Ruibo Liu

(+86) 18102647816 | rl3233@columbia.edu | New York City, NY

EDUCATION

Columbia University, *New York, NY* Feb 2023

Master of Science in Mechanical Engineering, Robotic and Control Track (GPA 3.838/4.33)

Relevant Coursework: Mechatronics and Embedded Microcomputer, Intro-Robotic, Robotic Studio, Digital Manufacturing

University of California, Los Angeles, *Los Angeles, CA* June 2021

Bachelor of Science in Mechanical Engineering (GPA 3.681/4.00)

Relevant Coursework: *Heat Transfer, Thermodynamic, Fluid Mechanic, Dynamic System and Control, Mechanical Design*

PROFESSIONAL EXPERIENCE

Institute of Software Chinese Academy of Sciences, Guangzhou institute of software and application technology

Guangzhou, China

R&D Engineer Apr 2023 – Aug 2024

AI Lab Scoring System for Middle Schools

- Proposed a scoring algorithm framework based on middle school experimental standards in Shenzhen, with 15 AI scoring criteria.
- Designed an adaptive scoring framework to meet user-defined criteria and scoring standards.
- Utilized the YOLO model to achieve object and action recognition with an accuracy exceeding 90% under stable recognition.
- Managed the database for the computer vision recognition model and handled the preprocessing and postprocessing workflows for training data, utilizing over 100,000 labeled images to train and optimize the model, achieving an accuracy rate exceeding 90% under laboratory conditions.
- Supported the successful deployment of the project at the Chongqing Education Equipment Exhibition and schools in Sichuan, and Inner Mongolia.

Smart Street Light Precision Operation and Maintenance Project

- Processed daily operational data for over 10,000 smart streetlights based on government platforms and vendor data, conducting analysis through dimensionality reduction and data visualization techniques.
- Utilized machine learning and deep learning algorithms, such as LSTM and decision trees, to detect faults in streetlights with over 90% accuracy.
- Built a multi-model system for data cleaning, analysis, modeling, and prediction, reducing manual inspection costs.

Digital Avatar APP based on Large Models

- Collected and cleaned image data of various human figures, including annotations, to enhance model learning quality.
- Fine-tuned the parameters of the Stable Diffusion model to train the LORA model based on the refined user-defined figures.
- Generated speech from text using large AI models and text-to-speech technology.
- Achieved real-time virtual human lip-syncing with voice using deep learning model on A800 servers.

RESEARCH AND COURSE PROJECTS

Creative Machine Lab*, Columbia University* **New York, NY**

Student Researcher May 2022 – Feb 2023

Robot Arm Project

- Modified WidowX 200 robot arm's gripper and base design; created the URDF model to optimize arm design.
- Implemented Socket library to conduct the PyBullet simulation and let real-world robot arm execute same actions simultaneously.
- Programed a Python script to collect 100K images with different numbers and shapes of objects on the table and resized those images for deep learning data.
- Set up and calibrated real-world environment to collect real-world object image data.
- Modified Yolov7 and Resnet model to distinguish the object's position, dimension, and orientation from RGB camera and return real-time detect information in 10 FPS.

Legged Self-Model Robot Project

- Programed a python script to automatically create different configurations of robot models and exam the capability of robots.
- Explored Sin Gait motion by utilizing hill climbing and genetic algorithms to achieve the 'walk' function of the robot.
- Improved the robot's circuit design to avoid overheating problems of the robot's servos.
- Used Domain Randomization approach to reduce the sim2real gap to enable robots 'walk' under two kind configurations.
- Created the communication between the robot and PC by implementing Socket Library in python and collected real data for deep learning.

Two-legged Rabbit Robot, *Columbia University* **New York, NY**

Course: Robotic Studio Jan 2022 – May 2022

- Leveraged SolidWorks to design different body and leg structures of the robot using raw stability analysis and power estimate.
- Fabricated the optimized robot design by 3D printing and laser cutting with lightweight and high structural strength.
- Built a simulation model of the robot using PyBullet to create a simulation environment for machine learning.
- Implemented machine learning models to optimize robot gaits and increased the robot's walking speed from 3 to 15 cm/s.
- Controlled the robot remotely using Raspberry pi.

Wardrobe Robot, *UCLA* **Los Angeles, CA**

Course: Mechanical Design Jan 2021 - June 2021

- Designed a device that was equipped to handle all clothing items which in similar weights as a standard men's flannel shirt.
- Devised a sequential gear mechanism with partial gears to drive four robotic arms, which reduced the number of servos from 4 to 1.
- Operated SolidWorks to finalize the mechanism system and the main body of the Wardrobe robot.
- Analyzed the device structure using SolidWorks to determine the stress and displacement under different working conditions.

INTERNSHIP EXPERIENCE

Q.T Tech Company **Beijing, China**

Mechanical Engineer July 2018 – Sep. 2018

- Reviewed CAD drawings following the company's requirements for robotic projects.
- Collaborated with machine learning engineers to modify hardware and software to meet requirements.
- Oversaw the quality control process for an assembled prototype to eliminate factors that affected the results.
- Participated in the testing procedure, provided technical advice, and documented the testing process and results.

GuangDong Museum **Guangzhou, China**

Tech Advisor July 2017 - Oct 2017

- Planned and implemented projects that aimed to expose children to traditional Chinese culture on a limited budget.
- Led 20 kids utilizing LOGO to construct traditional Chinese buildings.
- Served as a designer to devise maps and posters; utilized AutoCAD and Photoshop to help guide visitors.
- Assisted in setting up the project website, maintained and updated projects routinely.

SKILLS

Computer Skills: Python, R, AutoCAD, C++, MATLAB, SolidWorks, JLCEDA, Microsoft Office

Language: English (Proficient), Mandarin (Native), Cantonese (Native)