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 robor 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

**ProgrammingLanguages:** Python, C++, Linux(Ubuntu)

**Libraries:** ROS, Python Libraries suchas PyTorch, PyBullet, StableBaselines3, OpenCV

**DevTools:** PyCharm, Git, VScode, Colaboratory

**CadDesign:** SolidWorks, AutoDesk, OpenSCAD