Jonathan D. Realmuto
CURRICULUM VITAE

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Visiting Scientist
Children's Hospital of Orange County

Research Interests

Physical Human-Robot Interaction 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

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

2021 - present	Assistant Professor, Department of Mechanical Engineering, University of California, Riverside.
2020 - present	Visiting Scientist, Children's Hospital of Orange County.
2017 - 2021	Postdoctoral Scholar, Sanger Lab, Department of Electrical Engineering and Computer Science, University of California, Irvine, and previously at the Department of Biomedical Engineering, University of Southern California. Supervisor: Terence Sanger, Topic: Upper extremity soft wearable robots.
2011 - 2017	Graduate Research Assistant, Ultra Precisions Control Lab, Department of Mechanical Engineering, UW. Advisor: Santosh Devasia, Topic: Learning for collaborative human-robot systems.
2011 - 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	2nd 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 Funding

Active

2. **NSF-National Robotics Initiative.** (Realmuto, PI) \$1,474,497. 10/2022-9/2026. *Adaptive wearable robots for movement assistance via bio-inspired sensorimotor integration.* Jun Sheng (Co-PI), Terence Sanger (Co-PI).

1. **Investigator-Initiated Clinical Research.** (Realmuto, PI) \$150,000. 7/2022-6/2023, no-cost extension till 6/2024. *Soft Robotic Garments for Assisting Lower-Limb Function in Children with Nemaline Myopathy.* Funding via A Foundation Building Strength.

Completed

1. **UCI COVID-19 Basic.** (Realmuto, Senior Personnel) \$60,000. *Identifying alternative filter materials and mask designs for the rapid production of crowdsourced medical masks.* Funding via Translational and Clinical Research Fund, Joint Research Fund and Office of Research at the University of California, Irvine. James Smith (PI), Michael Kleinman (Co-PI), Terence Sanger (Co-PI).

Scholarly Contributions
(underlined denotes my student or advisee)
Google scholar: https://tinyurl.com/jrealscholar

Peer-Reviewed Journal Articles

6. C. Prasanna, **J. Realmuto**, A. Anderson, E. Rombokas, and G. Klute.
   A data-driven and personalized symmetry controller for robotic ankle-foot prostheses: a preliminary investigation.
   IEEE Trans. Neural Syst. Rehabilitation Eng., 2023.

5. C. Prasanna, **J. Realmuto**, A. Anderson, E. Rombokas, and G. Klute.
   Using Deep Learning Models to Predict Prosthetic Ankle Torque.
   Sensors, 2022.

4. **J. Realmuto**, M.T. Kleinman, T. Sanger, M.J. Lawler, and J.N. Smith
   Design and testing of a sew-free origami mask for improvised respiratory protection.
   Nanotechnology, 2023. **(A preprint version of this article was featured in National Geographic.)**

3. **J. Realmuto** and T. Sanger.
   Assisting forearm function in children with movement disorders via a soft wearable robot with equilibrium-point control.
   Frontiers in Robotics and AI, 2022.

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, 2015.

Peer-Reviewed Conference Proceedings

12. T. Liu, T. Abrar, **J. Realmuto**.
    Modular and reconfigurable body mounted soft robots.
    IEEE Soft Robotics Conference (RoboSoft). San Deigo, CA, USA, April 14-17, 2024

11. N.K. Hafiz, T. Sanger, **J. Realmuto**.
    System identification of human dynamics using periodic impedance models during physical interaction.
    IEEE Haptics Symposium. Long Beach, CA, USA, April 7-10, 2024

10. **J. Realmuto**, J. Vidmark, and T. Sanger.
    Modeling deep brain stimulation evoked responses with phase oscillator networks.
    IEEE EMBS International Conference on Neural Engineering (NER). Baltimore, MD, USA, April 25-27, 2023.

9. N. Dennler, C. Yunis, **J. Realmuto**, T. Sanger, S. Nikolaidis, and M. Mataric.
Personalizing User Engagement Dynamics in a Non-Verbal Communication Game for Cerebral Palsy.
IEEE International Conference on Robot & Human Interactive Communication (RO-MAN). Virtual, August 8-12, 2021.

8. **J. Realmuto** and 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. Warrier, 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. Standford 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, Workshop Presentations and Other Contributions

9. X. Wang, T. Liu, **J. Realmuto**.
Model-based impedance modulation of antagonistic pneumatic artificial muscles.
Late Breaking Results, IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), June 27 - July 1, 2023. (poster)

8. **J. Realmuto**, and T. Sanger.
Equilibrium-point control for soft pneumatic-based wearable robots with joint antagonism.
4th Workshop on Integrating Multidisciplinary Approaches to Advance Physical Human-Robot Interaction, IEEE International Conference on Robotics and Automation Workshop (pHRI-ICRA), May 27, 2022.
Philadelphia, PA, and virtual. (video)

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. Warrier, 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)

Patents

Granted

1. **J. Realmuto**, and T. Sanger.
   A Robotic Forearm Orthosis Using Soft Fabric-Based Helical Actuators.
   US Patent 11,510,841. 2022.

Press

2. Jeff O'Heir Robot Aims to Help Children with Cerebral Palsy. American Society of Mechanical Engineers (ASME), Robotics Collection. November 30 2022. This article was a result of an interview with Jeff on the topic our our NSF award.

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

11/2023   *Advancing wearable robots through soft actuation and neuromorphic control*
         University of California, Irvine. Mechanical Engineering Seminar. Host: Alexandra S. Voloshina

9/2023   *Leveraging biological principles for advancing human-robot physical interaction*
         Southern California Robotics Symposium, University of California, Irvine.

