Yulun Zhang | Curriculum Vitae

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EDUCATION

Carnegie Mellon University **Pittsburgh, PA, USA**

Ph.D., Robotics GPA: 4.17/4.00 Aug 2022 – Present

- Advisor: Jiaoyang Li

University of Southern California **Los Angeles, CA, USA**

MSc, Computer Science (Progressive Degree Program) GPA: **4.00/4.00** Aug 2020 – May 2022

BSc, Computer Science GPA: **3.90/4.00** Aug 2017 – May 2021

RESEARCH INTERESTS

- Quality-Diversity Optimization, Multi Robot Coordination, Evolutionary Computation, Procedural Content Generation, Human-Robot-Interaction, Human-AI Collaboration.

PUBLICATION

Yulun Zhang, Matthew C. Fontaine, Varun Bhatt, Stefanos Nikolaidis, Jiaoyang Li, "Multi-Robot Coordination and Layout Design for Automated Warehousing," International Joint Conference on Artificial Intelligence (IJCAI), 2023.

Bryon Tjanaka, Matthew C. Fontaine, David H. Lee, **Yulun Zhang**, Nivedit Reddy Balam, Nathaniel Dennler, Sujay S. Garlanka, Nikitas Dimitri Klapsis, Stefanos Nikolaidis, "pyribs: A Bare-Bones Python Library for Quality Diversity Optimization," Genetic and Evolutionary Computation Conference (GECCO) , 2023.

K.R. Zentner, Ujjwal Puri, **Yulun Zhang**, Ryan C. Julian, Gaurav S. Sukhatme. "Efficient Multi-Task Learning via Iterated Single-Task Transfer," IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022.

Yulun Zhang, Matthew C. Fontaine, Amy K. Hoover, Stefanos Nikolaidis, "Deep Surrogate Assisted MAP-Elites for Automated Hearthstone Deckbuilding," Genetic and Evolutionary Computation Conference (GECCO), 2022.

K.R. Zentner*, Ryan C. Julian*, Ujjwal Puri, **Yulun Zhang**, Gaurav S. Sukhatme, "A Simple Approach to Continual Learning by Transferring Skill Parameters," Preprint, 2021.

Matthew Rueben, Mohammad Syed, Emily London, Mark Camarena, Eunsook Shin, **Yulun Zhang**, Timothy S. Wang, Thomas R. Groechel, Rhianna Lee, Maja J Matarić, "Long-Term, in-the-Wild Study of Feedback about Speech Intelligibility for K-12 Students Attending Class via a Telepresence Robot," International Conference on Multimodal Interaction (ICMI), 2021.

Matthew C. Fontaine*, Ya-Chuan Hsu*, **Yulun Zhang***, Bryon Tjakana, Stefanos Nikolaidis, "On the Importance of Environments in Human-Robot Coordination," Robotics: Science and Systems (RSS), 2021.

K.R. Zentner*, Ryan C. Julian*, Ujjwal Puri, **Yulun Zhang**, Gaurav S. Sukhatme, "Towards Exploiting Geometry and Time for Fast Off-Distribution Adaptation in Multi-Task Robot Learning," NeurIPS 2020 Workshop: Challenges of Real World Reinforcement Learning.

Matthew Rueben, Thomas Groechel, **Yulun Zhang**, Gisele Ragusa, and Maja J. Matarić, "Increasing Telepresence Robot Operator Awareness of Speaking Volume Appropriateness: Initial Model Development," Companion of the 2020 ACM/IEEE International Conference on Human-Robot Interaction (Companion HRI '20).

RESEARCH EXPERIENCE

Undergraduate/Graduate (MS) Researcher | USC Robotics Embedded System Laboratory (RESL) **May 2020 – May 2022**

A Simple Approach to Continue Learning by Transferring Skill Parameters | advised by **Prof. Gaurav S. Sukhatme**

- Proposed a continue learning framework that allowed robots to acquire new skills on-the-fly with only past learned policies.
- Demonstrated **a matrix of skill transfer efficiency** for **Meta-World MT10** benchmark.
- Formulated an **optimal curriculum searching** problem for MT10 as a Directed Minimal Spanning Tree problem.

