## Thomas R Groechel


| | | |
|---|---|---|
| Contact Information | 3425 Motor Ave #310<br>Los Angeles, CA 90034 | *Mobile:* 248-921-3254<br>*E-mail:* groechel@usc.edu |


**Research Interests**

Computational Modeling for Human-Machine Interaction, Virtual and Augmented Reality, Socially Assistive Robotics, Computer Science Education

**Technical**

**Languages:** C#, C++, Python, Javascript, R, Bash
**Tools:** Unity, Robot Operating System (ROS), RosSharp (ROS#), Mixed Reality Toolkit (MRTK), Jupyterlab (pandas, seaborn, sklearn)

**Education**

**University of Southern California**, Los Angeles, CA *July 2018 - Present*
– Ph.D. Computer Science: *Expected Dec 2022*
– Masters Computer Science: *Completed Aug 2021*
– Research Advisor: Professor Maja J. Matarić

**University of Michigan**, Ann Arbor, MI *Sep 2014 - May 2018*
– B.S.E. Computer Science: *Completed May 2018*
– Undergraduate Research Advisor: Professor Odest C. Jenkins

**Experience**

**Ph.D. Researcher, USC Interaction Lab,** Los Angeles, CA *July 2018 - Present*
– Created mixed reality robot tutor aiming to teach K-12 students coding through modeling student kinesthetic learning processes
– Developed and deployed telepresence robots in schools for home-bound students
– Supported month-long in-home deployments of robot tutor for students with Autism Spectrum Disorder

**Robotics Software Intern, iRobot,** Pasadena, CA *May 2021 - Aug 2021*
– Worked on autonomous robot vacuum behaviors
– Virtual internship

**UG Researcher, UofM 4Progress Lab**, Ann Arbor, MI *May 2016 - May 2018*
– Developed 2D SLAM algorithm using Iterative Closest Point visualization
– Implemented Stochastic Gradient Descent for loop closure based on *Fast Iterative Alignment of Pose Graphs with Poor Initial Estimates* (Olson et al.) using the Fetch

**Staff Development Czar and TA, UofM**, Ann Arbor, MI *Sep 2016 - May 2018*
– Created Staff Development program for teaching staff of 30 graduate and undergraduate TAs to improve teaching skills of new and returning staff members
– Structured 35-student lab session to review and teach concepts in a specialized alternative to traditional lecture, tailoring for active learning
– Produced class-specific help and tip videos to give students an extra resource to common issues in a newer format

**Robotics Software Intern at TRACLabs**, Houston, TX *Summer 2017*
– Adapted local mapping and navigation to move TRACBot, a mobile-manipulator, to maneuver dynamically through obstacles such as doors and people in order to reach/use items in Affordance Template library

– Refitted and rebuilt action server nodes into custom system to perform dynamic re-planning based on real time observations

## Student Research Mentoring

**Current Students**

| | |
|---|---|
| – Chloe Kuo | Merit Research Fellow, USC Computer Science |
| – Julia Cordero | Merit Research Fellow, USC Computer Science |
| – Haemin Lee | USC Computer Science |
| – Nisha Chatwani | Merit Research Fellow, USC Computer Science |
| – Adam Wathieu | Northwestern University Computer Science |
| – İpek Göktan | Viterbi Fellow, USC SHINE Program, USC Computer Science |
| – Karen Ly | Merit Research Fellow, USC Computer Science |
| – Karen Berba | Cal State LA Computer Science MS |
| – Daniel Ramirez | Cal State LA Computer Science |

**Previous Students**

| | |
|---|---|
| – Radhika Agrawal | Merit Research Fellow, USC Computer Science |
| – Kartik Mahajan | Merit Research Fellow, USC Computer Science |
| – Roddur Dasgupta | USC Computer Science |
| – Annika Modi | USC SHINE Program, High School Student |
| – Jacob Zhi | USC SHINE Program, High School Student |
| – Roxanna Pakkar | Merit Research Fellow, USC Electrical Engineering |
| – Zhonghao Shi | USC Computer Science |
| – Mena Hassan | USC SHINE Program, High School Student |
| – Adnan Karim | SURE Student, University of Calgary Computer Science |
| – Ryan Stevenson | USC Computer Science Games |
| – Ashley Perez | USC SHINE Program, High School Student |
| – Bryan Pyo | USC SHINE Program, High School Student |

## Contributions to Grant Proposals

**NSF NRI 2.0 - Communicate, Share, Adapt: A Mixed Reality Framework for Facilitating Robot Integration and Customization**

