

## Thomas R Groechel

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CONTACT INFORMATION	3425 Motor Ave #310 Los Angeles, CA 90034	<i>E-mail:</i> groechel@usc.edu
RESEARCH INTERESTS	Virtual and Augmented Reality for Human-Robot Interaction (VAM-HRI), Socially Assistive Robotics, Computer Science Education, Computational Modeling for HRI	
TECHNICAL	<b>Languages:</b> C#, C++, Python, Javascript, R, Bash <b>Tools:</b> Unity, Robot Operating System (ROS), RosSharp (ROS#), Mixed Reality Toolkit (MRTK), Jupyterlab (pandas, seaborn, sklearn)	
EDUCATION	<b>University of Southern California</b> , Los Angeles, CA <i>July 2018 - Present</i> – Ph.D. Computer Science: <i>Expected Dec 2022</i> – Master’s Computer Science: <i>Completed Aug 2021</i> – Research Advisor: Professor Maja J. Matarić  <b>University of Michigan</b> , 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	<b>Ph.D. Researcher, USC Interaction Lab</b> , 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  <b>Robotics Software Intern, iRobot</b> , Pasadena, CA <i>May 2021 - Aug 2021</i> – Worked on robot behaviors framework – Virtual internship  <b>UG Researcher, UofM 4Progress Lab</b> , 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  <b>Staff Development Czar and TA, UofM</b> , 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  <b>Robotics Software Intern at TRAC Labs</b> , 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**

- İpek Göktan Viterbi Fellow, USC SHINE Program, USC Computer Science
- Karen Ly Merit Research Fellow, USC Computer Science
- Massimiliano Nigro Politecnico di Milano Computer Science (MS)

**Previous Students**

- Chloe Kuo Merit Research Fellow, USC Computer Science
- Julia Cordero Merit Research Fellow, USC Computer Science
- Nisha Chatwani Merit Research Fellow, USC Computer Science
- Adam Wathieu Northwestern University Computer Science
- Karen Berba Cal State LA Computer Science (MS)
- Daniel Ramirez Cal State LA Computer Science
- Jenny Haemin Lee USC Computer Science
- 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

**Amazon Research Awards - Learning User Preferences for In-Home Robots Through In Situ Augmented Reality**

- Contributed significant ideas and content to proposal based upon ongoing Ph.D. work in learning SAR preferences using Mixed Reality
- Research grant awarded in Spring 2022

**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

**MoveToCode: Pair Programming a Robot in Augmented Reality**

John Mack Elementary *29 Apr 2022*

**From High School to Robotics Research at USC Panel**

USC Robotics Ed Week via Zoom *6 Apr 2022*

**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 STEM<sup>3</sup> Academy Visit**  
 STEM<sup>3</sup> 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 Computer Science Best Research Assistant** May 2022  
**ASEE PSW Section Graduate Student Award** May 2022  
**National Science Foundation Travel Fellowship** Nov 2021  
**USC Viterbi Undergraduate Research Mentoring Award** May 2021  
**USC Viterbi Undergraduate Research Mentoring Award** May 2020  
**USC Computer Science Best Research Assistant** May 2020  
**USC Robotics George Bekey Service Award** May 2019

PUBLICATIONS  
 AND ABSTRACTS  
 \* INDICATES CO-FIRST AUTHOR

- [1] Nisha Chatwani\*, Chloe Kuo\*, **Thomas R. Groechel\*** and Maja J. Matarić. “PoseToCode: Exploring Design Considerations toward a Usable Block-Based Programming and Embodied Learning System”, Accepted in the Fifteenth International Conference on Advances in Computer-Human Interactions (ACHI 2022), Porto, Portugal, Jun-2022.
- [2] Adam Wathieu\*, **Thomas R. Groechel\***, Haemin Jenny Lee, Chloe Kuo, and Maja J. Matarić. “RE:BT-Espresso: Improving Interpretability and Expressivity of Behavior Trees Learned from Robot Demonstrations”, Accepted in 2022 IEEE International Conference on Robotics and Automation (ICRA 2022), Philadelphia, PA, May-2022.
- [3] İpek Göktan\*, Karen Ly\*, **Thomas R. Groechel\***, and Maja J. Matarić “Augmented Reality Appendages for Robots: Design Considerations and Recommendations for Maximizing Social and Functional Perception” In *Refereed ACM/IEEE International Conference on Human Robot Interaction (HRI) Workshop on Virtual, Augmented, and Mixed Reality for Human-Robot Interaction (VAM-HRI 2022)*, Virtual, Mar-2022.
- [4] Julia R. Cordero\*, **Thomas R. Groechel\***, and Maja J. Matarić “What and How Are We Reporting in HRI? A Review and Recommendations for Reporting Recruitment, Compensation, and Gender” In *Refereed ACM/IEEE International Conference on Human Robot Interaction (HRI) Workshop on Fairness and Transparency in HRI: Algorithms, Methods, and Metrics*, Jan 2022
- [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.” Accepted in *Transactions on Human-Robot Interaction* (THRI 2022).
- [6] **Thomas R. Groechel\***, Michael E. Walker\*, Christine T. Chang, Eric Rosen, and Jessica Zosa Forde. “A Tool for Organizing Key Characteristics of Virtual, Augmented, and Mixed Reality for Human-Robot Interaction Systems: Synthesizing VAM-HRI Trends and Takeaways.” Accepted in *IEEE Robotics and Automation Magazine* (2022).

- [7] **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)
- [8] 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.
- [9] 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.
- [10] 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.
- [11] **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.
- [12] 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.
- [13] 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)*
- [14] 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.
- [15] 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.
- [16] 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.

- [17] **Thomas R. Groechel**, Zhonghao Shi, Roxanna Pakkar, and Maja J. Mataric  
 “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

**Overview of Computer Science Capstone Course: Design and Construction of Large Software Systems**  
 USC Viterbi Corporate Advisory Board Meeting 3 May 2022  
**Visualizing Robot Capabilities using Augmented Reality: Designing with Co-Dependent Factors Poster**  
 USC Viterbi Ph.D. Visit Day 3 Mar 2022  
**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 Robot Human Interactive Communication 2022
- Robotics: Science and Systems 2022
- Virtual, Augmented, and Mixed Reality for Human-Robot Interaction Workshop at HRI 2020, 2021, & 2022
- Transactions on Human-Robot Interaction 2021 & 2022
- 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

- 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](https://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*