

Qianhuang Li

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EDUCATION

Columbia University, ROAM Lab, New York, NY **Expected Jan. 2023**

Master of Science in Mechanical Engineering, Robotics

GPA: 4.1/4.0

Relevant Coursework: Robot Learning, AI, ML, Reinforcement Learning, Computational Aspect of Robotics

Huazhong University of Science and Technology (HUST), Wuhan, CN **Jun. 2021**

Bachelor of Science in Mechanical Design, Manufacturing, and Automation(Honor class)

GPA: 3.72/4.0

Relevant Coursework: Machine Design, Software Programming, Robotics, Dynamics and Control

University of California, Santa Barbara, Santa Barbara, CA **Jun. 2022**

Relevant Research: Robot Haptic Perception, Rehabilitation Soft Robot Glove, Control Method for Reaction Wheel-based 3D Inverted Pendulum

RESEARCH EXPERIENCE

Sampling-based Exploration for Reinforcement Learning of Dexterous Manipulation **Dec. 2022- Present**

Supervisor: Matei Ciocarlie (CU)

- Assisted in implementing reinforcement learning algorithm part of the dexterous hand; Added signal filters in IsaacGym simulator to mimic real model physical signals.
- Tested domain randomization in simulators to prevent effects of model deviations; Fine-tuned the reward functions in the simulator and accurated physical models.
- Implemented algorithm from manipulation to pose-reaching goal; Utilized rapidly exploring random tree (RRT) for quicker state space search.
- Collected contact data from curriculum learning for further analysis.

Fast-moving Bipedal Robot with Gait Optimization

Sept. 2022- Dec.2022

Supervisor: Hod Lipson (CU)

- Designed and built a parallel legged robot controlled with LePotato; Trained a model to represent the inverse kinematics in Mujoco.
- Designed a elliptical gait and developed gait pose using the IK model in the Mujoco simulator.
- Implemented stochastic search algorithm and PPO algorithm for gait optimization; Fine-Tuned physical model parameters to increase the robot's movement speed by 3.7 times.

Indoor Mapping Slam Robot Project

Sept. 2020- Sept. 2021

Supervisor: Shuting Wang, Ling Ling (HUST)

- Confirmed pre-work research direction through literature research from interdisciplinary perspectives, including information architecture and function division.
- Completed modeling work for robot's appearance and designed the interface; utilized 3D-modeling RTAB-MAP to render robot surroundings using Kinect.
- Confirmed physical production and complete testing; completed the defense, physical display, and live demonstration of the robot.

RFID and face modeling smart supermarket

Sept. 2020- Aug. 2021

Supervisor: Bo Tao (HUST)

- Reproduced the essential functions of face recognition and classification; Assisted in completing the combination of face models and RFID objects.
- Assisted team members to complete feature point recognition of face modeling; Reduced key-points on human face for faster response.
- Completed the RFID scanning accuracy experiment of goods; Improved the original product for application market.

PROJECT EXPERIENCE

Robotic Pick-Place Task Based on Visual Affordance Model

Feb.2023- May.2023

Supervisor: Shuran Song (CU)

- Implemented object recognition/obstacle avoidance and pick-place tasks in PyBullet with multiple objects.
- Built the Mini-U-net architecture to learn the grasping pose of gripper from the pictures; Trained the model for grasp process using probability distribution provided by the Gaussian heat map.
- Added Gaussian blur processing to the grasping point and data augmentation processing on the image to make the model more robust.

Learning Robot Motion Control with MPC Demonstration

Feb.2023-May.2023

Supervisor: Matei Ciocarlie (CU)

- Utilized different control methods to complete the 2-link robot arm control task learning for a MPC teacher agent to reach available goal in 2D space.
- Compiled the MLP network using velocity and position input for torque output.
- Implemented the DQN and PPO algorithm for the robot arm for more precise goal-reaching poses.

Evolutionary Soft Robots

Sept.2022- Dec.2022

Supervisor: Hod Lipson (CU)

- Compiled the program to evolve robots with a variable morphology in the customized physical simulator by using the evolutionary algorithm.
- Built and parameterized mass-spring physics simulator by using C++ and OpenGL.
- Changed the morphology and physical constants of the robot using evolutionary algorithm for a fastest moving speed.

INTERNSHIP EXPERIENCE

Hubei Defon Heat Exchanger Co., Ltd

Dec. 2019- Feb. 2020

Internship as assistant engineer

- Collaborate with engineers to restructure heater exchanger physical model
- Conducted simulations of heat exchanger operation in ships using Ansys for product safety testing.

EXTRACURRICULAR ACTIVITIES

Debate

Captain of debate team at HUST

Volleyball

Captain of the volleyball team at HUST

Robocon

Participated in the 2018 and 2019 Asia-Pacific Robocon competition

TECHNICAL SKILLS

Programming Languages: Python, C++, Linux(Ubuntu)

Libraries: ROS, Python Libraries such as PyTorch, PyBullet, StableBaselines3, OpenCV

DevTools: PyCharm, Git, VScode, Colaboratory

CadDesign: SolidWorks, AutoDesk, OpenSCAD