

Thomas R Groechel

CONTACT INFORMATION	3425 Motor Ave #310 Los Angeles, CA 90034	<i>E-mail:</i> 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 <i>July 2018 - Present</i> – Ph.D. Computer Science: <i>Expected Dec 2022</i> – Masters Computer Science: <i>Completed Aug 2021</i> – Research Advisor: Professor Maja J. Matarić University of Michigan , Ann Arbor, MI <i>Sep 2014 - May 2018</i> – B.S.E. Computer Science: <i>Completed May 2018</i> – Undergraduate Research Advisor: Professor Odest C. Jenkins	
EXPERIENCE	Ph.D. Researcher, USC Interaction Lab , Los Angeles, CA <i>July 2018 - Present</i> – 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 <i>May 2021 - Aug 2021</i> – Worked on autonomous robot vacuum behaviors – Virtual internship UG Researcher, UofM 4Progress Lab , Ann Arbor, MI <i>May 2016 - May 2018</i> – Developed 2D SLAM algorithm using Iterative Closest Point visualization – Implemented Stochastic Gradient Descent for loop closure based on <i>Fast Iterative Alignment of Pose Graphs with Poor Initial Estimates</i> (Olson et al.) using the Fetch Staff Development Czar and TA, UofM , Ann Arbor, MI <i>Sep 2016 - May 2018</i> – 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 TRAC Labs , Houston, TX <i>Summer 2017</i> – 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 Gökten 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

PoseToCode: Embodied Learning for Coding

USC CS Ed Week via Zoom *7 Dec 2021*

Virtual, Augmented, and Mixed Reality for Human-Robot Interaction

USC Robotics Ed Week via Zoom *10 Apr 2021*

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 STEM³ Academy Visit

STEM³ 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

National Science Foundation Travel Fellowship Nov 2021
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
AND ABSTRACTS

- [1] **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.” Accepted in *IEEE Robotics and Automation Magazine* (2022).
- [2] **Thomas R. Groechel** and Maja J. Matarić “Abstract: Improving Bidirectional Communication in Human-Robot Interaction Through Mixed Reality Modalities”, Accepted in Robotics Gordon Research Seminar (Jan 2022)
- [3] Christine T. Chang, Eric Rosen, **Thomas R. Groechel**, Michael Walker, Jessica Zosa Forde “Virtual, Augmented, and Mixed Reality for Human-Robot Interaction (VAM-HRI)”, Accepted in *Companion of the 2022 ACM/IEEE International Conference on Human-Robot Interaction (Companion-HRI '21)*, Virtual, Mar-2022.
- [4] 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”, In *23rd International Conference on Multimodal Interaction (ICMI)*, Montreal, Canada, Oct-2021.
- [5] 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.
- [6] **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.
- [7] 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).
- [8] 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.
- [9] 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 In-*

ternational Conference on Social Robotics (ICSR '20), Colorado, USA, Nov-2020.
Best Paper Award Finalist (5 nominated out of 113)

- [10] 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.
- [11] Tom Williams, Daniel Szafr, 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.
- [12] 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.
- [13] **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