

# Katherine J. Kuchenbecker, Ph.D.

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Curriculum vitae last updated on November 25, 2018



## EDUCATION

- 2006 Ph.D. in Mechanical Engineering**, Stanford University, Stanford, California, USA  
Dissertation: Characterizing and Controlling the High-Frequency Dynamics of Haptic Interfaces  
Advisor: Günter Niemeyer, Ph.D.
- 2002 M.S. in Mechanical Engineering**, Stanford University, Stanford, California, USA  
Specialization: Mechatronics and Robotics
- 2000 B.S. in Mechanical Engineering**, Stanford University, Stanford, California, USA  
With Distinction

## POSITIONS HELD

- 2018-present **Managing Director** of the Stuttgart Site and Deputy Overall Managing Director, Max Planck Institute for Intelligent Systems (MPI-IS), Stuttgart, Germany
- 2017-present **Spokesperson**, International Max Planck Research School for Intelligent Systems (IMPRS-IS), a joint Ph.D. program between MPI-IS, Uni. Stuttgart, and Uni. Tübingen, Germany
- 2016-present **Director**, Max Planck Institute for Intelligent Systems, Stuttgart, Germany  
Part time from June 15, 2016, and full time from January 1, 2017
- 2015-2016 Class of 1940 Bicentennial Endowed Term Chair, University of Pennsylvania (Penn)
- 2013-2018 Associate Professor, Department of Mechanical Engineering and Applied Mechanics (MEAM), University of Pennsylvania – on leave starting January 1, 2017  
Secondary Appointment, Dept. of Computer and Information Science, from 2013  
Member, Electrical and Systems Engineering Graduate Group, from 2015  
Member, Bioengineering Graduate Group, from 2010
- 2013-2016 Undergraduate Curriculum Chair, MEAM Department, University of Pennsylvania
- 2007-2013 Skirkanich Assistant Professor of Innovation, MEAM Department, Univ. of Pennsylvania
- 2006-2007 Postdoctoral Research Fellow, Dept. of Mechanical Engineering, Johns Hopkins University  
Advisor: Allison M. Okamura, Ph.D.
- 2000-2006 Research and Teaching Assistant, Dept. of Mechanical Engineering, Stanford University

## RESEARCH INTERESTS

My research leverages scientific knowledge about the sense of touch to create haptic interfaces that enable a user to interact with virtual objects and distant environments as though they were real and within reach. Our key insight in this endeavor has been that tactile cues, such as high-frequency tool vibrations and the making and breaking of contact, convey rich mechanical information that is necessary to make the interaction feel real, but this type of feedback has rarely been included in haptic simulations and teleoperation systems. This research led us to realize that autonomous robots can also benefit from attending to the dynamic tactile cues that occur as they manipulate objects in their environment and interact with humans. My goal is to elevate and formalize our understanding of haptic cues while simultaneously uncovering new opportunities for their use in interactions between humans, computers, and machines.

## SELECTED AWARDS AND HONORS

- 2017 Finalist for Best Poster (with co-author), IEEE World Haptics Conference
- 2015 TCPW Award for Excellence in Undergraduate Advising, University of Pennsylvania
- 2015 Student Section Faculty Advisor Award, ASME Philadelphia Section
- 2014 Best Poster (with co-author), IROS Workshop on Sensorimotor Control in Surgical Robotics
- 2014 Lindback Award for Distinguished Teaching, University of Pennsylvania
- 2014 Finalist for Best Paper (with co-author), IEEE Haptics Symposium
- 2014 Finalist for Best Poster (with co-authors), IEEE Haptics Symposium

