Heather Culbertson

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Education

Doctor of Philosophy, Mechanical Engineering & Applied Mechanics — August 2015
University of Pennsylvania
Dissertation: Data-Driven Haptic Modeling and Rendering of Realistic Virtual Textured Surfaces
Advisor: Dr. Katherine J. Kuchenbecker

Master of Science, Mechanical Engineering & Applied Mechanics — May 2013
University of Pennsylvania

Bachelor of Science with Distinction, Mechanical Engineering — May 2010
University of Nevada, Reno
Summa Cum Laude
Minor: Mathematics
Graduation Award: Senior Scholar, the top graduate in the School of Engineering

Positions Held

WiSE Gabilan Assistant Professor — January 2018-present
University of Southern California, Department of Computer Science
Courtesy Appointment, Dept. of Aerospace and Mechanical Engineering from Fall 2018

Postdoctoral Research Fellow — 2015-2017
Stanford University, Department of Mechanical Engineering
Advisor: Allison M. Okamura, Ph.D.

Research and Teaching Assistant — 2010-2015
University of Pennsylvania, Dept. of Mechanical Engineering and Applied Mechanics
Advisor: Katherine K. Kuchenbecker, Ph.D.

Awards and Honors

IEEE Technical Committee on Haptics Early Career Award	2021
NSF CAREER Award	2021
Finalist for Best Paper, IEEE Haptics Symposium	2020
Best Paper, ACM Symposium on User Interface Software and Technology (UIST)	2017
Citation for Meritorious Service as a Reviewer, IEEE Transactions on Haptics	2016
Finalist for Best Poster, IEEE Haptics Symposium	2014
Best Hands-on Demonstration, IEEE World Haptics Conference	2013
Finalist for Best Paper, IEEE World Haptics Conference	2013
President Gutmann Leadership Award, University of Pennsylvania	2013
Finalist for Best Poster, IEEE Haptics Symposium	2012
National Science Foundation Graduate Research Fellowship	2011
Summa Cum Laude, University of Nevada	2010
Senior Scholar, University of Nevada (top engineering senior)	2010
Best Student Speech, Doc Harris Speech Competition, University of Nevada	2009

Publications

Unpublished Papers

[U1] Yang Chen, Kevin Oghalai, and **Heather Culbertson**, "Mitigating cybersickness during locomotion in VR through increased agency with vibrotactile feedback," *to be submitted to IEEE Transactions on Visualization and Computer Graphics (TVCG).*

[U2] Xin Zhu, Tiantian Feng, and **Heather Culbertson**, "The communication of human emotions: an attempt with wearable touch interaction," *submitted to Frontiers in Computer Science.*

[U3] Naghmeh Zamani and **Heather Culbertson**, "Masking effects in combined hardness and stiffness rendering using an encountered-type haptic display," *submitted to IEEE Transactions on Haptics.*

[U4] Shihan Lu, Mianlun Zheng, Matthew C. Fontaine, Stefanos Nikolaidis, and **Heather Culbertson**, "Preference-driven texture modeling through interactive generation and search," *submitted to IEEE Transactions on Haptics.*

[U5] Naghmeh Zamani and **Heather Culbertson**, "Combining haptic augmented reality with encountered-type display to modify perceived hardness," in *submitted to IEEE Haptics Symposium*, 2022.

[U6] Yawen Liu, Shihan Lu, and **Heather Culbertson**, "Texture classification by audio-tactile crossmodal congruence," in *submitted to IEEE Haptics Symposium*, 2022.

[U7] Sunny Singh, Nitu Sharaff, Naghmeh Zamani, and **Heather Culbertson**, "Learning to feel: Predicting applied force from 2-d depth maps of object deformation," in *submitted to Haptics Symposium*, 2022.

[U8] Pardis Miri, Mehul Arora, Aman Malhotra, Robert Flory, Stephanie Hu, Ashley Lowber, Ishan Goyal, Jacqueline Nguyen, John P Hegarty II, Marlo Kohn, David Schneider, **Heather Culbertson**, Daniel L. K. Yamins, Lawrence Fung, Antonio Hardan James Gross, and Keith Marzullo, "FAR: End-to-end vibrotactile distributed system designed to facilitate affect regulation in children diagnosed with autism spectrum disorder through slow breathing," in *submitted to CHI Conference on Human Factors in Computing Systems*, 2022.

[U9] Cara Nunez, Michael Raitor, Philipp J. Stolka, Allison M. Okamura, and **Heather Culbertson**, "Design and evaluation of haptic guidance in ultrasound-based needle-insertion procedures," submitted to *IEEE Transactions on Biomedical Engineering.*

Journal Articles

[J1] Mike Salvato, Sophia Williams, Cara Nunez, Xin Zhu, Frances Lau, Keith Klumb, Ali Israr, Freddy Abnousi, Allison M. Okamura, and **Heather Culbertson**, "Data-driven sparse skin stimulation can convey social touch information to humans," accepted to *IEEE Transactions on Haptics.*

[J2] Shihan Lu, Yang Chen, and **Heather Culbertson**, "Towards multisensory perception: Modeling and rendering sounds of tool-surface interactions," *IEEE Transactions on Haptics (Impact Factor=2.757)*, 2020. doi:10.1109/TOH.2020.2966192

