

Chendi Qu (屈晨迪)

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EDUCATION

Shanghai Jiao Tong University, Ph.D. in Control Science and Engineering Sep. 2021 – Present

- Research interests: Optimal Control, Learning from Demonstration, Data-driven Control, Multi-agent Cooperative Control
- First author of 2 journal papers (IEEE TAC), 2 under review, and 4 first-author conference papers (top-tier conferences in control)

Tsinghua University, B.Eng. in Automation Sep. 2017 – Jun. 2021

- Top 40% GPA ranking, strong foundation in mathematics and physics
- Leadership roles: Class President, Publicity Committee Member, Department Science and Technology Association Officer, Captain of Women's Soccer Team

SELECTED PUBLICATIONS (J=JOURNAL, C=CONFERENCE, S=SUBMITTED)

- [J1] **C. Qu**, J. He and X. Duan, "Control Law Learning based on LQR Reconstruction with Inverse Optimal Control", **IEEE Transactions on Automatic Control (TAC)**, 2024.
- [J2] **C. Qu**, J. He, J. Li, X. Duan and Y. Mo, "Optimal Control for Mobile Agents Considering State Unpredictability", **IEEE Transactions on Automatic Control (TAC)**, 2023.
- [J3] **C. Qu**, J. He, J. Li and X. Duan, "Optimal Unpredictable Control for Linear Systems", **Automatica**, 2026.
- [C4] **C. Qu**, J. He, X. Duan and J. Chen, "Inverse Reinforcement Learning with Unknown Reward Model based on Structural Risk Minimization", 2025 IEEE Conference on Decision and Control (**CDC**), to appear.
- [C5] **C. Qu**, J. He, X. Duan and S. Wu, "Control Input Inference of Mobile Agents under Unknown Objective", **IFAC World Congress 2023**, Yokohama, Japan, 2023.
- [C6] **C. Qu**, J. He and J. Li, "Multi-period Optimal Control for Mobile Agents Considering State Unpredictability", IEEE VTC2022-Fall, London, UK, 2022.
- [C7] **C. Qu**, J. He, J. Li, C. Fang and Y. Mo, "Moving Target Interception Considering Dynamic Environment", American Control Conference (**ACC**), Atlanta, USA, 2022.
- [S8] **C. Qu**, J. He and X. Duan, "3DIOC: Direct Data-Driven Inverse Optimal Control for LTI Systems", submitted to **Automatica**, major revision.

RESEARCH EXPERIENCE

Learning from Demo: Intention Inference/Imitation via Inverse Learning Jan. 2023 – Present

Shanghai Jiao Tong University (Advisors: Prof. Jianping He, Prof. Xiaoming Duan)

Visiting PhD *University of California San Diego (Advisor: Prof. Yang Zheng)* Aug. 2024 – Nov. 2024

- Designed inverse optimal control (IOC) and inverse reinforcement learning (IRL) algorithms to infer task intentions from expert demonstrations, improving generalization beyond behavior cloning.
- Contributions: (1) Reconstructed LQR controllers from state trajectories via inverse KKT/PMP/Riccati conditions. (2) Developed IRL framework based on Structural Risk Minimization to avoid manually selection in reward models. (3) Designed data-driven IOC with bi-level optimization formulation, proving statistical stability under noisy data and validated on self-designed autonomous cars and Unitree Z1 robotic arm platforms.

Trajectory Unpredictability: Maximum-Entropy Optimal Control Sep. 2021 – Dec. 2022

Shanghai Jiao Tong University (Advisor: Prof. Jianping He)

- Studied privacy-preserving control strategies to prevent external from predicting agent trajectories accurately.
- Contributions: Proposed two unpredictability metrics (expectation and confidence interval) and formulated min-max optimization problems respectively for control input distributions design. Proved the optimality of uniform distribution. Integrated the entropy term into dynamic programming to achieve a trade-off between control performance and unpredictability.

Moving Target Interception in Dynamic Environments Sep. 2020 – Jun. 2021

Tsinghua University (Advisor: Prof. Yilin Mo)

- Designed online trajectory prediction algorithm using polynomial fitting and Kalman filter. Developed a novel hierarchical optimization framework, consisting of candidate interception points, hybrid A* path planning, and ST-graph velocity planning. Validated algorithms in ROS+Gazebo simulations.