- 2013 Best Demonstration Award (by committee vote, with co-authors), SIGGRAPH Asia
- 2013 Best Paper Silver Award (with co-authors), Advances in Computer Entertainment (ACE)
- 2013 Best Cognitive Robotics Paper Award (with co-authors), IEEE ICRA
- 2013 Best Demonstration (by audience vote, with co-authors), IEEE World Haptics Conference
- 2013 Finalist for Best Paper (with co-authors), IEEE World Haptics Conference
- 2012 IEEE Robotics and Automation Society Academic Early Career Award
- 2012 Best Demonstration (three-way tie, with co-authors), IEEE Haptics Symposium
- 2012 Finalist for Best Poster (with co-authors), IEEE Haptics Symposium
- 2011 Citation for Meritorious Service as a Reviewer, IEEE Transactions on Haptics
- 2011 PopTech Science and Public Leadership Fellow
- 2011 Participant, National Academy of Engineering's U.S. Frontiers of Engineering Symposium
- 2011 Best Poster in Session (with co-authors), American Urological Association Annual Meeting
- 2011 Best Associate Editor, IEEE International Conference on Robotics and Automation
- 2011 Outstanding Reviewer, IEEE Transactions on Instrumentation and Measurement
- 2010 Popular Science Brilliant 10
- 2010 Ford Motor Company Award for Faculty Advising, SEAS, University of Pennsylvania
- 2010 Finalist for Best Poster (with co-authors), IEEE Haptics Symposium
- 2009 National Science Foundation CAREER Award
- 2009 Early Career Spotlight Talk (keynote speaker), Robotics: Science and Systems Conference
- 2009 Best Demonstration (with co-author), IEEE World Haptics Conference
- 2008 Citation for Meritorious Service as a Reviewer, IEEE Transactions on Haptics
- 2007 Best Haptic Technology Paper (with co-author), IEEE World Haptics Conference
- 2004-2005 Achievement Rewards for College Scientists (ARCS) Fellowship
- 2004 Best Student Paper (with co-author), Dynamic Systems and Controls Div., ASME IMECE
- 2004 Best Poster (with co-authors), Medicine Meets Virtual Reality Conference
- 2000-2003 National Science Foundation Graduate Research Fellowship
- 2000-2001 Tau Beta Pi Fellowship
- 2000 Mayfield Fellow, entrepreneurship program, Stanford University
- 2000 Henry Ford II Scholar, #1 Graduating Student in Engineering, Stanford University
- 2000 Henry O. Fuchs Memorial Award for Excellence in Mechanical Design, Stanford University
- 2000 Best of Program (with co-authors), Senior Design Competition, Lincoln Foundation
- 1999 ASME Kenneth Andrew Roe Scholarship
- 1999 Phi Beta Kappa Honor Society, elected Junior Year
- 1999 Tau Beta Pi Engineering Honor Society, elected Junior Year
- 1998 Cap and Gown, the Stanford Women's Honor Society, elected Junior Year
- 1996-1999 Scholar Athlete Award, Varsity Volleyball, Stanford University

## SCIENTIFIC AND PROFESSIONAL SOCIETIES

- IEEE Institute for Electrical and Electronic Engineers, Robotics and Automation Society
- ASME American Society of Mechanical Engineers, Dynamic Systems and Controls Division
- SWE Society of Women Engineers

## PUBLICATIONS

★ Invited publications are marked by a star.

Underlining marks co-authors who were funded members of my research group while producing the work.

Dotted underlining marks individuals whom I supervised or co-supervised for the published research, who were primarily members of another professor's research group or were self-funded while producing the work, typically through a collaboration, a visiting student appointment, or a class project.

Wavy underlining marks co-authors who are clinicians.

*Unpublished Papers (In Preparation and Under Review)*

- [U1] Robert Parajon, Katherine J. Kuchenbecker, and Margrit P. Maggio. Dental student opinions of and performance on a vibrotactile simulator for caries detection. In preparation for submission to *Journal of Dental Education* (*Impact Factor* = 0.927).
- [U2] Ernest D. Gomez, Daniel A. Hashimoto, Rajesh Aggarwal, William McMahan, Eza Koch, Ara Darzi, Kenric Murayama, Kristoffel R. Dumon, Noel N. Williams, and Katherine J. Kuchenbecker. Objective assessment of laparoscopic surgical skill using instrument contact vibrations. In preparation for submission to *Journal of the American College of Surgeons* (*Impact Factor* = 4.307).
- [U3] Alex Burka and Katherine J. Kuchenbecker. The Proton visuo-haptic surface interaction dataset. In preparation for submission to *International Journal of Robotics Research* (*Impact Factor* = 5.301).
- [U4] Eric M. Young and Katherine J. Kuchenbecker. A PCM-based device for delivering 6-DOF tactile cues to the fingertip. Under review for publication in *IEEE Transactions on Haptics* (*Impact Factor* = 2.000).
- [U5] Eric Cao, Sergio Machaca, Timothy Bernard, Brett Wolfinger, Zachary Patterson, Amy Chi, Gina L. Adrales, Katherine J. Kuchenbecker, and Jeremy D. Brown. Bimanual wrist-squeezing haptic feedback changes speed-force tradeoff in robotic surgery training. Extended abstract under review for publication at the 2019 *Annual Meeting of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)*.
- [U6] Siyao Hu and Katherine J. Kuchenbecker. Hierarchical encoding for task-parameterized learning from demonstration. Under review for publication in *IEEE Transactions on Robotics* (*Impact Factor* = 4.036).
- [U7] Hyosang Lee\*, Kyungseo Park\*, Jung Kim, and Katherine J. Kuchenbecker. Internal array electrodes improve the spatial resolution of soft tactile sensors based on electrical resistance tomography. Under review for publication at the 2019 *IEEE International Conference on Robotics and Automation (ICRA)*. \*These authors contributed equally to this work.
- [U8] Benjamin A. Richardson and Katherine J. Kuchenbecker. Improving haptic adjective recognition with unsupervised learning. Under review for publication at the 2019 *IEEE International Conference on Robotics and Automation (ICRA)*.

