

Yunchu Zhang

10930 Ashton Ave#201,LA,CA,90024

E-mail: yunchu@g.ucla.edu Mobile: +1 3109231784

www.linkedin.com/in/yunchu-zhang-a1338aa8

Github : <https://github.com/YunchuZhang>

Personal website:<https://yunchuzhang.github.io/index.html>

EDUCATION

- Sept.2017 — June 2019* **University of California, Los Angeles (UCLA)**
Major:Control&Robotic(AI) Cumulative GPA: 3.84/4.0
Degree:Master of Science
- Sept.2013 — June 2017* **Dalian University of Technology (DUT)**
Degree:Master of Science
- ♦ *Sept.2014 — June 2017* **School of Electrical Engineering, Dalian University of Technology (DUT)**
Major:Automation Cumulative GPA: 3.81/4.0
- ♦ *Sept.2013 — June 2014* **School of Software Technology, Dalian University of Technology (DUT)**
Major:Software Cumulative GPA: 3.71/4.0

RESEARCH EXPERIENCE

July 2019 — Present **Long path algorithm for manipulation based on perception and planning**

Prepared to be published in RSS in January

Advisor: Katerina Fragkiadaki, Assistant Professor, Department of Machine Learning,
and Chris Atkeson, Professor, Robotics Institute, Carnegie Mellon University

Details: •Based on RGBD image information to construct a 3D symbolic tensor
that represent the whole scene include robot and objects.

•Utilize deep reinforcement learning algorithm (DDPG+HER) to train basic arm-
object contact and short range pushing policy for multiple different objects
separately in relative frame.

•Utilize behavior cloning(Dagger) learning with 3d tensor information and object
pose position to train single policy that could push different objects for
random goals in short distance.

•Utilize motion planner (model-based thought)based on 3D representation to get
long path manipulation subgoals and achieve them one by one.

October 2018 — Mar 2019

Intelligent Aerial manipulator HCI system: Using arm-drone to collaborate with human

Research team leader

Advisor: Xiang Anthony Chen, Assistant Professor, Department of Electrical and Computer
Engineering, University of California, Los Angeles.

Details: • Based on robot-arm and drone to build aerial manipulator system and make it
stable with impedance control and motion planning algorithms in ROS.

• Utilize deep neural network to train an offline grasps network for grasp position
predict.

- Fused human demonstration to dataset for stable grasping.

June 2018 — Sept.2018 **Robotics research Intern at DMAI**

Graduate Researcher

Advisor: Yixin Zhu , Research Director and VP, DMAI

- Details:
- Build red-ball tracking system with several motors, 3D-printed links, Raspberry Pi and Pi camera.
 - Utilized Zeromq to build communicate pipeline with CV group to attain object's dynamic information.
 - Solved inverse kinematic problem for self-designed humanoid robot's neck in ROS and achieve real-time neck tracking with human's gaze info.
 - Based on Monocular-ORB-Slam algorithm to scan current environment scene and build surrounding environment map for robots.

Apr.2018 — June 2018 **Control for Robotics system: Solving Rubik's Cube with robot arm and motor**
Team leader

Advisor: Veronica Santos, Associate Professor, Department of Mechanical Engineering , Director of Biomechatronics Lab in UCLA

- Details:
- Based on web-camera to detect randomly shuffled Rubik's cube and sent motion command's solution to robot arm.
 - Utilize inverse kinematic to make trajectory and position planning for robot arm.
 - Utilized PID position control to rotate Rubik's Cube and realized real-time Gripper's force control to grasp Rubik's Cube.

Jan.2018 — Mar.2018

Artificial Intelligence Course Project: Reinforcement Learning method for locomotion
Team leader

Advisor: Demetri Terzopoulos, Distinguished Professor and Chancellor's Professor of Computer Science , Director of Computer Graphics and Vision Lab in UCLA

Details: • <http://tinyurl.com/275project>

- Developed a reinforcement learning approach and an evolution strategy for physics-based character locomotion skills training on the BipedalWalker-v2 physical environment provided by OpenAI Gym.
- Implemented Asynchronous Advantage Actor-Critic (A3C) algorithm and evolution strategy in complex environment (a sequence of challenging terrain with rough ground, stumps, pitfalls, and stairs)with good results and satisfying accumulated rewards.
- Comparing these two algorithms and add LSTM to A3C algorithm to gain stable natural behavior in more complex environment where a sequence of terrain are random generated.

Feb.2018 — Mar.2018 **Image based Object Detection System for Self-driving Cars Application**

Advisor: Shi Ruan , Deep learning and computer vision Researcher, Google

- Details:
- Base on Deep learning (Mxnet) to implement object detection and tracking system on self-driving car system.
 - Utilize Yolo algorithm to construct special neural network model(utilize Resnet to

- extract basic image information and then with new designed network frame)
- update a new loss function, train the network on GPU and tune parameters to converge and optimize the result.
- Optimize feedforward inference network and realize object detection and tracking in real time on Raspberry with its Pi camera.