[J3] Pardis Miri, Andero Uusberg, Robert Flory, Agata Kelman, Erik Peper, Richard H. Harvey, **Heather Culbertson**, James Gross, Katherine Isbister, and Keith Marzullo, "PIV: Placement, pattern, and personalization of an inconspicuous vibrotactile breathing pacer," *ACM Transactions on Computer-Human Interaction*, vol. 27, no. 1, pp. 1–44, 2020. doi:10.1145/3365107

[J4] Cara M. Nunez, Sophia R. Williams, Allison M. Okamura, and **Heather Culbertson**, "Understanding continuous linear sensations from a sequential discrete lateral skin-slip haptic device," *IEEE Transactions on Haptics (Impact Factor=2.757)*, vol. 12, no. 4, pp. 414–427, 2019. doi:10.1109/TOH.2019.2941190

[J5] Peter B Shull, Tian Tan, **Heather Culbertson**, Xiangyang Zhu, and Allison Okamura, "Resonant frequency skin stretch for wearable haptics," *IEEE Transactions on Haptics (Impact Factor=2.757)*, vol. 12, no. 3, pp. 247–256, 2019. doi:10.1109/TOH.2019.2917072

[J6] Yuhang Che, **Heather Culbertson**, Chih-Wei Tang, Sudipto Aich, and Allison M Okamura, "Facilitating human-mobile robot communication via haptic feedback and gesture teleoperation," *ACM Transactions on Human-Robot Interaction (THRI)*, vol. 7, no. 3, p. 20, 2018. doi:10.1145/3243503

[J7] **Heather Culbertson**, Samuel B. Schorr, and Allison M. Okamura, "Haptics: The present and future of artificial touch sensations," *Annual Review of Control, Robotics, and Autonomous Systems*, 2018. doi:10.1146/annurev-control-060117-105043

[J8] Julie M. Walker, **Heather Culbertson**, Michael Raitor, and Allison M. Okamura, "Haptic orientation guidance using two parallel double-gimble control moment gyroscopes," *IEEE Transactions on Haptics (Impact Factor=2.000)*, 2017. doi:10.1109/TOH.2017.2713380

[J9] **Heather Culbertson** and Katherine Kuchenbecker, "Ungrounded haptic augmented reality system for displaying roughness and friction," *IEEE/ASME Transactions on Mechatronics (Impact Factor=4.357)*, 2017. doi:10.1109/TMECH.2017.2700467

[J10] **Heather Culbertson** and Katherine J. Kuchenbecker, "Importance of matching physical friction, hardness, and texture in creating realistic haptic virtual surfaces," *IEEE Transactions on Haptics (Impact Factor=2.000)*, vol. 10, no. 1, pp. 63–74, Jan.–March 2017. doi:10.1109/TOH.2016.2598751

[J11] **Heather Culbertson**, Juliette Unwin, and Katherine J. Kuchenbecker, "Modeling and rendering realistic textures from unconstrained tool-surface interactions," *IEEE Transactions on Haptics (Impact Factor=2.000)*, vol. 7, no. 3, pp. 381–393, July–Sept. 2014. doi:10.1109/TOH.2014.2316797

Peer-Reviewed Conference Papers

[C1] Naghmeh Zamani, Ashkan Pourkand, **Heather Culbertson**, and David Grow, "Plate-and-Cable (PAC) haptic device for orthopaedic training," in *International Symposium on Medical Robotics (ISMR)*, 2021.

[C2] Naghmeh Zamani, Pooja Moolchandani, Naomi Fitter, and **Heather Culbertson**, "Effects of motion parameters on acceptability of human-robot patting touch," in *Proc. IEEE Haptics Symposium*, 2020, pp. 664–670. doi:10.1109/HAPTICS45997.2020.ras.HAP20.36.d8bb0c58

[C3] Dustin Goetz, David Owusu-Antwi, and **Heather Culbertson**, "PATCH: Pump Actuated Thermal Compression Haptics," in *Proc. IEEE Haptics Symposium*, 2020, pp. 643–649. doi:10.1109/HAPTICS45997.2020.ras.HAP20.32.c4048ec3

[C4] Cara M. Nunez, Bryce N. Huerta, Allison M. Okamura, and **Heather Culbertson**, "SHIFTS: Social haptic interfaces for tactile stroking," in *Proc. IEEE Haptics Symposium*, 2020, pp. 629–636. doi:10.1109/HAPTICS45997.2020.ras.HAP20.35.f631355d

[C5] Naghmeh Zamani and **Heather Culbertson**, "Effects of dental glove thickness on tactile perception through a tool," in *Proc. IEEE World Haptics Conference*, 2019, pp. 187–192. doi:10.1109/WHC.2019.8816166

[C6] Weicheng Wu and **Heather Culbertson**, "Wearable haptic pneumatic device for creating the illusion of lateral motion on the arm," in *Proc. IEEE World Haptics Conference*, 2019, pp. 193–198. doi:10.1109/WHC.2019.8816170

[C7] Nathaniel Agharese, Tyler Cloyd, Laura H. Blumenschein, Michael Raitor, Elliot W. Hawkes, **Heather Culbertson**, and Allison M. Okamura, "HapWRAP: Soft growing wearable haptic device," in *Proc. IEEE International Conference on Robotics and Automation (Acceptance Rate=40%)*, 2018, pp. 1–6. doi:10.1109/ICRA.2018.8460891

[C8] **Heather Culbertson**, Cara M. Nunez, Ali Israr, Frances Lau, Freddy Abnousi, and Allison M. Okamura, "A social haptic device to create continuous lateral motion using sequential normal indentation," in *Proc. IEEE Haptics Symposium (Acceptance Rate=40%)*, 2018, pp. 32–39. doi:10.1109/HAPTICS.2018.8357149