*Journal Articles (Including 2016 Impact Factors)*

- [J1] Naomi T. Fitter and Katherine J. Kuchenbecker. How does it feel to clap hands with a robot? Accepted for publication in *International Journal of Social Robotics* (*Impact Factor* = 2.559).
- [J2] Naomi T. Fitter and Katherine J. Kuchenbecker. Teaching a robot bimanual hand-clapping games via wrist-worn IMUs. *Frontiers in Robotics and AI* (*No Impact Factor Available*), 5:85, 2018.
- [J3] Alexis E. Block and Katherine J. Kuchenbecker. Warmth, softness, and responsiveness improve robot hugs. *International Journal of Social Robotics* (*Impact Factor* = 2.559), pages 1–16, October 2018.
- [J4] Claudio Pacchierotti, Eric M. Young, and Katherine J. Kuchenbecker. Task-driven PCA-based design optimization of wearable cutaneous devices. *IEEE Robotics and Automation Letters* (*No Impact Factor Available*), 3(3):2214–2221, July 2018. Presented by Young at *ICRA 2018*.
- [J5] Yousi A. Oquendo, Elijah W. Riddle, Dennis Hiller, Thane A. Blinman, and Katherine J. Kuchenbecker. Automatically rating trainee skill at a pediatric laparoscopic suturing task. *Surgical Endoscopy* (*Impact Factor* = 3.747), 32(4):1840–1857, April 2018.
- [J6] Elisabetta Ambron, Alexander Miller, Katherine J. Kuchenbecker, Laurel J. Buxbaum, and H. Branch Coslett. Immersive low-cost virtual reality treatment for phantom limb pain: Evidence from two cases. *Frontiers in Neurology* (*Impact Factor* = 3.552), 9(67):1–7, February 2018.
- [J7] Andrés M. Bur, Ernest D. Gomez, Jason G. Newman, Gregory S. Weinstein, Bert W. O'Malley Jr., Christopher H. Rassekh, and Katherine J. Kuchenbecker. Evaluation of high-fidelity simulation as a training tool in transoral robotic surgery. *Laryngoscope* (*Impact Factor* = 2.471), 127(12):2790–2795, December 2017.