PROJECTS

AgiBot Research: RL Post-training for Real-world Robotics Sep. 2025 - Feb. 2026

AgiBot Research Center, Mentored by Dr. Jianlan Luo

- Developed RL post-training algorithms based on the **pi0.5 VLA** model; conducted simulation testing on the **LIBERO** benchmark and successfully deployed multi-task dual-arm collaborative behaviors (e.g., shelf picking and placing) on the **AgiBot Go1** wheeled bimanual robot.
- Contributed to the **Scalable Online Post-training (SOP)** project, a distributed, parallel, and cluster-based system for real-world deployment. Integrated representative algorithms (**HG-Dagger** and **RECAP**) into the SOP framework for distributed online training. Achieved significant performance gains across various scenarios: improved success rates by **12% – 17.5%** in supermarket grasping tasks and reached **over 94%** success rate in multi-task training. Enhanced dexterous manipulation (e.g., clothes folding, box assembly) by leveraging learned **error-recovery** capabilities; the SOP+HG-Dagger pipeline achieved a **114% increase in task throughput** compared to the baseline.

IDEAL: Automatic Data Re-weighting for Multi-capability LLM Fine-tuning Feb. 2025 – Jun. 2025

- In LLM training, balancing performance across multiple domains usually requires manual adjustment of dataset proportions. Poor allocation often leads to capability degradation, and the adjustment process heavily relies on experience.
- Proposed the IDEAL method, which leverages Influence Function theory to automatically compute the adjustment direction and magnitude for each dataset when enhancing a target domain. By iteratively applying IDEAL, the training data distribution is optimized. Achieved balanced performance across benchmarks, with 7% improvement over baseline data allocation methods in four domains. Demonstrated robustness under multiple experimental setups, providing a principled tool for dataset ratio adaptation in LLM fine-tuning.
- Co-authored publication: C. Ming, **C. Qu**, M. Cai, et al., “IDEAL: Data Equilibrium Adaptation for Multi-Capability Language Model Alignment”, **ICLR**, 2026.

Intelligent Lawn Care Robot Development Nov. 2021 – Jun. 2024

Shanghai Jiao Tong University, IWIN-FINS Lab

- Led planning and control module development from prototype to the third-generation lawn mower, enabling full-coverage and local path planning on the lawn.
- Contributed to perception, SLAM, pedestrian detection, lawn boundary recognition, sensor fusion (LiDAR + RTK), and Ackermann chassis control.
- Founded “DeepBlue Autonomy” underwater robotics team, leading to Bronze Award in China International Student Innovation Competition. Mentored undergraduates to win Silver Award in Shanghai “Internet+” Competition and co-filed patents on robot perception and planning.

Multi-task Reinforcement Learning with Auxiliary Gradients May 2020 – Aug. 2020

University of California Berkeley (Advisor: Prof. Xiaolong Wang)

- Developed gradient-based task weighting using auxiliary task gradients to accelerate main task learning.
- Applied gradient surgery to mitigate conflicts, improving performance by 30% on benchmark RL tasks (including cartpole_swingup, walker_walk, cheetah_run).

RoboCup2020 Simulation Project Feb. 2020 – May 2020

Tsinghua University (Advisor: Prof. Mingguo Zhao)

- Built RoboCup simulation with NVIDIA ISAAC SIM and applied domain randomization for data augmentation. Trained YOLO models within darknet for object detection, using LabelImg for annotation.

ACADEMIC SERVICE

Reviewer for Automatica, IEEE TAC, TCNS, TASE, TVT, IROS 2024, ACC 2025, CDC 2025

Teaching Assistant, Control Theory, SJTU Sep. 2021 – Jun. 2025

SKILLS

Programming: Python, C++, Matlab; ROS, Ubuntu, Gazebo, Mujoco

Experience in project management and national grant proposal writing

HONORS & AWARDS

IEEE CSS Graduate Student Collaboration Fellowship (10 recipients worldwide)	2024
Zhengyang Scholarship, Shanghai Jiao Tong University (awarded to 4 students in school)	2024
Tsinghua University Reading Excellence Scholarship	2020
Tsinghua Friends – Ronghua Zhang Scholarship	2019
Outstanding Award for Social Practice and Sports, Dept. of Automation, Tsinghua University	2019, 2020