[C9] Inrak Choi, **Heather Culbertson**, Mark Miller, Alex Olwal, and Sean Follmer, "Grabity: A wearable haptic interface for simulating weight and grasping in virtual reality," in *Proc. ACM Symposium on User Interface Software and Technology (Acceptance Rate=23%)*, 2017, pp. 119–130. doi:10.1145/3126594.3126599

[C10] **Heather Culbertson**, Julie M Walker, Michael Raitor, and Allison M Okamura, "WAVES: A wearable asymmetric vibration excitation system for presenting three-dimensional translation and rotation cues," in *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (Acceptance Rate=25%)*, 2017, pp. 4972–4982. doi:10.1145/3025453.3025741

[C11] Michael Raitor, Julie M Walker, Allison M Okamura, and **Heather Culbertson**, "WRAP: Wearable, restricted-aperture pneumatics for haptic guidance," in *Proc. IEEE International Conference on Robotics and Automation (Acceptance Rate=41%)*, 2017, pp. 427–432. doi:10.1109/ICRA.2017.7989055

[C12] **Heather Culbertson**, Julie M. Walker, Michael Raitor, Allison M. Okamura, and Philipp J. Stolka, "Plane assist: The influence of haptics on ultrasound-based needle guidance," in *Proc. International Conference on Medical Image Computing and Computer Aided Intervention (MICCAI) (Acceptance Rate=30%)*. Springer, October 2016, pp. 370–377. doi:10.1007/978-3-319-46720-7_43

[C13] **Heather Culbertson**, Julie M. Walker, and Allison M. Okamura, "Modeling and design of asymmetric vibrations to induce ungrounded pulling sensation through asymmetric skin displacement," in *Proc. IEEE Haptics Symposium (Acceptance Rate=49%)*, April 2016, pp. 27–33, oral presentation. doi:10.1109/HAPTICS.2016.7463151

[C14] Julie M. Walker, Michael Raitor, Alex Mallery, **Heather Culbertson**, and Allison M. Okamura, "A dual-flywheel ungrounded haptic feedback system provides single-axis moment pulses for clear direction signals," in *Proc. IEEE Haptics Symposium (Acceptance Rate=49%)*, April 2016, pp. 7–13, oral presentation. doi:10.1109/HAPTICS.2016.7463148

[C15] **Heather Culbertson** and Katherine J. Kuchenbecker, "Should haptic texture vibrations respond to user force and speed?" in *Proc. IEEE World Haptics Conference (Acceptance Rate=42.5%)*, June 2015, pp. 106–112, oral presentation. doi:10.1109/TOH.2016.2598751

[C16] **Heather Culbertson**, Juan José López Delgado, and Katherine J. Kuchenbecker, "One hundred data-driven haptic texture models and open-source methods for rendering on 3D objects," in *Proc. IEEE Haptics Symposium (Acceptance Rate=68%)*, February 2014, pp. 319–325, poster presentation. Finalist for Best Poster Award. doi:10.1109/HAPTICS.2014.6775475

[C17] **Heather Culbertson**, Juliette Unwin, Benjamin E. Goodman, and Katherine J. Kuchenbecker, "Generating haptic texture models from unconstrained tool-surface interactions," in *Proc. IEEE World Haptics Conference (Acceptance Rate=59%)*, April 2013, pp. 295–300, oral presentation. Finalist for Best Paper Award. doi:10.1109/WHC.2013.6548424

[C18] **Heather Culbertson**, Joseph M. Romano, Pablo Castillo, Max Mintz, and Katherine J. Kuchenbecker, "Refined methods for creating realistic haptic virtual textures from tool-mediated contact acceleration data," in *Proc. IEEE Haptics Symposium (Acceptance Rate=61%)*, March 2012, pp. 385–391, poster presentation. Finalist for Best Poster Award. doi:10.1109/HAPTIC.2012.6183819

Short Peer-Reviewed Conference Papers and Abstracts

[A1] Naghmeh Zamani, Adim Abass, Manjunath Shetkar, Saumya Dureja, Menghan Li, **Heather Culbertson**, and James Finley, "Integrating haptic feedback into a virtual reality mobility training game for people with parkinson's disease," in *IEEE World Haptics Work-In-Progress*, 2021, pp. 1–2. doi:10.1109/WHC49131.2021.9517136

[A2] Rey Pocius, Naghmeh Zamani, **Heather Culbertson**, and Stefanos Nikolaidis, "Communicating robot goals via haptic feedback in manipulation tasks," in *ACM/IEEE HRI Pioneers Workshop*, 2020, pp. 591–593. doi:10.1145/3371382.3377444

[A3] David K. Owusu-Antwi, Weicheng Wu, and **Heather Culbertson**, "PATCH: Pump-actuated thermal compression haptics," in *IEEE World Haptics Work-In-Progress*, 2019.

[A4] Cara M. Nunez, Sophia R. Williams, Allison M. Okamura, and **Heather Culbertson**, "Continuous linear sensations from a sequential discrete lateral skin-slip haptic device," in *IEEE Haptics Symposium Work-In-Progress*, 2018.

