

# JONATHAN REALMUTO

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Visiting Scientist  
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## RESEARCH INTERESTS

*Augmentation Robotics and Neuromechanics*: Theoretical and engineering foundations for human-robot systems aimed at restoring and enhancing human mobility and perception, including wearable and assistive robots, active prostheses and orthoses, and neuroprostheses.

## EDUCATION HISTORY

- 2017** PhD, Mechanical Engineering, University of Washington  
Dissertation: Towards personalized powered ankle-foot prostheses.  
Co-advisors: Santosh Devasia and Glenn Klute.
- 2010** BS, Mechanical Engineering, University of Nevada, Las Vegas

## EMPLOYMENT HISTORY

- 7/2021 - present** Assistant Professor, Department of Mechanical Engineering, University of California, Riverside.
- 1/2020 - present** Visiting Scientist, Children's Hospital of Orange County.  
Sponsor: Terence Sanger.
- 9/2017 - 7/2021** Postdoctoral Scholar, Sanger Lab, Department of Electrical Engineering and Computer Science, UCI, previously at Department of Biomedical Engineering, USC.  
Supervisor: Terence Sanger, Topic: Upper extremity soft wearable robots.
- 9/2011 - 9/2017** Graduate Research Assistant, Ultra Precisions Control Lab, Department of Mechanical Engineering, UW. Advisor: Santosh Devasia, Topic: Learning for collaborative human-robot systems.
- 9/2011 - 9/2017** Graduate Research Assistant, Center for Limb Loss and Mobility, VA Medical Center, Seattle, WA. Advisor: Glenn Klute, Topic: Powered lower extremity prostheses.

## HONORS AND AWARDS

- 2019** Best Paper Finalist, IEEE Soft Robotics Conference
- 2019** 2<sup>nd</sup> Place, Wearable Robotics Competition, IEEE Soft Robotics Conference
- 2016** Ron Crockett Endowed Fellowship, Dept. of Mechanical Engineering, UW
- 2016** Nomination (w/ co-instructors), Excellence in Teaching Award, College of Engineering, UW
- 2016** Nomination, Student Researcher of the Year, College of Engineering, UW
- 2015** Best Student Seminar, Dept. Mechanical Engineering, UW
- 2013** Graduate Assistance in Areas of Nation Need (GAANN) Fellowship, US Department of Education (\$34k + tuition/year; 2013-2016)

## RESEARCH GRANTS

**2020** COVID-19 Basic, Translational and Clinical Research Fund, Joint Research Fund and Office of Research at the University of California, Irvine. James Smith (PI), Michael Kleinman (co-I), Terence Sanger (co-I), and Jonathan Realmuto (co-I). \$60,000 unrestricted funds. *Identifying alternative filter materials and mask designs for the rapid production of crowdsourced medical masks.*

## SCHOLARLY PUBLICATIONS

### PRE-PRINTS

1. **J. Realmuto**, M.T. Kleinman, T. Sanger, M.J. Lawler, J.N. Smith. A Sew-Free Origami Mask for Improvised Respiratory Protection. MedRxiv, 2020. (**Featured in National Geographic**)

### PEER-REVIEWED JOURNAL ARTICLES

2. **J. Realmuto**, R. Warrior, and S. Devasia. Data-inferred personalized human-robot models for iterative collaborative output tracking. *Journal of Intelligent & Robotic Systems*, 2018.
1. **J. Realmuto**, G. Klute, and S. Devasia. Nonlinear passive cam-based springs for powered ankle prostheses. *Journal of Medical Devices* 9(1), 2015.

