

# Zijian Hu | Curriculum Vitae

Ronald Tutor Hall (RTH), 3710 McClintock Ave – Los Angeles, CA 90089

✉ [zijianhu@usc.edu](mailto:zijianhu@usc.edu) • 🌐 [www.zijianhu.com](http://www.zijianhu.com)

## Work and Research Experience

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- **University of Southern California** **Los Angeles, CA, USA**  
*Undergraduate Student Researcher* *Jun 2018–Present*
  - Researched robot expressiveness, telepresence applications, multi-party interaction and attention acquisition in Professor Maja Mataric's Interaction Lab.
  - Working on projects involving the following areas
    - Human Robot Interaction
    - Human Computer Interaction
    - Machine Learning
    - Computer Vision
    - Natural Language Processing
    - Socket programming
    - Web development
- **4Paradigm** **Beijing, China**  
*Intern Full-Stack Engineer* *Jun 2017–Aug 2017*
  - Website development using Node.js, npm, Koa for server-side Angular for client-side.
  - Developed an office automation software which
    - Stores employee information and allows HRs to manage employee information
    - Has authority system that regulates user behavior. It can be managed by system administrator
    - Stores department information which can be managed by system administrator
    - Allows system administrator to modify user authority
    - Allows new user to register their profile without logging in
    - Submitted user profiles are stored and waited to be approved by HR. Upon approval, an account will be created automatically for the user
- **Beijing Duodian Online Science and Technology** **Beijing, China**  
*Intern Software Engineer* *Jun 2016–July 2016*
  - Android application development
  - Developed a tutorial application for Duodian's primary product – Nox App Player, an android emulator for PC
  - Participate and Assist interviewer
- **Jian Jia Translation** **Beijing, China**  
*Assistant Translator* *May 2014–December 2014*
  - Translating game dialogue/conversation, interface and in-game encyclopedia (usually covers content about history, science, literature) of video games from English to Chinese
  - Participated translation of Plague Inc., Wolfenstein: The New Order, Dragon Age: Inquisition and Company of Heroes 2

## Education

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### Academic Qualifications.....

- **University of Southern California** **Los Angeles, CA, USA**  
*Bachelor of Science, Computer Science,*  
*Master of Science ([Progressive Degree Program](#)), Computer Science*  
Expected May 2020 *2016–Present*
- **University of Missouri** **Columbia, MO, USA**  
*Bachelor of Science, Computer Science,*  
*Bachelor of Science, Electrical Engineering* *2014–2016*

### Notable Projects.....

- **Multi-Party Human-Robot Interaction for Group Therapy**

This project will explore maximizing inter-group trust in multi-party human-robot interaction through the context of group therapy. Over the course of the semester the project will consist of designing and implementing an experiment in which a small group of undergraduates (3) interact with a Nao Robot for the purpose of discussing their academic fears and anxiety. The robot will attempt to lower their stress and anxiety through established group therapy techniques mixed with a computational model of inter-member trust.

*Since this project is still in its early stage, details are currently unavailable*

- **Infant-Robot Interaction as an Early Intervention Strategy** ([Project website](#))

Infants engage in motor babbling that allows them to explore their space and learn what movements produce desired outcomes. Less motor babbling from infants can lead to developmental delays. Our goal is to develop a socially assistive, non-contact, infant-robot interaction system to provide contingent positive feedback to increase exploration and expand early movement practice. Towards this end, we are collaborating with physical therapists to create approaches to predict the developmental status of infants using wearable sensors; running user studies that explore various robot rewards for contingent activities for the infant, as well as measuring the infant's ability to mimic the robot; and using reinforcement learning to adjust the difficulty of the task presented by the robot to increase the infant's engagement with the task. *The below detail is subject to change* My role in this project involves the following

- Tracking baby's limbs with a wall-mounted camera
- Tracking the robot with a wearable camera on baby's head.

*So far this functionality is developed with several different methods since the requirement of the project is not finalized*

- Deep learning Method: apply transfer learning to a SSD network pretrained with MS-COCO dataset
- Classical Methods: *used image pyramid and data augmentation for the following methods*
  - SIFT and Selective Search + SVM
  - template matching
  - MIL Tracker/KCF Tracker

- **Socially Aware, Expressive, and Personalized Mobile Remote Presence: Co-Robots as Gateways to Access to K-12 In-School Education** ([Project website](#))

This project is motivated by a particular real-world challenge, enabling mobile remote presence robots to provide continued access to K-12 education.

