

Yuchen Rao

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Portfolio: <https://yuchenrao.github.io/Portfolio/>

EDUCATION

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| Master of Science in Robotics | 09/2016-12/2017 |
| Northwestern University, Evanston, IL, United States | |
| GPA 3.90/4.00 | |
| Bachelor of Science in Mechanical and Electrical Engineering | 09/2012-07/2016 |
| China Agricultural University (CAU, a Project 985 University) , Beijing, China | |
| GPA 3.88/4.00, Rank: 1/43 | |

ACADEMIC & ACTIVITY AWARDS

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| Outstanding graduate of Beijing, China | 05/2016 |
| Outstanding graduate of CAU | 05/2016 |
| Excellent Student Award granted by the Ministry of Education with Scholarship, China, twice | 09/2013-07/2014 |
| Excellent Student Award with Scholarship, CAU | 09/2014-07/2015 |
| Excellent Student Award in Academics Grade 1 with Scholarship, CAU, three times | 09/2013-07/2015 |
| Excellent Student Award, CAU, twice | 09/2013-07/2014 |
| 3 rd place in Freescale Cup: Intelligent Car Racing of North China region | 05/2014-05/2015 |
| Honorable Mention for Mathematical Contest in Modeling (MCM) (USA) | 03/2015 |
| 3 rd place in NEAR Speak Out for Engineering Competition (Asia-Pacific region) | 09/2014 |

WORK EXPERIENCE

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| Robotics Software Engineer, Berkshire Grey, Massachusetts, United States | 05/2019-present |
| <ul style="list-style-type: none">Fine-tuned Mask RCNN on a custom dataset containing augmented real and simulated RGB images for grocery objects; achieving 92% accuracy for object instance segmentation during graspingContributed to the development of perception modules for ABB robots for object grasping<ul style="list-style-type: none">Improved system performance of tote detection, object segmentation, and bin content extraction, including optimization for imaging acquisition and perception to meet high computation requirements of real-time perception tasks with ENSENSO N35 3D cameraImproved system performance of grasped object pose estimation with RealSense D435 depth cameraPerformed calibration, parameter tuning, and camera driver modification on both RGBD camerasIndependently integrated existing perception system with modifications to fit the requirements for a customer picking project | |
| Robotics Software Engineer, Otsaw Digital Inc, California, United States | 07/2018-05/2019 |
| <ul style="list-style-type: none">Improved, tested and successfully delivered a mobile base navigation system on an Ackermann drive robot equipped with Velodyne Lidar for a customer in SingaporeCreated a recovery method to handle a navigational failure based on obstacle detectionDesigned a global path planner based on A* algorithmControlled the robot to follow a planned path using Pure Pursuit Control method | |
| Robotics Software Engineer Intern, Honda Research Institute USA, California, United States | 02/2018-07/2018 |
| <ul style="list-style-type: none">Simulated and implemented a system for decluttering a table on a Fetch robot with a Kinect RGB-D cameraDetected centroid position of a cup based on point cloud data using Point Cloud Library (PCL)Designed arm movements using MoveIt! with consideration for obstacle avoidance and orientation constraintsFine-tuned "you only look once" (YOLO) network with custom data to detect plates and cups | |
| Robotics Software Engineer Intern, Zoetic AI, California, United States | 09/2017-11/2017 |
| <ul style="list-style-type: none">Developed a system for blob motion detection and tracking by using Lucas-Kanade optical flow in OpenCVCreated a machine learning pipeline for classifying user's facial expression based on face features | |

PROJECTS

- Robot Drawing Control Based on Detected Facial Emotion, Northwestern University** 01/2017-04/2017
- Extracted facial features using OpenCV Haar Cascade and dense SIFT algorithm
 - Developed machine learning pipeline capable of multi classification of users' real-time emotions (happy, sad, surprise, and disgust) using webcam
 - Developed ROS software to control a Baxter Research Robot to draw images corresponding to results of emotion classification
- Autonomous Path-Following Car Controlled by Android Phone, Northwestern University** 04/2017-06/2017
- Designed and built a differential drive robot car using 3D printer and laser cutter
 - Developed an image processing Android app for detecting the road with a phone camera
 - Controlled motor with PIC microcontroller using custom PCB board and communication with Android over USB CDC protocol
- Machine Learning Projects, Northwestern University** 09/2016-07/2017
- Classified playing cards in real time using OpenCV and Convolutional Neural Net in TensorFlow
 - Developed a musical instrument classifier using Mel-Frequency Cepstral Coefficients and SVM algorithm
- Computer Vision Side-Projects** 05/2019-present
- Detected objects from video data using a well-trained Single Shot MultiBox Detector (SSD) model
 - Implemented Generative Adversarial Networks (GANs) in Pytorch

RESEARCH EXPERIENCE

- Research Assistant, Tsinghua University, Beijing, China** 10/2015-06/2016
- Contributed to research in Natural Language Processing (NLP): extracted emotions of online users based on micro-blog articles
- Developed software for emotion classification (happiness, sadness, surprise, disgust, anger, or fear) for online articles based on features of words and sentence structures using SVMPerf, improving accuracy by 15% over the previous solution that ignores sentence structure
- Research Assistant, Renmin University of China, Beijing, China** 11/2014-09/2015
- Contributed to research in Music Information Retrieval (MIR): music emotion classification (happiness, sadness, or neutral) during Èrhú performances (Èrhú: a traditional Chinese string instrument)
- Proposed and worked on a new research direction: combined performer actions (such as bow speed and bow travel) with audio data to create classification features, improving accuracy by 9.4% over the previous solution that ignores hand movements

SKILLS

- Proficient: C/C++, Python, Linux, GitHub, ROS, OpenCV, PCL, CUDA, CMake, Gazebo, Rviz, Autoware, MoveIt!
- Experienced: Tensorflow, Pytorch, Docker, Anaconda, Jupyter Notebook, Mathematica, MATLAB
- Knowledgeable: Computer Vision/Perception, Machine Learning, Deep Learning, Manipulation

EXTRACURRICULAR ACTIVITIES

- Participated as an Èrhú performer in GBCCA Chinese Music Ensembles, Boston, MA, United States 05/2019-present
- Performed at Boston Symphony Orchestra
- Participated as an Èrhú performer in Stanford Chinese Music Chamber Orchestra, CA, United States 09/2018-05/2019
- Volunteered in Community Animal Rescue Effort, Chicago, United States 07/2017-01/2018
- Participated as an Èrhú performer in CAU Chinese Music Chamber Orchestra, Beijing, China 07/2012-09/2015
- Received The Silver Award in the Chinese National Music Alliance's International Chinese Music Chamber Orchestra Competition 08/2013
 - Received 1st place in the Beijing University Students Performance for Chinese Music Chamber Orchestra Competition 11/2014
- Volunteered tutoring students, Beijing, China 09/2012-09/2014
- Received 2nd place in photography competition, CAU, China 10/2013