[A5] Pardis Miri, Robert Flory, Andero Uusberg, **Heather Culbertson**, Helen Uusberg, James Gross, Keith Marzullo, and Katherine Isbister, "Emotion regulation in the wild: Introducing WEHAB system architecture," in *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*. ACM, 2018, p. LBW021. doi:10.1145/3170427.3188495

[A6] Karlin Bark, Ernest D. Gomez, Will McMahan, Charlotte Rivera, Austin Remington, **Heather Culbertson**, Kenric Murayama, David I. Lee, Kristoffel Dumon, Noel Williams, and Katherine J. Kuchenbecker, "Surgical instrument vibrations are a construct-valid measure of robotic technical skill for in vitro training tasks," June 2012, poster presentation at Symposium on Surgical Robotics.

Open-Source Project

[OS1] **Heather Culbertson**, Juan Jose Lopez Delgado, and Katherine J Kuchenbecker, "The Penn Haptic Texture Toolkit for modeling, rendering, and evaluating haptic virtual textures," February 2014. [Online]. Available: http://repository.upenn.edu/meam_papers/299/

Hands-On Demonstrations

[D1] Shihan Lu, Yang Chen, and **Heather Culbertson**, "A real-time sound modeling and rendering system for virtual tool-surface interactions," Hands-on Demonstration presented at *IEEE World Haptics Conference*, July 2021.

[D2] Xin Zhu, Tiantian Feng, and **Heather Culbertson**, "Wearable system for generating mediated social touch through force mapping," Hands-on Demonstration presented at *IEEE World Haptics Conference*, July 2021.

[D3] Eura Shin, Hejia Zhang, Rey J Pocius, Nathaniel Dennler, **Heather Culbertson**, Naghmeh Zamani, and Stefanos Nikolaidis, "Robot-assisted hair-brushing," Hands-on Demonstration presented at *Conference on Neural Information Processing Systems*, December 2019.

[D4] Pardis Miri, Andero Uusberg, Robert Flory, Agata Kelman, Erik Peper, Richard H. Harvey, **Heather Culbertson**, James Gross, Katherine Isbister, and Keith Marzullo, "Demonstrating personalization of PIV: Personalizable inconspicuous vibrotacile breathing paced," Hands-on Demonstration presented at *ACM CHI Conference on Human Factors in Computing Systems*, May 2019.

[D5] **Heather Culbertson**, Cara M. Nunez, and Allison M. Okamura, "Continuous lateral motion created using sequential normal indentation for displaying social haptic cues," Hands-on Demonstration presented at *IEEE Haptics Symposium*, San Francisco, CA, March 2018.

[D6] Michael Raitor, Matthew W. Gilbertson, Allison M. Okamura, and **Heather Culbertson**, "Wearable pneumatic wristband for displaying haptic guidance cues," Hands-on Demonstration presented at *IEEE World Haptics Conference*, Munich Germany, June 2017.

[D7] **Heather Culbertson**, Julie M. Walker, Michael Raitor, and Allison M. Okamura, "Targeting task using ungrounded pulling force induced by asymmetric vibrations," Hands-on Demonstration presented at *IEEE Haptics Symposium*, Philadelphia, Pennsylvania, April 2016.

[D8] Julie M. Walker, Michael Raitor, Alex Mallery, **Heather Culbertson**, Philipp J. Stolka, and Allison M. Okamura, "Moment pulses with a dual-flywheel ungrounded haptic feedback system," Hands-on Demonstration presented at *IEEE Haptics Symposium*, Philadelphia, Pennsylvania, April 2016.

[D9] **Heather Culbertson** and Katherine J. Kuchenbecker, "Haptic textures for online shopping." Interactive demonstrations in *The Retail Collective* exhibit, presented for two days at the *Dx3 Conference* in Toronto, Canada, March 2015.

[D10] **Heather Culbertson**, Juan José López Delgado, and Katherine J. Kuchenbecker, "The Penn Haptic Texture Toolkit," Hands-on Demonstration presented at *IEEE Haptics Symposium*, Houston, Texas, February 2014. doi:10.1109/HAPTICS.2014.6775540

[D11] **Heather Culbertson**, Craig G. McDonald, Benjamin E. Goodman, and Katherine J. Kuchenbecker, "Data-driven modeling and rendering of isotropic textures," Hands-on Demonstration presented at *IEEE World Haptics Conference*, Daejeon, South Korea, April 2013, Best Hands-On Demonstration Award.

[D12] Pablo Castillo, Joseph M. Romano, **Heather Culbertson**, Max Mintz, and Katherine J. Kuchenbecker, "Pen tablet drawing program with haptic textures," Hands-on Demonstration presented at *IEEE Haptics Symposium*, Vancouver, Canada, March 2012.

Patents

1. Shihan Lu, **Heather Culbertson**, Matthew Fontaine, and Mianlun Zheng. *Interactive Texture Generation and Search System Driven by Human Preference.* United States Provisional Patent Application No. 63/184,659, filed May 6, 2021.

2. **Heather Culbertson**, Allison M. Okamura, Cara M. Nunez, and Sophia R. Williams. *Improved Haptic Devices to Create the Sensation of Continuous Lateral Motion.* United States patent pending under application PCT/US2019/022550, filed March 15, 2019.

3. Inrak Choi, Sean Follmer, and **Heather Culbertson**. *Grabity: A Virtual Reality Haptic Controller for Creating Gravity and Stiffness during Grasping Motions Through Asymmetric Vibrations.* United States patent US 10,852,872 B2, awarded December 1, 2020.

