

# ESTHER(YIJUN) GU

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## RESEARCH INTERESTS

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Human Robot Interaction, Assistive Robotics, Machine Learning, Robot Perception, Physics Simulation

## EDUCATION

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**Georgia Institute of Technology**, Atlanta, GA, USA

Aug. 2019 – present

*Master of Science in Computer Science*

GPA: 4.0/4.0

**University of Michigan**, Ann Arbor, MI, USA

Sep. 2015 – Apr. 2019

*Bachelor of Science in Computer Science Engineering*

*Bachelor of Science in Data Science Engineering*

*Minor in Mathematics*

GPA: 3.7/4.0

**UM-SJTU Joint Institute**, Shanghai, China

May – Aug. 2016

International Program in Engineering

## PUBLICATIONS

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Zackory Erickson\*, **Yijun Gu\***, and Charles C Kemp. *Assistive VR Gym: Using Interactions with Real People to Improve Virtual Assistive Robots*. in IEEE International Conference on Robot & Human Interactive Communication(RO-MAN), Aug 2020. (\* Equal contribution.)

## HONOR & AWARD

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University Honors in University of Michigan

2015-2016

Engineering Dean's Honor List

2017-2018

## RESEARCH EXPERIENCE

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**Assistive VR Gym: Interactions with Real People to Improve Virtual Assistive Robots**

*Healthcare Robotics Lab*, Georgia Institute of Technology

Aug 2019 – present

Principal Investigator: Prof. Charlie Kemp

Goal: Present a framework that uses virtual reality to evaluate and improve simulation trained assistive robots with real people.

- Connected assistive environments in real-time physics simulation into virtual reality with vrBullet.
- Developed improved reinforcement learning policies based on better human biomechanics models from virtual reality.
- Designed and conducted a user study to evaluate and analyze the performance of policies trained in simulation in terms of objective and subjective measures.

**Archemedes**

*CROMA Lab*, University of Michigan

July 2018 – Apr 2019

Principal Investigator: Prof. Walter Lasecki

Goal: Create a mix-initiative system to help robot recognize novel objects.

- Set up a platform that leverages real-time crowd workers to annotate subcomponents of objects and generate point cloud objects with new configurations.
- Evaluated performance of the model trained on a dataset of newly generated point clouds using Point Net.

## Point Pair Features

Laboratory for Progress, University of Michigan  
Principal Investigator: Prof. Chad Jenkins

Sep 2017 – Apr 2018

Goal: Explore Point Pair Features (PPF) that detects 3D objects in point clouds with point pairs.

- Implemented a PPF pipeline and developed a new feature mapping method for the pipeline.
- Refined the poses generated by PPF using Iterative Closest Point (ICP) and Fast Point Feature Histograms (FPFH).
- Compared and analyzed the performance with original PPF on a collection of point cloud scenes with a given bounding box.

## PROJECT EXPERIENCE

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### Active Hierarchical Imitation and Reinforcement Learning in Continuous Tasks

Georgia Institute of Technology

Aug 2019 – Dec 2019

Principal Investigator: Prof. Matthew Gombolay

Goal: Purpose a Hierarchical Imitation and Reinforcement Learning framework that enables agents to learn multiple levels of policies in parallel in continuous space.

- Extended Hierarchical Actor-Critic (HAC) framework by using Data Aggregation method to train a high-level controller and a revised Deep Deterministic Policy Gradient method to train a low-level controller.
- Enhanced framework's performance by learning an initialization of agent's starting location with a noise-based Active Learning method.

### Autonomous Robot for Garbage Grasp and Classification

University of Michigan

Jan 2019 - Apr 2019

Principal Investigator: Prof. Chad Jenkins

Goal: Introduce a robot system comprised of robot arm which is capable of picking garbage in a static environment and depositing it based on the respective categories.

- Created a point map for navigation using existed GMapping Simultaneously Localization and Mapping (SLAM) system.
- Programmed a local search algorithm to detect an object from the scene and trained a Convolutional Neural Network (CNN) to classify the object detected.
- Designed an optimal motion path for grasping and placing the object.

### Parking sign recognition and semantic classification

University of Michigan

Sep 2017 - Dec 2017

Principal Investigator: Prof. Jason Corso

Goal: Develop a system to classify parking signs and learn the semantic information encoded in the signs.

- Implemented K-Means Clustering and Spectral Clustering algorithms to classify a dataset of parking signs.
- Interpreted location information of parking signs by pre-trained AlexNet and enforcement hours and time limit of parking signs by Optical Character Recognition (OCR).

## TEACHING EXPERIENCE

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### Graduate Teaching Assistant

CS6601 Artificial Intelligence

Aug 2020 – present

Georgia Institute of Technology

- Hosted weekly office hours and answered questions online for over 600+ students
- Designed and graded exams, projects and course content.

## Teaching Assistant

EECS280 Programming and Intro Data Structures

Jan 2017 – Dec 2018

University of Michigan

- Led a weekly laboratory and guide 30+ students to work on coding exercises.
- Hosted weekly office hours and answered questions about projects and concepts.
- Designed and graded exams, projects and course content.
- Checked project cheating and sent feedback to Honor Council.

## COURSES

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<b>Robotics</b>	Autonomous Robotics, Human-Robot Interaction, Interactive Robot Learning, Robotic Caregivers
<b>Graphics, ML, AI</b>	Computer Vision, Machine Learning, Artificial Intelligence, Computer Animation
<b>Math, Statistics</b>	Linear Algebra, Differential Equation, Cryptography, Probability and Statistics, Applied Regression

## SKILLS

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<b>Programming Languages</b>	Python, C++, Matlab, Latex, HTML, IOS(Swift)
<b>Libraries and Tools</b>	ROS, Bullet, MUJOCO, PCL, Virtual Reality, OpenNI, BLENDER, OPENCV, PyTorch, Tensorflow, Scikit-learn
<b>Languages</b>	Chinese (Native), English (Proficient), Japanese (Conversational)