- [J8] Jeremy D. Brown, Conor E. O'Brien, Sarah C. Leung, Kristoffel R. Dumon, David I. Lee, and Katherine J. Kuchenbecker. Using contact forces and robot arm accelerations to automatically rate surgeon skill at peg transfer. *IEEE Transactions on Biomedical Engineering (Impact Factor = 3.577)*, 64(9):2263–2275, September 2017.
- [J9] Heather Culbertson and Katherine J. Kuchenbecker. Ungrounded haptic augmented reality system for displaying texture and friction. *IEEE/ASME Transactions on Mechatronics (Impact Factor = 4.357)*, 22(4):1839–1849, August 2017.
- [J10] Netta Gurari, Allison M. Okamura, and Katherine J. Kuchenbecker. Perception of force and stiffness in the presence of low-frequency haptic noise. *PLoS ONE (Impact Factor = 2.806)*, 12(6):e0178605, June 2017.
- [J11] Katherine J. Kuchenbecker, Robert Parajon, and Margrit P. Maggio. Evaluation of a vibrotactile simulator for dental caries detection. *Simulation in Healthcare (Impact Factor = 1.615)*, 12(3):148–156, June 2017.
- [J12] 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)*, 10(1):63–74, January–March 2017.
- [J13] Rebecca P. Khurshid, Naomi T. Fitter, Elizabeth A. Fedalei, and Katherine J. Kuchenbecker. Effects of grip-force, contact, and acceleration feedback on a teleoperated pick-and-place task. *IEEE Transactions on Haptics (Impact Factor = 2.000)*, 10(1):40–53, January–March 2017.
- [J14] Ernest D. Gomez, Rajesh Aggarwal, William McMahan, Karlin Bark, and Katherine J. Kuchenbecker. Objective assessment of robotic surgical skill using instrument contact vibrations. *Surgical Endoscopy (Impact Factor = 3.747)*, 30(4):1419–1431, April 2016.
- [J15] Claudio Pacchierotti, Domenico Prattichizzo, and Katherine J. Kuchenbecker. Cutaneous feedback of fingertip deformation and vibration for palpation in robotic surgery. *IEEE Transactions on Biomedical Engineering (Impact Factor = 3.577)*, 63(2):278–287, February 2016.
- [J16] Claudio Pacchierotti, Domenico Prattichizzo, and Katherine J. Kuchenbecker. Displaying sensed tactile cues with a fingertip haptic device. *IEEE Transactions on Haptics (Impact Factor = 2.000)*, 8(4):384–396, October–December 2015.
- [J17] Jacqueline K. Koehn and Katherine J. Kuchenbecker. Surgeons and non-surgeons prefer haptic feedback of instrument vibrations during robotic surgery. *Surgical Endoscopy (Impact Factor = 3.747)*, 29(10):2970–2983, October 2015.
- [J18] Rebecca P. Khurshid and Katherine J. Kuchenbecker. Data-driven motion mappings improve transparency in teleoperation. *Presence: Teleoperators and Virtual Environments (Impact Factor = 0.750)*, 24(2):132–154, May 2015.
- [J19] Karlin Bark, Emily Hyman, Frank Tan, Elizabeth Cha, Steven A. Jax, Laurel J. Buxbaum, and Katherine J. Kuchenbecker. Effects of vibrotactile feedback on human motor learning of arbitrary arm motions. *IEEE Transactions on Neural Systems and Rehabilitation Engineering (Impact Factor = 3.410)*, 23(1):51–63, January 2015.
- [J20] Vivian Chu\*, Ian McMahon\*, Lorenzo Riano\*, Craig G. McDonald, Qin He, Jorge Martinez Perez-Tejada, Michael Arrigo, Trevor Darrell, and Katherine J. Kuchenbecker. Robotic learning of haptic adjectives through physical interaction. *Robotics and Autonomous Systems (Impact Factor = 1.950)*, 63(3):279–292, January 2015. \*These authors contributed equally to this work. Corrigendum published in June 2016.
- [J21] Yosuke Kurihara, Seiya Takei, Yuriko Nakai, Taku Hachisu, Katherine J. Kuchenbecker, and Hiroyuki Kajimoto. Haptic robotization of human body via data-driven vibrotactile feedback. *Entertainment Computing (No Impact Factor Available)*, 5(4):485–494, December 2014.
- [J22] 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)*, 7(3):381–292, July–September 2014.

- [J23] William McMahan, Ernest D. Gomez, Litng Chen, Karlin Bark, John C. Nappo, Eza I. Koch, David I. Lee, Kristoffel Dumon, Noel Williams, and Katherine J. Kuchenbecker. A practical system for recording instrument interactions during live robotic surgery. *Journal of Robotic Surgery (No Impact Factor Available)*, 7(4):351–358, December 2013.
- [J24] ★ Seungmoon Choi and Katherine J. Kuchenbecker. Vibrotactile display: Perception, technology, and applications. *Proceedings of the IEEE (Impact Factor = 9.237)*, 101(9):2093–2104, September 2013.
- [J25] Joseph M. Romano, Jordan P. Brindza, and Katherine J. Kuchenbecker. ROS open-source audio recognizer: ROAR environmental sound detection tools for robot programming. *Autonomous Robots (Impact Factor = 2.706)*, 34(3):207–215, April 2013.
- [J26] Karlin Bark, William McMahan, Austin Remington, Jamie Gewirtz, Alexei Wedmid, David I. Lee, and Katherine J. Kuchenbecker. In vivo validation of a system for haptic feedback of tool vibrations in robotic surgery. *Surgical Endoscopy (Impact Factor = 3.747)*, 27(2):656–664, February 2013. dynamic article (paper plus video), available at <http://www.springerlink.com/content/417j532708417342/>.
- [J27] Netta Gurari, Katherine J. Kuchenbecker, and Allison M. Okamura. Perception of springs with visual and proprioceptive motion cues: Implications for prosthetics. *IEEE Transactions on Human-Machine Systems (Impact Factor = 2.493)*, 43:102–114, January 2013. Video.
- [J28] Andrew A. Stanley and Katherine J. Kuchenbecker. Evaluation of tactile feedback methods for wrist rotation guidance. *IEEE Transactions on Haptics (Impact Factor = 2.000)*, 5(3):240–251, July–September 2012.
- [J29] Joseph M. Romano and Katherine J. Kuchenbecker. Creating realistic virtual textures from contact acceleration data. *IEEE Transactions on Haptics (Impact Factor = 2.000)*, 5(2):109–119, April–June 2012. Cover article.
- [J30] Joseph M. Romano, Kaijen Hsiao, Günter Niemeyer, Sachin Chitta, and Katherine J. Kuchenbecker. Human-inspired robotic grasp control with tactile sensing. *IEEE Transactions on Robotics (Impact Factor = 4.036)*, 27(6):1067–1079, December 2011.
- [J31] William McMahan, Jamie Gewirtz, Dorsey Standish, Paul Martin, Jacquelyn Kunkel, Magalie Lilavois, Alexei Wedmid, David I. Lee, and Katherine J. Kuchenbecker. Tool contact acceleration feedback for telerobotic surgery. *IEEE Transactions on Haptics (Impact Factor = 2.000)*, 4(3):210–220, July–September 2011.
- [J32] Amy Blank, Allison M. Okamura, and Katherine J. Kuchenbecker. Identifying the role of proprioception in upper-limb prosthesis control: Studies on targeted motion. *ACM Transactions on Applied Perception (Impact Factor = 1.250)*, 7(3):1–23, June 2010.
- [J33] Stephen Kim, Geoffrey Spencer, George Makar, Nuzhat Ahmad, David Jaffe, Gregory Ginsberg, Katherine J. Kuchenbecker, and Michael Kochman. Lack of discriminatory function for endoscopy skills on a computer-based simulator. *Surgical Endoscopy (Impact Factor = 3.747)*, 24(12):3008–3015, December 2010.
- [J34] Katherine J. Kuchenbecker and Günter Niemeyer. Induced master motion in force-reflecting teleoperation. *ASME Journal of Dynamic Systems, Measurement, and Control (Impact Factor = 1.388)*, 128(4):800–810, December 2006.
- [J35] Katherine J. Kuchenbecker, Jonathan P. Fiene, and Günter Niemeyer. Improving contact realism through event-based haptic feedback. *IEEE Transactions on Visualization and Computer Graphics (Impact Factor = 2.840)*, 12(2):219–230, March/April 2006.
- [J36] William R. Provancher, Mark R. Cutkosky, Katherine J. Kuchenbecker, and Günter Niemeyer. Contact location display for haptic perception of curvature and object motion. *International Journal of Robotics Research (Impact Factor = 5.301)*, 24(9):691–702, September 2005.