### PEER-REVIEWED CONFERENCE PROCEEDINGS

8. **J. Realmuto**, T. Sanger. A robotic forearm orthosis using soft fabric-based helical actuators. *IEEE Soft Robotics Conference (RoboSoft2019)*. Seoul, South Korea, April 14-18, 2019. (**Finalist for best paper**)
7. **J. Realmuto**, G. Klute, and S. Devasia. Preliminary investigation of symmetry learning control for powered ankle-foot prostheses. *2019 Wearable Robotics Association Conference (WearRAcon19)*. Scottsdale, AZ, USA. March 26-28, 2019.
6. A. Sie, **J. Realmuto**, and E. Rombokus. A lower limb prosthesis haptic feedback system for stair descent. *Design of Medical Devices Conference*. Minneapolis, MN, USA. April 10, 11-13, 2017.
5. **J. Realmuto**, R. Warrior, and S. Devasia. Iterative learning control for human-robot collaborative output tracking. *IEEE/ASME Mechatronic and Embedded Systems and Applications Conference*. Auckland, New Zealand. Aug. 29-31, 2016.
4. **J. Realmuto**, G. Klute, and S. Devasia. Nonlinear passive elements using cam-based springs for powered robotic ankles. *ASME Dynamic Systems and Control Conference*. Stanford University, CA, USA. Oct. 21-23, 2013.
3. S. Gutta, **J. Realmuto**, W. Yim, K. Kim. Dynamic model of a cylindrical ionic polymer-metal composite actuator. *IEEE Ubiquitous Robots and Ambient Intelligence Conference*. Incheon, South Korea, Nov. 23-26, 2011.
2. S. Sadineni, **J. Realmuto**, R. Boehm. An integrated performance monitoring and solar tracking system for utility scale PV plants. *ASME Power Conference*. Denver, CO, USA. July 12-14, 2011.
1. **J. Realmuto**, S. Sadineni, S. Madala, R. Boehm. Experimental comparison and economic analysis of PV technologies for utility scale installations. *ASME Energy Sustainability Conference*. Washington, DC, USA. Aug. 7-10, 2011.

### THESIS

1. **J. Realmuto**. Towards Personalized Powered Ankle-Foot Prostheses. PhD dissertation., 2017

### ABSTRACTS, POSTERS, AND OTHER WORKS

7. **J. Realmuto**, and T. Sanger. The USC robotic forearm orthoses. *Wearable Robotics Competition, IEEE Soft Robotics Conference*, 2019. (demo) (**Second Place**)
6. N. Taparia, **J. Realmuto**, S. Lim, M. Canton, J. Borgford-Parnell. Cooperative teaching as an effective training mechanism for future instructors. *PNW-ASEE Section Conference*. April 6-8, 2017. (podium talk given by N Taparia)

5. **J. Realmuto**, R. Warriar, G. Klute, and S. Devasia. Iterative learning control for collaborative human-robot task: towards automatic controller tuning of lower limb prostheses. VA Center of Excellence Young Investigators Symposium, 2016. (podium talk)
4. **J. Realmuto**, A. Lim, S. Braddock. ReVision, a smart white cane with sonar and haptic feedback. Center for Neural Technology Hackathon, UW, 2015. (team presentation and demo; archival website: <https://www.cnthackathon.org/previous-projects>)
3. **J. Realmuto**, G. Klute, and S. Devasia. Preliminary subject testing of a powered ankle prosthesis using a nonlinear spring. Northwest Biomechanics Symposium, 2015. (poster)
2. **J. Realmuto**, G. Klute, and S. Devasia. Nonlinear passive cam-based springs for powered ankle prostheses. VA Center of Excellence Young Investigators Symposium, 2014. (podium talk)
1. **J. Realmuto**, G. Klute, and S. Devasia. Optimizing and comparing elastic actuator configuration for use in powered ankle prosthesis VA Center of Excellence Young Investigators Symposium, 2012. (podium talk)

## PRESS

1. Maya Wei-Hass. [We need better face masks—and origami might help](#). National Geographic, January 20, 2021. This article featured my sew-free origami mask design for improvised respiratory protection.

## INVITED TALKS

- 2/2021 *Improving wearable robotics via soft actuation and neuromorphic control*  
University of Washington. Biomechanics Seminar.  
Hosts: Glenn Klute and Eric Rombokas
- 3/2020 *Empowering ability through wearable robotics.*  
University of California, Riverside. Mechanical Engineering Seminar.  
Host: Guillermo Aguilar
- 2/2020 *Empowering ability through wearable robotics.*  
New Jersey Institute of Technology. Biomedical Engineering Seminar.  
Host: Sergei Adamovich
- 2/2020 *Empowering ability through wearable robotics.*  
Worcester Polytechnic Institute. Biomedical Engineering Seminar.  
Host: Kristen Billiar
- 2/2020 *Empowering ability through wearable robotics.*  
University of Nevada, Reno. Mechanical Engineering Seminar.  
Host: Matteo Aureli
- 4/2019 *A survey on wearable robotics: challenges, success, and future directions.*  
Montana State University. College of Engineering Seminar.  
Host: Mark Jankauski
- 5/2017 *Towards personalized wearable and collaborative robots.*  
Oculus Research (now Facebook Reality Labs), Redmond, WA.  
Host: Nick Colonnese
- 4/2017 *Collaborative learning for human-robot systems.*  
University of Southern California, Sanger Lab.  
Host: Terence Sanger
- 3/2017 *Collaborative learning for human-robot systems.* (w/ Prof. Santosh Devasia)  
New York University, Mechanical Engineering Seminar.

