the sample complexity of adaptively stabilizing linear time-invariant (LTI) systems. We introduce a novel spectral-decomposition-based approach to learn stabilizing controllers and provide theoretical stabilization guarantees for it.

PUBLICATIONS

[1] Y. Lin*, **Yang Hu***, H. Sun*, G. Shi*, G. Qu*, A. Wierman. Perturbation-based Regret Analysis of Predictive Control in Linear Time Varying Systems, 2021, arXiv preprint arXiv: 2106.10497.

Accepted by **NeurIPS'2021** as **Spotlight** (**top 3%** of all submissions).

Co-first authors are marked with asterisks (*).

[2] **Yang Hu**, Z. Zhu, S. Song, X. Liu, Y. Yu. Calculus of Consent via MARL: Legitimizing the Collaborative Governance Supplying Public Goods, 2021.

Accepted by **NeurIPS'2021 PERLS Workshop** as Poster.

[3] **Yang Hu**, G. Qu, A. Wierman. On the Sample Complexity of Stabilizing LTI Systems, 2021.

Manuscripts in preparation (accessible via personal website).

COURSE PROJECTS**Performance Improvement of Episodic Memory Deep Q-Networks**

Project of the course “Artificial Intelligence: Principles and Techniques”

- Attempt multiple approaches to improve the performance of EMDQN by better utilizing the similarity of states and improving the efficiency of episodic memory.

A Survey on the Representation Learning of Large-Scale Networks

Project of the course “Numerical Analysis”

- Survey, implementation and comparison of multiple networking embedding algorithms.

A 2-Player No-limit Texas Holdem Bot Based on Monte-Carlo CFR and Hand-crafted Rules

Project of the course “Game Theory”

- Design and train an agent for 2-player Texas Holdem, using a simplified counterfactual regret minimization (CFR) approach that is compatible with small-scale training.

SERVICES**Volunteer at the Tsinghua Undergraduate Admissions Office in Shanghai****2019 & 2020**

- Receive “outstanding service award” in year 2019.

Writing assistant at the Tsinghua Teaching Center for Writing**2021 ~ present**

REFERENCES

Adam Wierman, Professor of Computing and Mathematical Sciences

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