# Yiqi Lyu

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## EDUCATION

**Carnegie Mellon University** Pittsburgh, PA

Master of Science in Mechanical Engineering Aug 2021 - May 2023

GPA: 3.91/4.00

Relevant Courses: Trustworthy AI Autonomy, Introduction to Machine Learning, Computer Vision, Modern Control Theory and Design, Advanced Control System Integration, Robot Dynamics and Analysis, Bio-inspired Robot Design and Experimentation, Sensing and Sensors, Biomechanics of Human Movement.

**Huazhong University of Science and Technology** Wuhan, China

Bachelor of Engineering in Mechanical Design, Manufacturing and Automation Sep 2015 - Jun 2019

## EXPERIENCE

**Safe AI Lab, Carnegie Mellon University** Pittsburgh, PA

Research Assistant Jun 2023 – Present

- Developed generalizable decision-making on robot arms with skill-based policy and energy function.
- Achieved quadrupedal robot mobility via behavior cloning.
- Enhanced smoothness and performance in autonomous driving with residual policy learning.
- Contributed to the morphological design of the Unitree GO1 robot.
- Designed and fabricated customized parts for demonstration with the 3D printer.
- Developed Python API for robot arm projects including Kinova Gen3 and Ufactory xArm7.
- Assisted in editing course reading materials for “24-677 Modern Control Theory and Design”

**Wuhan Institute of Physics and Mathematics, Chinese Academy of Science** Wuhan, China

Research Assistant Aug 2020 – Jan 2021

- Designed, fabricated, and assembled a precision air spindle platform for machining optical microcavities.
- Achieved surface roughness of under 10 microns in microcavity made by delicate materials.
- Assisted in frequency stabilization of laser system with PID closed-loop control.

## PROJECTS

**Generalizable Robot Arm Manipulation** Sep 2023 – Present

- Collected expert data on the robosuite simulator with rule-based controllers such as A* and RRT.
- Achieve 98% success rate with a skill-based imitation learning policy generalizable to randomly initialized scenarios with task-specific skills inferred by energy-based function.
- Deployed model in the real-world dynamic environment with Kinova Gen3 and Ufactory xArm7.
- Improved safety in human interrupting scenarios.

**Quadrupedal Robot Mobility** Jun 2023 – Aug 2023

- Leveraged MPC controller to complete tasks and collected data for offline training on MuJoCo.
- Implemented Behavior Cloning algorithm for Unitree quadrupedal robot mobility.

**Autonomous Driving Experiment on Carla Simulator** Apr 2023 – May 2023

- Detect objects on roads in adversarial environments with YOLO-v5 and Faster-RCNN algorithm.
- Reduced collision rate by 20% with SAC algorithm in safety-critical scenarios of AV.

**Image Identification** Apr 2023 – May 2023

- Achieved 95% accuracy by developing PyTorch-based MLP and 98% accuracy by retraining ResNet-50 for image identification on NIST36 and CIFAR-10 datasets.

**Dynamic Balance and Stability in Tumbler Robotics** Oct 2022 – Dec 2022

- Implemented model predictive control and made a tumbler robot to stand upright in a team of five.
- Built model in Simulink and validated the performance of LQG controller.
- Smoothen angular movement of the robot with input shaping.

**Signal Detection in High-Noise Environments** Nov 2022

- Performed phase-sensitive detection with photoresistor in Arduino platform to detect modulated light signal when the signal-to-noise ratio is lower than 7dB.

**Autonomous Material Handling Robot** Apr 2018 – Jun 2018

- Collaborated with teammates and developed a robot for transporting objects automatically.
- Implemented programmable logic controllers and designed programs to coordinate movements of a pneumatic clamp and motors.

## RESEARCH INTEREST

Data-driven reinforcement learning
Multi-task learning
Human-robot interaction
Multi-modality perception

## PUBLICATION

Barnett, Braden, Yiqi Lyu, Kyle Pichney, Brian Sun, and Jixiao Wu. "Mechanical Evidence for the Phylogenetic Origin of the Red Panda's False Thumb as an Adaptation to Arboreal Locomotion."

Yiqi Lyu. “Optimization and Analysis of Hemispheric Resonator Gyroscope.” (Undergraduate Thesis)

## AWARDS & HONORS

Excellent Chinese Youth Volunteer (2017)
Outstanding Minister of Huazhong University of Science and Technology Funding Committee (2016)
Top Score in County in the National College Entrance Examination (Gaokao) (2015)

## SKILLS

Programming: Python, C++, MATLAB, Linux, ROS
Algorithms: PyTorch, OpenCV, PyBullet, OpenAI Gym, Numpy, Pandas
Control: LQR, MPC, Kalman Filter, Arduino
Mechanics: CAD/CAE, FEA, PLC

## ENGLISH PROFICIENCY

GRE: 330 Duolingo: 135 TOEFL: 102