

Zhuo Ouyang

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5 Yiheyuan Rd, Haidian District, Beijing, China

EDUCATION

- **Peking University** Sep. 2022 - Jun. 2026
B.S. in Robotics Engineering Beijing, China
 - GPA: 3.86/4.00 (Major Course Score: 93.5/100)
 - **Rank: 1/26 in Robotics Engineering and Top 5%/156 in College of Engineering**
- **Johns Hopkins University** Oct. 2025 - Feb. 2026
Visiting Research Student Baltimore, MD, U.S.

HONORS AND AWARDS

- **Award for Academic Innovation, College of Engineering, Peking University (top 1%)** 2025
- **China National Scholarship (Top Undergraduate Student Award)** 2025
- **Merit Student Pacesetter, Peking University** 2025
- **Peking University Students of the Year Finalist (20 Candidates, Most Prestigious Award for All University Students)** 2024
- **Merit Student Pacesetter, Peking University** 2024
- **China National Scholarship (Top Undergraduate Student Award)** 2024
- **The First Prize in the Final Round of Chinese National College Mathematics Competition (Top 20 among all Participants)** 2024
- **The First Prize in Preliminary Round of Chinese National College Mathematics Competition (Non-Mathematics Major, Top 0.05% in Beijing)** 2023
- **First Prize in Chinese National College Physics Competition** 2023
- **Schlumberger Scholarship of the College of Engineering, Peking University** 2023
- **Merit Student, Peking University** 2023
- **Third Prize Scholarship for Freshman of Peking University** 2022

RESEARCH INTERESTS

- Self-Supervised Learning (Contrastive Learning)
- Transfer Learning in the Context of Safe Reinforcement Learning
- Data-Drive Control in Nonlinear Systems

RESEARCH EXPERIENCES

- **Projection Head is Secretly an Information Bottleneck** Apr. 2024 - Jan. 2025
Advisor: Prof. Yisen Wang, School of Artificial Intelligence, Peking University
 - We develop a new theoretical understanding for the role of the projection head in contrastive learning from the **information-theoretic perspective**. Mathematically, we rigorously derive both **lower and upper bounds for the downstream performance** of the features preceding the projection head.
 - Our findings indicate theoretical principles for designing an effective projection head: it should act as an **information bottleneck**, filtering out the irrelevant information and preserving the essential information for the contrastive objective.
 - Based on theoretical principles, we propose two categories of methods to improve projection head design, namely **training regularization** and **structural regularization**, that outperform previous approaches across a range of datasets and contrastive methods.
- **Transfer Learning based on Safe Reinforcement Learning to Enhance Sample Efficiency** March 2025 - Present
Advisor: Prof. Pengcheng You, Department of Industrial Engineering and Management, Peking University

- We apply the **upper confidence bound value iteration** (UCBVI) method to safe reinforcement learning settings. In this way, we extend prior work on safe RL from a generative-learning setting to an online-learning paradigm, making the approach better suited to real-world deployment.
- We generalize **transfer learning paradigm** to safe RL settings, utilizing offline dataset from source environment to **enhance sample efficiency** in target environment with shifted dynamics.
- Furthermore, we conduct numerical experiments on transfer safe RL settings to demonstrate reduction of sample complexity.

• Data-Driven Control for Imitation Learning in Hamiltonian Systems

July 2025 - Present

Advisor: Prof. Enrique Mallada, Electrical and Computer Engineering, Johns Hopkins University

- We propose a method for **data-driven stabilization of Hamiltonian systems**, namely **Nonparametric Chain Policies** (NPC).
- We demonstrate that the NPC control can **break the exponential dependence on dimensionality**, which is more effective than canonical imitation learning and scalable to large state spaces.

PUBLICATIONS AND PREPRINTS

- **Z. Ouyang**, K. Hu, Q. Zhang, Y. Wang, and Y. Wang. **Projection Head is Secretly an Information Bottleneck**. (ICLR 2025, accepted as a Poster.)

LEADERSHIP AND TEACHING EXPERIENCES

- **Leadership:** President of the External Relations Department, Student Union of the College of Engineering, Peking University
- **Teaching Assistant:** Mathematical Analysis, Linear Algebra and Geometry
- **Speech:** Delivering Speech on the 2025 Opening Ceremony of College of Engineering, Peking University (as the Senior Undergraduate Representative).

PROFESSIONAL SKILLS

- **Programming Languages:** Python (Pytorch), MATLAB, C++, R
- **Engineering Software Skills:** SolidWorks, Simulink
- **Sports:** Athletics (Sprints, Middle-Distance Running), Table Tennis, and Badminton
- **TOEFL:** Total 105, Reading 29, Listening 27, Speaking 23, Writing 26

REFERENCES

1. **Enrique Mallada**
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Electrical and Computer Engineering
Johns Hopkins University
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2. **Pengcheng You**
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