– Contributed significant ideas and content to proposal based upon ongoing Ph.D. work in Mixed Reality SAR
– Research grant awarded in Fall 2019

## K-12 Educational Outreach

**Virtual, Augmented, and Mixed Reality for Human-Robot Interaction**
USC Robotics Ed Week via Zoom *10 Apr 2020*

**What is a Socially Assistive Robotics Ph.D.?**
Temple City High School Robotics Team Talk via Zoom *15 Nov 2020*

**Microsoft TEALS Teaching Volunteer**
Los Angeles Center for Enriched Studies, Los Angeles, CA *July 2019 - June 2020*

**Live Mixed Reality Demo and How it Applies to Socially Assistive Robotics**
USC Remote Robotics Open House via Zoom *19 May 2020*

**USC Robotics Academy Judge**
University of Southern California, Los Angeles, CA *Dec 2018 & 2019, Apr 2019*

**Robotics Family Night**
Monterey Hills Elementary, Los Angeles, CA *May 2019, Nov 2019*

**The Help Group STEM$^3$ Academy Visit**
STEM$^3$ Academy, Los Angeles, CA *June 2019*

**Mixed Reality and the Kuri Robot**
USC Robotics Open House *10 Apr 2019*

**VEX Robotics Team Leader**
Clifford Street Elementary, Los Angeles, CA *Oct 2018 - Feb 2019*

## Honors and Awards

**USC Viterbi Undergraduate Research Mentoring Award** *May 2020 & 2021*
**USC CSCI Best Research Assistant** *May 2020*
**USC Robotics George Bekey Service Award** *May 2019*

## Publications

[1] Matthew Rueben, Mohammad Syed, Emily London, Mark Camarena, Eunsook Shin, Yulun Zhang, Timothy S. Wang, **Thomas R. Groechel**, Rhianna Lee, and Maja J. Matarić. "Long-Term, In-the-Wild Study of Feedback About Speech Intelligibility for K-12 Students Attending Class via a Telepresence Robot", Accepted in *23rd International Conference on Multimodal Interaction (ICMI)*, Montreal, Canada, Oct-2021.

[2] **Thomas R. Groechel***, Michael E. Walker*, Christine T. Chang, Eric Rosen, and Jessica Zosa Forde. "TOKCS: Tool for Organizing Key Characteristics of VAM-HRI Systems." arXiv preprint arXiv:2108.03477 (2021).

[3] Zhonghao Shi, Manwei Cao, Sophia Pei, Xiaoyang Qiao, **Thomas R. Groechel** and Maja J. Matarić. "Personalized Affect-Aware Socially Assistive Robot Tutors Aimed at Fostering Social Grit in Children with Autism", In *Refereed Workshop ACM/IEEE International Conference on Human Robot Interaction (HRI) Workshop on Child-Robot Interaction and Child's Fundamental Rights.*, Mar-2021.

[4] **Thomas R. Groechel**, Roxanna Pakkar, Roddur Dasgupta, Chloe Kuo, Haemin Lee, Julia Cordero, Kartik Mahajan, and Maja J. Matarić "Kinesthetic Curiosity: Towards Personalized Embodied Learning with a Robot Tutor Teaching Programming in Mixed Reality", In *17th International Symposium on Experimental Robotics (ISER)*, Virtual, Mar-2021.

[5] Zhonghao Shi, **Thomas R. Groechel**, Shomik Jain, Kourtney Chima, Ognjen Rudovic, and Maja J. Matarić. "Toward Personalized Affect-Aware Socially Assistive Robot Tutors in Long-Term Interventions for Children with Autism." arXiv preprint arXiv:2101.10580 (2021).

[6] Eric Rosen, **Thomas R. Groechel**, Micahel Walker, Christine T. Chang, Jessica Zosa Forde "Virtual, Augmented, and Mixed Reality for Human-Robot Interaction (VAM-HRI)", In *Companion of the 2021 ACM/IEEE International Conference on Human-Robot Interaction (Companion-HRI '21)*, Virtual, Mar-2021.

[7] Kartik Mahajan*, **Thomas R. Groechel***, Roxanna Pakkar, Julia Cordero, Haemin Lee, Maja J. Matarić "Adapting Usability Metrics for a Socially Assistive, Kinesthetic, Mixed Reality Robot Tutoring Environment", In *Proceedings of 2020 International Conference on Social Robotics (ICSR '20)*, Colorado, USA, Nov-2020. *Best Paper Award Finalist (5 nominated out of 113)*

[8] Naomi T. Fitter, Luke M. Rush, Elizabeth Cha, **Thomas R. Groechel**, Maja J. Matarić, and Leila Takayama "Closeness is Key over Long Distances: Effects of Interpersonal Closeness on Telepresence Experience", In *Proceedings of 2020 ACM/IEEE International Conference on Human Robot Interaction (HRI '20)*, Cambridge, UK, Mar-2020.