## SOFTWARE

**OpenWearable** is an open source hardware/software project aimed at developing tools for wearable robotics. The hardware is designed on top of the TI Beaglebone Black. <https://github.com/jonreal/openWearable>

**TEACHING**

- Spring/2016** *Introduction to Biomechanics*, Co-instructor  
Departments of Bioengineering and Mechanical Engineering, UW  
Conceptualization, design and implementation of a senior level undergraduate course.  
Taught with Nikita Taparia and Saniel Lim as part of the GAANN Fellowship, which  
included a year long pedagogy workshop as preparation. [http://jonathanrealmuto.com/biome44\\_archive](http://jonathanrealmuto.com/biome44_archive)
- Fall/2012/14/16** *Instrumentation (Sensors and Actuators)*, Teaching Assistant  
Department of Mechanical Engineering, UW  
Instructor: Prof. Martin Berg
- Spring/2015** *Systems Dynamic Analysis and Design*, Teaching Assistant  
Department of Mechanical Engineering, UW  
Instructor: Prof. Joseph Garbini
- Spring/2014** *Feedforward Control (Graduate Course)*, Teaching Assistant  
Department of Mechanical Engineering, UW  
Instructor: Prof. Santosh Devasia

**UNDERGRADUATE STUDENT MENTORING**<sup>1</sup>

- 2017-2019** Miranda Costigan, Mechanical Engineering, Class of 2021, USC  
*A robotic arm using soft fabric-based actuators.* (2019)  
*Experimental design for evaluating wearable robots.* (2018)
- 2017-2019** Sydney Meyer, Biomedical Engineering, Class of 2021, USC  
*Development and design of force sensing gloves for intent interpreting.* (2019)<sup>2</sup>  
*Force sensing glove for interfacing with a wearable robotic arm.* (2018)
- 2018-2019** Jahn Almojera, Mechanical Engineering, Class of 2021, USC  
*Fabrication of an actuated biotensegrity arm using pneumatic artificial muscles.* (2019)
- 2017-2018** Edward Min and Afra Yaghoubian,  
Biomedical Engineering, Class of 2019, USC  
*Instrumented physical human-robot interface for wearable robots.* (2018)
- 2015-2016** Jesse Hernandez, Mechanical Engineering, Class of 2018, UW  
*Low-cost 3-D printed insoles with embedded sensors.* (2016)

**TECHNICAL REVIEWS** [Publons Profile Link](#)

**Journals:** IEEE Transactions on Neural Systems and Rehabilitation Engineering, IEEE/ASME Transactions on Mechatronics, ASME Journal of Mechanical Design, International Journal of Intelligent Robotics and Applications, Journal of Rehabilitation and Assistive Technologies Engineering, Robotica, Robotics and Autonomous Systems, Robotics (MDPI), Royal Society Open Science

**Conferences:** ASME Dynamic Systems and Control Conference, IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications, Wearable Robotics Association Conference, IEEE International Conference on Robotics and Automation

<sup>1</sup>Undergraduate researchers present their work at yearly undergraduate research symposia. Titles denote presentations.

<sup>2</sup>Honorable Mention Award

## PROFESSIONAL ACTIVITIES

**2015 - present** IEEE Member

**2015 - present** ASME Member

**2019** *Session Co-Chair, IEEE Soft Robotics Conference*  
Lead the conference session, including speaker introductions, allocating speaker timing, and soliciting participation from the audience.

**2014 - 2015** *Mechanical Engineering Mentoring Program, UW*  
The main goal of the mentoring program was to provide a formal outlet to connect first year graduate students with more experienced students that are nearing the end of their graduate studies. Mentors were available to answer questions ranging from course selection to thesis writing.

## COMMUNITY OUTREACH

**4/2019** *Robotics Open House, USC*  
Yearly event in which the USC robotics labs host self-paced tours to the community. Most of the visitors are K-12 students coming during the school day on field trips. This year I provided demonstrations of soft-fabric based actuators for use as wearable robots.

**1/2019 - 9/2019** *Community Tutor, Schools on Wheels*  
The Skid Row Learning Center, Downtown Los Angeles  
The mission of School on Wheels is to enhance educational opportunities for children from kindergarten through twelfth grade who are experiencing homelessness. I volunteer one hour per week providing tutoring to homeless middle school and high school children. Topics range from mathematics to English literature.

**2015 - 2017** *Engineering Discovery Days, UW*  
Yearly event in which the UW College of Engineering invites the community to participate in hands-on activities and demonstration given by students and faculty. Our exhibit typically showcases the newest prosthetic devices that we're developing and we discussed how they work with the audience.