Telepresence enables children to be remotely present at school and engage in regular classroom and social activities. This project focuses on developing algorithms which enable mobile remote presence platforms to support the educational, cognitive, and social needs of remote students.

We are using an [Ohmni robot](#) equipped with an arm and a small Linux PC, and 3 [Beam telepresence robots](#).

- Taking telepresence robots to various college level classes for user study where participants are mostly students enrolled in that class
- Using 3D cameras (Kinect) with skeleton tracking algorithms to track users' arm motion and assign it to robot
- Providing customized user interface for robot control
- Collecting IMU data with Wii Remote and using machine learning algorithms such as random forest and hidden Markov model to classify users' gesture and assign the corresponding configuration to robot

We plan to further improve the user experience by enabling SLAM and displaying the map on the user interface. Also, users can just click the map and the robot will navigate to that location

#### ○ **CubeSat Simulation**

The research involves 3 robots that use jets of air to move around on an air table. Each robot has installed a microcontroller to control its behavior. The robots navigate through recognizing QR code on distant objects. Each robot can communicate with each other

- Programming on Nvidia Jetson TX1 microcontroller
- Wireless communication between robots via Bluetooth using BlueZ
- Multi-threading programming

## Technical and Personal skills

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#### ○ **Programming Languages:**

- **Competent** in: C/C++, Python, Java, JavaScript
- **Familiar** with: PHP, MATLAB

#### ○ **Software Skills:**

- *Machine Learning Libraries*: TensorFlow, PyTorch (Basic), scikit-learn
- *Scientific Computing and Visualization*: NumPy, Pandas, matplotlib, Simulink
- *Computer Vision and Graphics*: OpenCV, OpenGL
- *Database*: MySQL, PostgreSQL
- *Embedded System*: Arduino, Nvidia Jetson
- *Robotics*: ROS, V-Rep
- *Web Technology*: Node.js + Express/Koa, JavaEE, Angular, ReactJS (Basic), jQuery, Bootstrap
- *Cloud Computing platform*: Azure, AWS
- *Mobile Development*: Android Development
- *Standalone GUI*: JavaFX, Qt, Matlab GUI
- *Command-line*: Bash (Familiar), PowerShell (Basic), Batch (Basic)
- *Version Control*: Git, Apache Subversion
- *Testing Technology*: Google Test, GDB, Valgrind (Basic)
- *Assembly*: MIPS, X86 Assembly/GAS Syntax

#### ○ **Technologies:**

- Machine Learning:
  - took *Machine Learning*, *Theoretical Machine Learning*, and taking *Deep Learning and its Applications* at USC
  - Statistical Learning Framework (PAC and Agnostic PAC learnability, VC dimension)
  - Supervised Learning: Neural Network, SVM, Perceptron etc.
  - Unsupervised Learning: (Deep) Reinforcement Learning, Multi-armed bandit, K-Means etc.
- Computer Vision:
  - took *Advanced Computer Vision* at USC
  - Classical Methods: SIFT, RANSAC, Homography, SFM, Clustering etc.
  - Deep Learning: FCN, (Fast/Faster/Masked) R-CNN, YOLO, SSD, AlexNet
- Natural Language Processing:
  - taking *Applied NLP* at USC: information extraction, sentiment analysis, question answering, machine

- translation etc.
- Computer Graphics: Bézier and B-Spline curves for geometric modeling, interactive 3D graphics programing, Computer animation, kinematics, rendering including ray tracing (wrote a ray tracer W/ openGL), shading, and lighting
- o **Math, Physics and Engineering Knowledge:**  
Algorithms, Discrete Mathematics, Probability Theory, Dynamic Modeling, Differential Equations, Linear Algebra, Calculus, Electricity and Magnetism, Mechanics and Thermodynamics
- o **General Business Skills:** Good presentation skills, Works well in a team.
- o **Other:** Hardworking.

## Leadership and extra-curricular activity

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- o **IEEE-Eta Kappa Nu Honor Society:** *President*
  - Preside and call meetings
  - Review chapter activities of previous years
  - Confer with the faculty adviser and other faculty members to explore plans and ideas.