Grants and Contracts

1. NSF Grant #2051117
   REU Site: Robotics and Autonomous Systems
   Role: Co-Principal Investigator PI: Stefanos Nikolaidis
   Sponsor: National Science Foundation Funding: $405,000
   Dates: March 15, 2021 - February 29, 2024

2. NSF Grant #2047867 (recommended for funding January 2021)
   CAREER: The Uncanny Valley in Socially Appropriate Haptic Interactions
   Role: Principal Investigator
   Sponsor: National Science Foundation Funding: $549,957
   Dates: March 1, 2021 - February 28, 2026

3. NSF Grant #1929270
   3rd Summer School on Cognitive Robotics: Proposed Summer School
   Role: Principal Investigator
   Sponsor: National Science Foundation Funding: $11,232
   Dates: June 1, 2019 - November 30, 2019

4. Subcontract from Facebook Research Contract
   Innatam - Approaches to Haptic Feedback for Social Touch
   Role: PI of USC Subcontract PI at Stanford: Allison Okamura
   Sponsor: Facebook, Inc. Funding: $98,548
   Dates: January 1, 2018 - August 31, 2018

Invited Presentations

Data-Driven Haptic Modeling. Invited talk, IEEE World Haptics Conference. July 9, 2021.

Haptic Modeling of Surfaces. Invited talk, Cirrus Logic. July 1, 2021.

Minimizing Hardware in Haptic Devices. Invited talk, Materials and Mechanics Challenges in Haptics for Human-Machine Interfaces Symposium, Materials Research Society (MRS) Fall Meeting. December 2, 2020.

Haptics for Commuinication in a Socially Distanced World. Keynote lecture, Tactile Research Group Annual Meeting. November 19, 2020.

Minimizing Haptic Hardware in Wearable Devices. Invited talk, Intro to Haptics for XR tutorial, IROS 2020. October 29, 2020.

Haptics for Communication in a Socially Distanced World. Invited talk, Viterbi Live virtual seminar series, June 24, 2020.

Fooling the Sense of Touch through Data and Illusions. Invited talk, Workshop: Experiencing What's Not There, University of Toronto, June 7, 2019.

Can You Feel It? Haptics for Realism and Virtual Communication. Invited seminar, Department of Electrical and Computer Engineering, UCLA, April 29, 2019.

Devices for Virtual Social Touch. Invited talk, WiSE Horizons Research Symposium, University of Southern California, March 22, 2019.

Virtual Social Communication Through Haptics. Invited demo, Amazon MARS Conference, March 18-19, 2019.

Haptic Perception and Technology. Invited talk in CSCI 697: Seminar in Computer Science Research, Department of Computer Science, USC, February 25, 2019.

Can You Feel It? Haptics for Realism and Virtual Communication. Invited seminar, Department of Aerospace and Mechanical Engineering, USC, November 27, 2018.

Haptics for Virtual Communication. Invited AI seminar, Information Sciences Institute (ISI), USC, July 20, 2018.

Haptics for Directional Guidance and Information Display in Cars. Invited presentation and panel discussion. Peterson Automotive Museum, Los Angeles, California, April 28, 2018.

Haptic Perception and Technology. Invited talk in CSCI 697: Seminar in Computer Science Research, Department of Computer Science, USC, April 9, 2018.

Realistic and Intuitive Haptic Feedback for Communication in Virtual and Real-World Environments. Invited seminar, Worcester Polytechnic Institute, Worcester, Massachusetts, January 20; The Ohio State University, Columbus, Ohio, February 2; University of Southern California, Los Angeles, California, February 7; Carnegie Mellon University, Pittsburgh, Pennsylvania, February 13; University of Minnesota, Minneapolis, Minnesota, February 20; Arizona State University Polytechic Campus, Mesa, Arizona, February 23; University of Michigan, Ann Arbor, Michigan, March 8; École Polytechnique Fédérale de Lausanne (EPFL), March 13; University of California, Los Angeles, April 3, 2017.

Haptics for Virtual and Real-World Applications. University of California at Santa Barbara, Santa Barbara, California. December 2, 1016.

Good Vibrations (and More): Haptics for Virtual Reality and Medicine. Invited presentation, meeting of Technology and Society Committee, Mountain View, California. August 9, 2016.

The Sense of Touch in Design. Invited lecture, California College of the Arts, December 12, 2015.

Data-Driven Modeling of Haptic Interactions for Virtual Reality. Invited seminar, University of Nebraska, Lincoln, February 9; University of Maryland, College Park, March 3, 2015.

Haptic Feedback for Natural User Interfaces. Invited presentation with hands-on demonstrations presented jointly with Katherine J. Kuchenbecker, meeting of NUI Central, New York, New York. July 21, 2014.

Modeling and Rendering of Virtual Haptic Textured Surfaces. Seminar, Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania, Philadelphia, PA. July 15, 2014.

Haptics: Making the Virtual World Feel Real. Invited presentation, TEDxYouth @ Horseheads, New York. April 6, 2014.

Haptic Rendering of Textures. Half-day tutorial presented jointly with Katherine J. Kuchenbecker, IEEE Haptics Symposium, Houston, Texas. February 23, 2014.

