Jianghan Zhang

zhangjianghan2@gmail.com | +1 347 439 2304 | https://github.com/JianghanZHang

Education

New York University, New York, U.S. Jan 2022 – May 2025

- B.S. in Mechanical Engineering, minor in Robotics
- GPA: **3.94/4.0**
- Relevant Coursework: **Robotic locomotion and manipulation, Robot vision, Robot perception, Telerobotic and Haptics in Med, Applied Matrix Theory, Automatic Control**

Beijing University of Posts and Telecommunications, Beijing, China Aug 2019 – Jan 2022

- B.E. in Internet of Things Engineering
  (joint program with Queen Mary University of London)
- Transferred to New York University in January 2022 to continue undergraduate study

Research Experience

Undergraduate Research Assistant, Machines in Motion Lab at NYU Jun 2023 – Present
Advised by Prof. Ludovic Righetti | Mentored by Armand Jordana

- Actively collaborate with PhD students and contribute to lab activities, including meetings and reading groups
- Implemented **callbacks** and **feature extensions** (e.g. visualization of convergence) in **C++** with **python bindings** for a Constrained Optimal Control Problem solver, facilitate development and analysis of the solver
- Developed an **accelerated gradient descent algorithm** for real-time, high-frequency **Nonlinear Model Predictive Control**, achieving performance comparable to **DDP** at 1 kHz (LBR paper accpeted by **UR 2024**)
- Currently developing **contact implicit trajectory optimization algorithms** to enhance robotic interaction in complex environments and enable **dexterous manipulation** & **legged locomotion without pre-specified mode sequences**

Undergraduate Research Assistant, AI4CE Lab at NYU Jun 2023 – Sep 2023
Advised by Prof. Chen Feng

- Improving safety and efficiency in **HRI** with a **3D human action target prediction algorithm** from **2D egocentric vision**, implemented **real-world HRI demonstrations** on a UR10e (paper accepted by **ICRA 2024**)

Projects

Accelerated gradient descent algorithm for MPC Jun 2023 - Apr 2024

- Investigated the performance of various first-order optimization algorithms on **non-linear MPC** problems, enhancing efficiency of the solver.
- Improved solver performance by identifying and mitigating computational bottlenecks, resulting in speeds **four times faster** than **Differential Dynamic Programming** (DDP) per iteration.
- Implemented accelerated gradient descent algorithms in C++, reducing computation time to **less than 1ms per control cycle** for a 7-DoF manipulator.
- Deployed the algorithm on a **real-world manipulator**, achieving performance comparable to **DDP** at **1kHz**.

Predicting 3D Action Target from 2D Egocentric Vision for HRI Jun 2023 - Sep 2023

- Augmented the size and diversity of the EgoPAT3D dataset; Enhancing the baseline algorithm with a **large pre-trained model** and **human prior knowledge**.
- Proposed real-world demonstrations that reflect **real-world scenarios** where a human and a robot share a common workspace
- Developed an **obstacle avoidance** controller using DDP with customized **soft constraints** to avoid the predicted human action target.
- Integrated the algorithm with the obstacle avoidance controller and **successfully deployed the combined system on a UR10e** for real-world human-robot interaction (HRI) demonstrations.

Contact Implicit Trajectory Optimization Jun 2024 - present

- Integrated the **MuJoCo** contact model into **optimal control problems** for direct trajectory planning, effectively generating **a range of motion trajectories for a quadruped robot** without pre-specified mode sequences.
- Actively researching alternative contact models, including **learned** models, that can enhance the performance and versatility of the algorithm used for dexterous manipulation tasks.

Publications

Egopat3dv2: Predicting 3d action target from 2d egocentric vision for human-robot interaction

Irving Fang[*], Yuzhong Chen[*], Yifan Wang[*], ***Jianghan Zhang***[†], Qiushi Zhang[†], Jiali Xu[†], Xibo He, Weibo Gao, Hao Su, Yiming Li, Chen Feng (*,† for equal contribution)

In 2024 IEEE International Conference on Robotics and Automation (ICRA) 2024

Accelerated gradient descent for high frequency Model Predictive Control

Jianghan Zhang, Armand Jordana, Ludovic Righetti

In 2024 21st International Conference on Ubiquitous Robots (UR) 2024 (As a late breaking news paper)

Work Experience:

Java Software Engineer, Beijing Qingzi Future Network Technology Co., Ltd. Jul 2019 - Sep 2019

- Implemented of robust database systems and table structures for the ToTok Game Center platform, utilizing Spring Boot, JavaScript, and Linux.
- Applied architectural methodologies to support the design and optimization of backend functionalities, contributing to scalable and efficient data management.
- Collaborated with cross-functional teams to ensure database implementation strategies aligned with overall project objectives, enhancing system performance and user experience.

Technical Skills

Programming Languages: C++/C, Java, Python, SQL, Matlab, TEX

Frameworks/Libraries: ROS, Crocoddyl, Pinocchio, Pytorch, Mujoco, Pybullet, Boost.Python

Mechanical Engineering: Solidworks, Fusion 360, Ansys (FEA), 3D Printing

Completed Online Courses

- **Machine Learning** – Stanford University
- **Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization** – DeepLearning.AI
- **Sequence Models** – DeepLearning.AI
- **Introduction to TensorFlow for Artificial Intelligence, Machine Learning, and Deep Learning** – DeepLearning.AI
- **Convolutional Neural Networks** – DeepLearning.AI
- **Neural Networks and Deep Learning** – DeepLearning.AI