[9] Tom Williams, Daniel Szafir, Tathagata Chakraborti, Ong Soh Khim, Eric Rosen, Serena Booth, **Thomas R. Groechel**, "Virtual, Augmented, and Mixed Reality for Human-Robot Interaction (VAM-HRI)", In *Companion of the 2020 ACM/IEEE International Conference on Human-Robot Interaction (Companion-HRI '20)*, Cambridge, UK, Mar-2020.

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

[11] **Thomas R. Groechel**, Zhonghao Shi, Roxanna Pakkar, and Maja J. Matarić "Using Socially Expressive Mixed Reality Arms for Enhancing Low-Expressivity Robots", In *2019 IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN '19)*, New Delhi, India, Oct-2019.
*Robotics Society of Japan and Korean Robotics Society Distinguished Interdisciplinary Research Award Finalist (3 nominated out of 206)*

## Talks, Demos, and Presentations

**Communicate, Share, Adapt: A Mixed Reality Framework for Facilitation Robot Integration and Customization Virtual Poster Presentation**
NSF NRI 2.0 PI Meeting via Hopin *10 Mar 2021*

**Guest Lecture: Online Features and Measures for K-12 Robot Computer Science Tutoring Through Mixed Reality Modalities**
CSCI 699: Computational Human-Robot Interaction via Zoom *8 Mar 2021*

**Robot Operating System (ROS) Tutorial and Demo**
USC Makers Club via Zoom *4 Mar 2021*

**Planning A Successful Summer Research Experience**
USC Summer Research Program Talks via Zoom *1 June 2020*

**Communicate, Share, Adapt: A Mixed Reality Framework for Facilitation Robot Integration and Customization Poster Presentation**
NSF NRI 2.0 PI Meeting, Arlington, VA *27 Feb 2020*

**Human-Robot Interaction & Socially Assistive Robots**
Laguna Woods Village, Laguna Woods, CA *19 Feb 2020*

**USC Robotics Visions & Voices: Emotionally Intelligent Robots Demo**
University of Southern California, Los Angeles, CA *24 Oct 2019*

**SAR Through Augmented Reality Extensions Demo and Discussion**
Public Affairs Council, Laguna Beach, CA *8-9 Jan 2019*

## Professional Service

**Workshop Organizer**
- "The Fifth International Workshop on Virtual, Augmented, and Mixed Reality for Human-Robot Interaction (VAM-HRI)", In *2022 ACM/IEEE International Conference on Human Robot Interaction (HRI '22)*
- "The Fourth International Workshop on Virtual, Augmented, and Mixed Reality for Human-Robot Interaction (VAM-HRI)", In *2021 ACM/IEEE International Conference on Human Robot Interaction (HRI '21)*
- "The Third International Workshop on Virtual, Augmented, and Mixed Reality for Human-Robot Interaction (VAM-HRI)", In *2020 ACM/IEEE International Conference on Human Robot Interaction (HRI '20)*

**Reviewer**
- International Conference on Human Robot Interaction 2021 & 2022
- Frontiers in Robotics and AI 2021
- International Conference on Development and Learning 2021
- International Conference on Intelligent Robots and Systems 2021
- Transactions on Human-Robot Interaction 2021
- Virtual, Augmented, and Mixed Reality for Human-Robot Interaction Workshop at HRI 2020 & 2021
- International Conference on Robotics and Automation 2021
- International Conference on Social Robotics 2020

– Applied Sciences 2020
– Science Robotics 2018

**Women in US Academic Research in Robotics Website** *July 2019 - Present*
– Designed and implemented, under Prof. Matarić's supervision, an actively curated and monitored list of current women in US academic robotics research
– Link: us-women-in-robotics-research.github.io

MEDIA COVERAGE **Letting Robots Guide The Learning Experience** *Spring 21*
Daniel Druhora, Viterbi Magazine https://magazine.viterbi.usc.edu/spring-2021/

CERTIFICATION **USC Center for Excellence in Teaching's Future Faculty Teaching Institute**
USC, Los Angeles, CA *Jan 2020 - May 2020*