Media Highlights

May 2021	HaRVI Lab undergraduate Alex Atcheson's research was featured on Viterbi website in article titled *Computer Science Senior Creates Tech to Help Students with Visual Impairments Learn to Code.*
April 2021	Prof. Culbertson and her research was featured in the Viterbi magazine in a comic titled *Virtual Touch in a Time of Isolation*
June 2020	The HaRVI Lab's Research was featured in the Viterbi Magazine in an article titled *The Future at Your Fingertips.*
February 2020	Prof. Culbertson was featured in a Robohub podcast episode
March 2019	Prof. Culbertson was quoted in an article published on Wired.com discussing the use of haptics for teleoperation (*How I Became a Robot in London–From 5,000 Miles Away*)
February 2019	Article was published on ANA Travel Unlimited website quoting Prof. Culbertson and discussing research being done in HaRVI Lab (*The 5 Biggest Tech Challenges to Building a Commercial Avatar*)
December 2018	Article was published in Knowable Magazine quoting Prof. Culbertson and discussing research being done in HaRVI Lab (*Reaching Out to Touch Virtual Reality*)
September 2018	Article was published on Venture Beat focusing on research conducted in HaRVI Lab (*Haptic Armband Lets You Feel the Sensation of Stroking in VR*).
June 2018	Research from HaRVI Lab was featured in article on Viterbi website titled *USC Computer Science Professor Develops Haptic Armband to Mimic Human Touch.*
May 2018	Prof. Culbertson was quoted in an article in WIRED on additional senses for robots titled *Give the Robots Electronic Tongues.*
May 2016	The New Yorker published a long article by Adam Gopnick featuring Prof. Culbertson and her research: *Feel Me: What the New Science of Touch Says about Ourselves.*

Instruction and Course Development

Introduction to Robotics. This senior-level lecture and lab course presents the fundamental control, sensing, and planning principles underlying most modern robotic systems. The main topics include sensors, hardware, feedback control, odometry, mapping, planning, manipulation, multirobot systems, and haptics. The material is reinforced with weekly hands-on labs with mobile robots. *CSCI 445: 33 students in Fall 2021, 27 students in Fall 2020, 30 students in Spring 2020, 29 students in Spring 2019, 31 students in Spring 2018.*

Haptic Interfaces and Virtual Environments. This graduate-level course provides an introduction to the field of haptics, which involves human interaction with real, remote, and virtual objects through the sense of touch. Topics for the course include human haptic sensing and control, haptic interface design, virtual environment rendering methods, teleoperation control algorithms, and system evaluation. Coursework includes homework/laboratory assignments and a research-oriented project. *CSCI 699: 13 students in Fall 2019.*

Assorted Other Topics (as a teaching assistant) I worked as a teaching assistant for three semesters at the University of Pennsylvania. The courses I helped to teach were Introduction to Mechanics (MEAM 110), Introduction to Mechanics Lab (MEAM 147), and Analytical Methods for Engineers (ENM 251).

Advising

Doctoral Students

Yang Chen, Summer 2020 through present.
Ph.D. Student in Computer Science.

Catherine Yunis, Fall 2019 through present.
Ph.D. Student in Biomedical Engineering.
Co-advised with James Finley.

Xin Zhu, Summer 2019 through present.
Ph.D. Student in Computer Science.
Annenberg Graduate Fellowship.

Sandeep Kollannur, Fall 2019 through present.
Ph.D. Student in Computer Science.
Annenberg Graduate Fellowship.

Shihan Lu, Fall 2018 through present.
Ph.D. Student in Computer Science.

Naghmeh Zamani, Summer 2018 through present.
Ph.D. Student in Computer Science.
Annenberg Graduate Fellowship.

Masters Students

Pranavi Jalapati, Fall 2021 through present.
M.S. Student in Computer Science.

Satya Naraparaju, Fall 2021 through present.
M.S. Student in Computer Science.

Shihong Ling, Spring 2021 through present.
M.S. Student in Computer Science.

Kevin Figueroa, Summer 2020.
M.S. Student in Computer Science.
Now a PhD student at University of Arizona.

Sunny Singh, Fall 2019 through Fall 2020.
M.S. Student in Computer Science.

Reshu Bisht, Fall 2019.
M.S. Student in Computer Science.

Mansi Jaitly, Spring 2019 through Fall 2019.
M.S. Student in Computer Science.

Shehadeh Dajani, Summer 2018.
M.S. Student in Mechanical Engineering.

Weicheng (Jerry) Wu, Summer 2018 through Fall 2019.
M.S. Student in Mechanical Engineering.

Xin Zhu, Began Summer 2018, continue to PhD.
M.S. Student in Computer Science.

Nitu Sharaff, Spring 2018 through Spring 2019.
M.S. Student in Computer Science.

Undergraduate Students

Zixin (Ellen) Ding, Fall 2021-present.
B.S. Student in Computer Science.

Anish Nagareddy, Fall 2021-present.
B.S. Student in Computer Science.

Huong Nguyen, Fall 2021-present.
B.S. Student in Computer Science.
CURVE Research Fellowship, Fall 2021-Spring 2022.

Kevin Oghalai, Summer 2021-present.
B.S. Student in Electrical and Mechanical Engineering.

Victoria Pinkett, Fall 2021-present.
B.S. Student in Mechanical Engineering.
Viterbi Merit Research Award.

Cami Gomez, Summer 2021-present.
B.S. Student in Electrical and Computer Engineering.

Gabriel Benitez, Summer 2021-present.
B.S. Student in Biomedical Engineering.
CURVE Research Fellowship, Fall 2021-Spring 2022.

Grace Owen, Summer 2021.
SURE Student, B.S. Biomedical Engineering at Case Western Reserve University.

Frank Peng, Spring 2021.
B.S. Student in Computer Science.

