

CHENFEI ZHU

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EDUCATION

Columbia University (CU)

New York, USA

Master of Science in Mechanical Engineering, Concentrated in Robotics & Control, GPA: 3.85/4.00

Expected Dec 2022

- Coursework: Machine Learning, Reinforcement Learning, Computer Vision, Robot Learning, etc.

Wuhan University of Technology (WUT)

Wuhan, CN

Bachelor of Engineering in Automotive Engineering, GPA: 3.9/5.0

Sep 2016 - Jun 2020

PUBLICATIONS

ACRNet: Attention Cube Regression Network for Multi-view Real-time 3D Human Pose Estimation in Telemedicine

ROAR Lab, CU

Feb 2022 – Oct 2022

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A Deep-Learning Based Real-Time Prediction of Seated Postural Limits and its Application in Trunk Rehabilitation

ROAR Lab, CU

Feb 2022 – Oct 2022

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PROJECTS

SARN: Shifted Attention Regression Network for 3D Hand Pose Estimation in Medical Application, ROAR Lab, CU

Research, manuscript under polishment

Feb 2022 – Oct 2022

- Proposed a novel network architecture, shifted attention regression network (SARN), which is characterized by shifted attention heatmap and soft input aggregation, to perform accurate, robust and unbiased 3D hand pose estimation (HPE) for medical application.
- Built a hand movement dataset (PAKH) based on Parkinson's finger tapping test (FTT) by conducting experiments on 17 subjects. PAKH contains 92k depth images collected by two Intel RealSense D435i depth cameras with 5 hand joint annotations labeled by Vicon infrared system.
- Proposed method outperforms or achieves state-of-the-art performance on three public datasets: NYU, ICVL and MSRA datasets, and achieves low error on predicting joint position and all task-specific metrics on PAKH, which indicates that the proposed method can perform accurate and robust HPE and has the potential for medical applications.

Neural Network Hyperparameters Tuning: Reinforcement Learning Approach, CU

New York, USA

Project

Sep 2021 - Jan 2022

- Collected a dataset of about 18k RGB images of subjects performing Parkinson's finger tapping test; each image contains a human hand with four hand joint annotations, built a simple CNN network for hand joint tracking.
- Proposed a model-based reinforcement learning method for efficient hyperparameter optimization: Designed a reinforcement learning environment to provide observation, action, and reward based on the network's hyperparameters and performance and built a DQN agent to learn how to improve the structure of the network.
- The agent learned how to optimize the hyperparameters of the network from a bad setting within a short time period and achieve human-level accuracy.

Boxing Robot: Design and Motion Tracking, CU

New York, USA

Project

Oct 2021 – Dec 2021

- Designed and assembled a kind of humanoid robot consisting of two arms and a trunk with 9 degrees of freedom, built a simulator using MATLAB robotics toolbox to simulate the dynamic motion of the robot designed.
- Recorded a boxing motion from two views using two optical cameras and synchronized them by analyzing audio signals, extracted the 3D motion data of 8 upper body landmarks from the synchronized videos using MediaPipe Pose and designed a post-processing algorithm to integrate the motion data predicted from two videos and project it to the workspace of the robot.
- Solved inverse kinematics to get the joint angle in each frame and designed a PID controller to follow the motion trajectory.
- Proposed robot succeeded in mimicking human boxing motion by achieving a mae within 6 degrees for most joints during the following task.

Structural Design and Kinematic Trajectory Analysis of Wheeled Legged Robot, WUT

Wuhan, CN

Undergraduate Graduation Thesis

Jan 2020 - June 2020

- Proposed a novel quadruped wheeled-foot separated mobile robot based on a special active suspension with adjustable height

by analyzing quadruped bionics.

- Designed and modeled the overall structure, wheel and foot assembly, steering system, power and control system of the robot.
- Calculated the key parameters of the power and control system; selected and arranged electronic components such as robot joint motor, hub motor, and battery on the robot designed.
- Implemented Finite Element Analysis and Motion Analysis on the robot in simulation to verify the reliability of the structure designed.

In-arm Torsion Electromagnetic Active Suspension Project, WUT

Wuhan, CN

Science and Technology Innovation Project

Mar 2018 - Mar 2019

- Proposed a novel active suspension with adjustable height, utilized SolidWorks to build the 3D model, which consists of above 100 parts; improved the model through structure optimization and finite element analysis.
- Designed a control system including a controller, motors, valves, etc.; coded in C to achieve adjustable damping and adjustment of body height from 350mm to 650mm.
- The proposed suspension has an adjustable height and a cushioned energy reduction capability, making it suitable for complex terrain.

PROFESSIONAL EXPERIENCE

ROAR Lab, Columbia University

New York, USA

Research Assistant

May 2022 – Present

- Leading a research project aims at implementing 3D hand pose estimation for medical use; also participating in several other projects regarding computer vision, deep learning, and muscle synergy.

Shenzhen Kewetair Enterprise Dev. Co., Ltd.

Shenzhen, CN

Structural Design Intern

Jul 2020 - Sep 2020

- Designed a transmission system in a drone hangar project: used SolidWorks to build the 3D model of the transmission system to lift and position a drone, open the hatch, and transmit power to the manipulator.

Beijing New Energy Automobile Co., Ltd.

Beijing, CN

Product Planning Intern

Jul 2019 - Aug 2019

- Managed and updated a database with thousands of user interview data and optimized the scenario demand database for analyzing the pros and cons of existing products to support the planning of future ones.

SKILLS

- AI: Computer Vision, Deep Learning, Reinforcement Learning, Machine Learning,
- Programming: Python, C++
- Robotics: Control theory, Mechanical design