Undergraduate/Graduate (MS) Researcher | USC Interactive and Collaborative Robotic Autonomous System (ICAROS) Jan 2020 – May 2022

On the Importance of Environments in Human-Robot Coordination | advised by **Prof. Stefanos Nikolaidis**

* Equal contribution

- Proposed a framework for procedurally generating environments to evaluate human-robot coordination.
- Trained a **Generative Adversarial Network (GAN)** to generate game levels for Overcooked-AI.
- Implemented **Latent Space Illumination (LSI)** framework to search for diverse levels in the latent space of the GAN.
- Evaluated **team fluency** and **distribution of workload** during the coordination of human and robot agents.
- Demonstrated significant impact of environments on coordination behaviors of human and robot agents.

Deep Surrogate Assisted MAP-Elites for Automated Hearthstone Deckbuilding | advised by **Prof. Stefanos Nikolaidis**

- Proposed **Deep Surrogate Assisted MAP-Elites (DSA-ME)** algorithm as a variant of MAP-Elites.
- Implemented DSA-ME algorithm using **.NET Core** and **C#.**
- Proposed **Bag-of-Cards** encoding for Hearthstone decks.
- Achieved **2.5 times better** Quality-Diversity score than vanilla MAP-Elites.
- Improved sample efficiency of MAP-Elites algorithm on black-box optimization problem.

***Pyribs:* A Bare-Bone Python Library for Quality Diversity Optimization |** advised by **Prof. Stefanos Nikolaidis**

- Implemented and tested **MAP-Elites with Sliding Boundary (MESB)** algorithm.
- Boosted efficiency of numerical computation using **numba**.
- Wrote a tutorial about applying **Latent Space Illumination (LSI)** to the latent space of an MNIST GAN.

Undergraduate Researcher | USC Interaction Lab **May 2019 – Dec 2019**

Socially Aware, Expressive, and Personalized Mobile Remote Presence: Co-Robots as Gateways to Access K-12 In-School Education | advised by **Prof. Maja Matarić**

- Enabled the telepresence robot to be more **socially appropriate** while being operated by homebound operators.
- Proposed a framework to tell telepresence robot operators whether their speaking volume was appropriate.
- Implemented a computational model that can tell the robot operators whether the listeners can hear the operators' voice.
- Implemented and deployed an Android app to gather ambient noise data around robots.
- Set up a **node.js** server to transmit data from Android app to the web overlay that controls the robot.

Undergraduate Researcher | USC Center for System and Software Testing **Oct 2018 – May 2019**

Towards Improving Android App Events Recording and Recording Tool (RERAN) | advised by **Prof. William G.J. Halfond**

- Discovered 2-3 times of **cumulative lagging** when the tool was writing event stream to the CPU.
- Collected data by using **Android NDK adb shell commands** that can get event streams.
- Designed and implemented **three new schedulers** in **C** for RERAN to reduce time latency.
- Successfully reduced the latency by **45%, 91%, and 92%** using the three new schedulers respectively.

TEACHING EXPERIENCE

Course Producer (USC Undergraduate TA) **Aug 2018 – Dec 2020**

CSCI 445: Introduction to Robotics **Fall 2020**
CSCI 170: Discrete Math in Computer Science **Spring 2020, Fall 2018**
CSCI 270: Introduction to Algorithms and Theory of Computing **Spring 2019, Summer 2019, Fall 2019**

- Strengthened students' understanding of discrete math concepts and algorithms by holding office hours.
- Led lab session of Robotics class and taught students to implement Robotics algorithms such as particle filter.
- Graded students' homework and exams and resolved their questions.
- Suggested exam questions to the professors.

WORK EXPERIENCE

Software Engineering Intern | INLT – Los Angeles, CA **Jan 2019 – May 2019**

- Implemented a system for customers to **keep track of international bulk cargo delivery information in real time.**
- Developed and updated web scraper for more than 100 airlines and steamlines websites using **node.js** and **Phantom.js.**
- Designed and built mapping agents for each scraper to sanitize scrapped data using **node.js**, **Lodash.js, and Moment.js**.
- Built and configured new scrapers on the server using **node.js.**

LEADERSHIP/EXTRA-CURRICULAR ACTIVITIES

Harvard College Association of US-China Relation Summit for Young Leaders in China **Aug 2018**

Position: Teaching Assistant

- Led and organized a class of 43 high school students in class competition and activities.
- Assisted seminar leader from Harvard University to teach a seminar class to 40 high school students.

AWARDS

USC Academic Achievement Award Sep 2019

20th/140 finish**,** USC Fall 2018 Programming Contest Oct 2018

China National Runner-up, International Space Settlement Design Competition (China) Oct 2016