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

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

Teaching

University of California, Riverside

- ME 170B - *Experimental Techniques*
  Winter 2023, 48 students

- ME 133 - *Introduction to Mechatronics*
  Winter 2022, 45 students, Mean course evaluation: 4.81/5.
  Winter 2023, 50 students

- ME 221 - *Kinematics and Dynamics of Robotics* (developed)
  Fall 2021, 17 students, Mean course evaluation: 4.88/5.
  Fall 2022, 6 students, Mean course evaluation: 5/5.

University of Washington

- BIOE/ME 445 - *Introduction to Biomechanics*, Co-instructor
  Spring 2016, Cross listed in the Departments of Bioengineering and Mechanical Engineering. 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.

- ME 473 - *Instrumentation (Sensors and Actuators)*, Teaching Assistant
  Fall 2012, 2014, & 2016, Instructor: Prof. Martin Berg.

- ME 473 - *Systems Dynamic Analysis and Design*, Teaching Assistant
  Spring 2015, Instructor: Prof. Joseph Garbini.

- ME 593 - *Feedforward Control*, Teaching Assistant
  Spring 2014, Instructor: Prof. Santosh Devasia.

Mentoring and Advising

Current Postdoctoral Scholars

Taqi Abrar, PhD Queens Mary University London (2022), 2023-present.
        Lower limb soft wearable robots.

Current PhD Students

Yitong Dai, Computer Science & Engineering, 2022-present. (Co-Advised with Prof. Tamar Shinar.)
        Dynamic simulations for soft actuators with neuromorphic control.

Tuo Liu, Mechanical Engineering, 2022-present.
        Human-robot mechanical interfaces.

K. Nusaiba Hafiz, Mechanical Engineering, 2022-present.
        Physical simulations in VR.

Xinyao Wang, Mechanical Engineering, 2021-present.
        Control for soft wearable robots.

Previous Masters Students

Rebecca Xi, MS in Robotics, 2022-2023. (Robotics capstone project)
        Soft pneumatic wearable robot for knee extension assistance.

Current Undergraduate Students[1]

Anfal Jneidi, Mechanical Engineering, Class of 2023.
    Mentoring Summer Research Internship Program, 2022.
    Instrumented insoles for tracking center of pressure progression. (2022)

David Mikhail, Mechanical Engineering, Class of 2023.
    Mentoring Summer Research Internship Program, 2022.
    Modeling antagonistic pneumatic actuators as quasi-passive tremor suppressors. (2022)

Previous High School Students[1]

Joshua Oh, Troy High School, Fullerton, CA, Class of 2023.
    Troy Tech Program, Summer Intern, 2022.
    An artificial robotic finger using pneumatic soft actuators. (2022)

Previous Undergraduate Students (at University of Southern California)[1]

Miranda Costigan, Mechanical Engineering, Class of 2021
    A robotic arm using soft fabric-based actuators. (2019)
    Experimental design for evaluating wearable robots. (2018)

Sydney Meyer, Biomedical Engineering, Class of 2021, USC
    Development and design of force sensing gloves for intent interpreting. (2019)[2]
    Force sensing glove for interfacing with a wearable robotic arm. (2018)

Jahn Almojera, Mechanical Engineering, Class of 2021, USC
    Fabrication of an actuated biotensegrity arm using pneumatic artificial muscles. (2019)

Edward Min and Afra Yaghoubian,
    Biomedical Engineering, Class of 2019, USC
    Instrumented physical human-robot interface for wearable robots. (2018)

Service

Departmental and University Service

2022 - present	*Highlander Racing Faculty Advisor* - UCR Formula SAE team
2022	*ME Faculty Search Committee* - Robotics, Energy, & Health
2021 - present	*MEGSA Faculty Advisor* - ME graduate student association; duties included helping to organize the yearly graduate student symposium.
2021 - present	*Undergraduate Committee*
2021	*Faculty Panelist* - GradSuccess UCR New Faculty Panel
2021	*ME Faculty Search Committee* - Robotics (served as the affirmative action monitor)
2014 - 2015	*Mechanical Engineering Mentoring Program*, (at UW) A formal mechanism to connect first year graduate students with more experienced students. Mentors were available to answer questions ranging from course selection to thesis writing.

Community Outreach

2019	*Robotics Open House*, (at 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.
2019	*Community Tutor*, Schools on Wheels, The Skid Row Learning Center, Downtown Los Angles. 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*, (at 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.

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[1]Undergraduate and high school researchers present their work at yearly research symposia. Titles denote presentations.
[2]Honorable Mention Award

Professional Activities

2015 - present	IEEE Member
2015 - present	ASME Member
2023 - present	*Associate Editor*, Journal of NeuroEngineering and Rehabilitation
2023	*Associate Editor*, 2023 IEEE/ASME International Conference on Advanced Intelligent Mechatronics
2019	*Session Co-Chair*, 2019 IEEE Soft Robotics Conference

Technical Reviews

Journals: Soft Robotics, IEEE Transactions on Neural Systems and Rehabilitation Engineering, IEEE Robotics and Automation Letters, IEEE/ASME Transactions on Mechatronics, ASME Journal of Mechanical Design, International Journal of Intelligent Robotics and Applications, Journal of Rehabilitation and Assistive Technologies Engineering, Robitica, Robotics and Autonomous Systems, MDPI Robotics, MDPI Actuators, MDPI Sensors, Royal Society Open Science, Robotics and Autonomous Systems

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