Dec.2016 — June.2017 **Graduation Design: Target Tacking for UAV Based on Vision**

Advisor: Yan Zhuang, Professor, Department of EE , DUT

- Details:
- Processed the UAV's images with opencv and ROS in Linux system and tracked object with L-K pyramid optical flow and nearest neighbor classifiers.
 - Adding cluster analysis to increase robustness in L-K tracking part.
 - Utilized online learning P-N teacher method to correct and update model.
 - Utilize Kalman filter to estimate relatively accurate object location from tracking and detection parts' input when object was obscured
 - Achieving real time tracking in UAV's processor platform

Sept.2015 — May.2016 **Unmanned Aerial Vehicle (UAV) Project**

Team member

Advisor: Yan Zhuang, Professor, Department of EE, DUT

- Details:
- Collected road image from UAV's camera and marked walkable road in the image with SVM method.
 - Sent real-time road info to instruct the wheeled robots and plan the walkable path with obstacles avoidance.

Mar.2015 — June 2016 **National College Student Innovation Project**

Team leader

Advisor: Qiuhui Pan, Professor, Department of Math, DUT

- Details:
- Research Project: Ecological System Evolution Model Based on the Influence of Water Resource.
 - Based on the cellular automaton method, build ecological system evolution model with Monte Carlo.

Jan.2016 — Feb.2016 **Intern At Chinese Academy of Sciences, Research on the Robot and UAV**

Advisor: Zhiqiang Pu, Associate Professor

- Details:
- Utilized Matlab/Simulink and S-Function to construct dynamic control system (based on PID) for a quadcopter.
 - Designed swarm optimization algorithm to solve the optimization problem for nonlinear functions.

HONORS AND SCHOLARSHIPS

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|---|--------------------------------|
| ♦ Academic Scholarship in EE Department | <i>Sep.2014 & Sep.2015</i> |
| ♦ Merit Student in Dalian University of Technology | <i>Sep.2015</i> |
| ♦ E+H Scholarship, by Endress + Hauser | <i>Sep.2015</i> |
| ♦ First prize Technology Innovation Scholarship with ranking of No. 1(in 695) | <i>Sep.2015</i> |
| ♦ Fifth place in school Top 10 singer contest | <i>Mar.2015</i> |

COMPETITIONS AND AWARDS

◆ Freescale Smartcar Competition

Regional Second Prize

Sep.2014 — June 2015

- Wrote the algorithms for different stages to identify the racing track, based on PID algorithm to control speed.
- Was responsible for hardware building, PCB design, welding and debugging.
- Equipped the smart car with sensors such as accelerometer to avoid obstacles and pass over the ramp.

◆ Electronic Design Competition (Research on blind pendulum) DUT

Nationwide Second Prize

July 2015 — Aug.2015

- Research on blind pendulum, building model, and spatial 3-D analysis.
- Built a model of nonlinear dispersion, composition and resolution of motion, and automatic control principle.
- Collected the attitude of wind pendulum, processed the data with SCM, and regulated wind force by position from PID closed-loop.
- Made the wind pendulum swing up, perform setting-out and stay still under the control of DC blower.

◆ Mathematical Contest of Modeling

Meritorious Winner for twice top5%

Feb.2016

- Topic: The Commercial Opportunity Analysis of Addressing the Space Debris Problem.
- Created model to update debris info and identified optimal solution by employing CMPSO model multiple times.

◆ Mathematical Contest of Modeling

Meritorious Winner for twice top5%

Feb.2015

- Topic: Find the Lost Spacecraft.
- Made efficient searching plan by taking Bayesian method and probability distribution of each searching range.

Extracurricular ACTIVITIES

- ◆ Deputy Director , Department of Culture and Art, Student Union, DUT Sep.2013—Aug.2015
Supervised the department and assigned tasks to the members
- ◆ Member, School Choir, DUT Sep.2014—Aug.2015
Participated in the performance and some contests
- ◆ Member, School Folk Art Club, DUT Sep.2014—Aug.2015
Participated in Chinese folk art performances, including singing, clapper talk, cross talks

COURSES AND SKILLS

- ◆ Courses:C/C++ Language; Data Structure;Automotive Control; Single Chip Microcomputer; Humanoid Robot; Kinematics of Robotic Systems; Computational Robotics; Pattern Recognition and Machine Learning; Deep Learning; linear algebra and probability; Convex optimization; Computer Vision course in PyImageSearch with Adrian.
- ◆ Language&Software: C/C++,Python, ROS, Matlab, Labview, Embedded programming.
- ◆ Software Skills:Machine Learning algorithm, Computer vision, Dynamic system control, Extended Kalman Filter , Motion Planning,ORB-SLAM, Deep Neural network ,Reinforcement learning,Faster-RCNN, LSTM, Mxnet, Tensorflow, Pytorch, OpenCV, Zeromq.
- ◆ Hardware Skills: welding, PCB hardware design, embedded system designing.