Christopher Slaughter, Summer 2020.
REU student, B.S. Computer Engineering at University of Maryland-Baltimore County.

Carlos Souffrain, Summer 2020.
REU student, B.S. Computer Engineering at University of Maryland-Baltimore County.

Yawen Liu, Summer 2020-present.
B.S. Student in Electrical Engineering.

Evelyn (Yifan) Zhuang, Spring 2020-present.
B.S. Student in Computer Science.

Brian Gillespie, Spring 2020 to Summer 2021.
B.S. student in Computer Science.

Emiliia Dyrenkova, Summer 2019.
SURE student, B.S. Computer Science at MiraCosta College.

Dustin Goetz, Summer 2019.
SURE student, B.S. Mechanical Engineering at The Ohio State University.
Awarded NSF Graduate Research Fellowship.

M'Kya Williams, Summer 2019.
REU student, B.S. Computer Science at Westmont College.

Yang Chen, Spring 2019 through present.
B.S. student in Computer Science.

Grant Garcia, Spring 2019 through present.
B.S. student in Electrical Engineering.

Samuel (Alex) Atcheson, Spring 2019 through Summer 2021.
B.S. student in Computer Engineering and Computer Science.
Bridge Undergraduate Science (BUGS) Research Fellowship, Summer 2019.
Provost's Research Fellowship, Fall 2019.

Kivilcim Cumbul, Spring 2019 through present.
B.S. student in Computer Engineering and Computer Science.
WISE Undergraduate Research Fellowship, 2019.
Provost's Research Fellowship, Fall 2019.

Nina Cragg, Spring 2019.
B.S. student in Arts, Technology and the Business of Innovation.

Lawrence Park, Spring 2019.
B.S. student in Mechanical Engineering.

Josh Joseph, Fall 2018.
B.S. student in Computer Science.

David Owusu-Antwi, Summer 2018.
SURE student, B.S. Physics at MIT.
NSF GRFP Honorable Mention.
Now a MS student at UIUC.

Pooja Moolchandani, Spring 2018 through Sprint 2019.
B.S. student in Computer Science.
Now a Ph.D. student in Robotics at Georgia Tech.

High School Students

Saamarth Sethi, Summer 2021.
Rising Sophomore, Whitney High School.

Smriti Wadha, Summer 2021.
Rising Senior, Arcadia High School.

Jesse Chen, Summer 2020.
Rising Junior, Mission San Jose High School.

Rachel Lobl, Summer 2019.
Rising Senior, San Marin High School.

Thesis and Exam Committees

BME Ph.D. thesis committee for Dario Urbina Melendez (student of Francisco Valero-Cuevas)
ME Ph.D. thesis committee for Negin Heravi (Stanford University, student of Allison Okamura and Jeannette Bohg)

CSCI Ph.D. thesis committee for Elizabeth Boronson (student of Nora Ayanian)
CSCI Ph.D. thesis committee for Brian Cohn (student of Francisco Valero-Cuevas)
AME Ph.D. thesis committee for Zaoyuan (Joey) Ge (student of Nestor Perez-Arancibia)
CSCI Ph.D. thesis committee for Artem Molchanov (student of Gaurav Sukhatme)
CSCI Ph.D. thesis committee for Danyong Zhao (student of Jernej Barbic)
CSE Ph.D. thesis committee for Ahmad Babaeian Jelodar (University of South Florida, student of Yu Sun)
AME Ph.D thesis committee for Shantanu Thakar (student of S.K. Gupta)
CSCI Ph.D. thesis committee for Yevgen Chebotar (student of Gaurav Sukhatme)
CSCI Ph.D. thesis committee for Zhe (Harry) Su (student of Stefan Schaal)
CSCI Ph.D. thesis committee for Giovanni Sutanto (student of Gaurav Sukhatme)

CSCI Ph.D. qualifying exam committee for Nathan Dennler (student of Maja Mataric)
BME Ph.D. qualifying exam committee for Dario Urbina Melendez (student of Francisco Valero-Cuevas)
CSCI Ph.D. qualifying exam committee for Powen Yao (student of Mike Zyda)
CSCI Ph.D. qualifying exam committee for Mianlun Zheng (student of Jernej Barbic)
CSCI Ph.D. qualifying exam committee for K.R. Zentner (student of Gaurav Sukhatme)
CSCI Ph.D. qualifying exam committee for David Millard (student of Gaurav Sukhatme)
CSCI Ph.D. qualifying exam committee for Jingyao Ren (student of Nora Ayanian)
CSCI Ph.D. qualifying exam committee for Chris Denniston (student of Gaurav Sukhatme)
AME Ph.D. qualifying exam committee for Mark Hermes (student of Mitul Luhar)
AME Ph.D. qualifying exam committee for Jason Gregory (student of S.K. Gupta)
AME PhD. qualifying exam committee for Ke Xu (student of Nestor Perez-Arancibia)
AME Ph.D qualifying exam committee for Shantanu Thakar (student of S.K. Gupta)
CSCI Ph.D. qualifying exam committee for James Preiss (student of Gaurav Sukhatme)
CSCI Ph.D. qualifying exam committee for Giovanni Sutanto (student of Gaurav Sukhatme)
AME Ph.D. qualifying exam committee for Zaoyuan (Joey) Ge (student of Nestor Perez-Arancibia)
CSCI Ph.D. qualifying exam committee for Brian Cohn (student of Francisco Valero-Cuevas)
CSCI Ph.D. qualifying exam committee for Ryan Julian (student of Gaurav Sukhatme)
CSCI Ph.D. qualifying exam committee for Elizabeth Boroson (student of Nora Ayanian)
CSCI Ph.D. qualifying exam committee for Bohan Wang (student of Jernej Barbic)
CSCI Ph.D. qualifying exam committee for Sarah Al-Hussaini (student of S.K. Gupta)
CSCI Ph.D. qualifying exam committee for Artem Molchanov (student of Gaurav Sukhatme)
CSCI Ph.D. qualifying exam committee for Zhe (Harry) Su (student of Stefan Schaal)
CSCI Ph.D. qualifying exam committee for Yevgen Chebotar (student of Stefan Schaal)
CSCI Ph.D. qualifying exam committee for Liz Cha (student of Maja Mataric)

Professional Service

Conference and Workshop Organization:

2020-present Publications Chair, IEEE Haptics Symposium, Santa Barbara, CA, 2022.

2019-present Student Innovation Challenge Chair, IEEE World Haptics Conference, Montreal, Canada, 2021.

2018-present Work-in-Progress Chair, IEEE Haptics Symposium, Washington DC, 2020.

2018-present Co-Organizer, Summer School on Cognitive Robotics, held at USC July 2019.

2019 Work-in-Progress Program Committee, World Haptics Conference, Tokyo, Japan, 2019.

2017-2018 Local Arrangements Chair, IEEE Haptics Symposium, San Francisco, California, March 2018.

2018 Program Committee, EuroHaptics Conference, Pisa, Italy, June 2018.

2018 Co-Organizer, Gendered Innovations Workshop on Gender in Robotics Research, Stanford, CA, January 2018.

2016 Video Chair, IEEE Haptics Symposium, Philadelphia, Pennsylvania, April 2016.

Leadership Roles:

2018-present Vice Chair for Information Dissemination, IEEE Technical Committee on Haptics.

Reviews:

Associate Editor:

ACM Transactions on Human-Robot Interaction.
CHI Conference on Human Factors in Computing Systems (Subcommittee: Building Devices–Hardware, Materials, and Fabrication)

Journal paper reviews: IEEE Transactions on Haptics, IEEE Transactions on Applied Perception, IEEE Robotics and Automation Letters (RA-L), Proceedings of the IEEE, PLoS ONE, International Journal of Human-Computer Interaction, International Journal of Advanced Robotic Systems, The Visual Computer (TVCJ), Frontiers in Psychology, Frontiers in Pain Research.

Conference paper reviews: IEEE Haptics Symposium, IEEE World Haptics Conference (WHC), EuroHaptics, IEEE International Conference on Robotics and Automation (ICRA), IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR), ACM/IEEE International Conference on Human-Robot Interaction (HRI), ACM Conference on Human Factors in Computing Systems (CHI), ACM User Interface Software and Technology Symposium (UIST), ACM Symposium on Virtual Reality Software and Technology (VRST), ACM International Conference on Tangible, Embedded, and Embodied Interaction (TEI), International Conference on Humanoid Robots (Humanoids), IEEE/AT-EQUAL Conference on Human Machine System Cyborgs and Enhancing Devices (HUMASCEND).

University Service

Engineering Faculty Council (EFC) (2020-present).
Viterbi Research Restart Committee (Summer 2020-present).
Computer Science Department robotics hiring committee chair (2019-2020).
Robotics PhD Committee (2018-present).
Viterbi Research Committee (VRC) (2019-present).
Computer Science Distinguished Lectures and Colloquium Series Co-Chair (2019-present).
Aerospace and Mechanical Engineering Department robotics faculty hiring committee (2019).
Graduate Admissions and Fellowship Committee (2018-2020).

Scientific and Professional Societies

Institute for Electrical and Electronic Engineers (IEEE), Robotics and Automation Society, IEEE Women in Engineering

Association of Computing Machinery (ACM)

Society of Women Engineers (SWE)

Association for Women in Science (AWIS)

Educational and Outreach Activities

Applying to Graduate School. Presentation to summer undergraduate researchers, University of Southern California. June 18, 2021.

USC Makers. Design review for undergraduate makers club, University of Southern California. March 19, 2021.

Haptics for Realism and Virtual Communication. Research presentation to ACM student chapter, University of Southern California. October 27, 2020.

Handling Academic Criticism. Presentation and panel to Women in Computing Club (WinCC), University of Southern California. October 9, 2020.

Alliance of Women in Media Arts and Sciences (AWMAS). Research presentation at workshop for female graduate students, UC Santa Barbara. February 7, 2020.

Hidden No More. Lab tour to visiting international women scientists, organized by U.S. Department of State. November 12, 2019.

Explore USC. Lunch with parents of prospective undergrads, Unversity of Southern California. April 18, 2019.

Explore USC. Research presentations to prospective undergrads, University of Southern California. April 16 and 23, 2019.

USC Robotics Open House. Hands-on research demonstrations to local K-12 students, University of Southern California. April 10, 2019.

Engineering Diversity. Lunch and panel with underrepresented minority students, University of Southern California, March 28, 2019.

Viterbi Summer Institute Panel. Panel for incoming underrepresented Viterbi Freshman, University of Southern California. July 26, 2018.

Women Who Code Panel. Panel for high school students in Girls Who Code program, University of Southern California. July 12, 2018. https://viterbipk12.usc.edu/2018/07/women-who-code/

USC Robotics Open House. Research presentations to local K-12 students, University of Southern California. April 11, 2018.