*Book Chapters/Collections*

- [B1] ★ Katherine J. Kuchenbecker. Haptics and haptic interfaces. Accepted for publication in the *Springer Encyclopedia of Robotics*.
- [B2] ★ Allison M. Okamura, Katherine J. Kuchenbecker, and Mohsen Mahvash. Measurement-based modeling for haptic rendering. In Ming Lin and Miguel Otaduy, editors, *Haptic Rendering: Algorithms and Applications*, chapter 21, pages 443–467. A. K. Peters, May 2008.

*Peer-Reviewed Conference Papers*

- [C1] Naomi T. Fitter and Katherine J. Kuchenbecker. Synchronicity trumps mischief in rhythmic human-robot social-physical interaction. Presented at the *International Symposium on Robotics Research (ISRR)* and awaiting publication, December 2017.
- [C2] Canaan Ng, Kouros Zareinia, Qiao Sun, and Katherine J. Kuchenbecker. Stiffness perception during pinching and dissection with teleoperated haptic forceps. In *IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*, pages 456–463, Lisbon, Portugal, August 2017. Oral presentation given by Ng.
- [C3] Jeremy D. Brown, Joshua N. Fernandez, Sean P. Cohen, and Katherine J. Kuchenbecker. A wrist-squeezing force-feedback system for robotic surgery training. In *Proceedings of the IEEE World Haptics Conference*, pages 107–112, Fürstfeldbruck (Munich), Germany, June 2017. Oral presentation given by Brown.
- [C4] Alex Burka and Katherine J. Kuchenbecker. Handling scan-time parameters in haptic surface classification. In *Proceedings of the IEEE World Haptics Conference*, pages 424–429, Fürstfeldbruck (Munich), Germany, June 2017. Poster presentation give by Burka.
- [C5] Siyao Hu and Katherine J. Kuchenbecker. High magnitude unidirectional haptic force display using a motor/brake pair and a cable. In *Proceedings of the IEEE World Haptics Conference*, pages 394–399, Fürstfeldbruck (Munich), Germany, June 2017. Poster presentation given by Hu.
- [C6] Eric M. Young and Katherine J. Kuchenbecker. Design of a parallel continuum manipulator for 6-DOF fingertip haptic display. In *Proceedings of the IEEE World Haptics Conference*, pages 599–604, Fürstfeldbruck (Munich), Germany, June 2017. Poster presentation given by Young. Finalist for best poster paper.
- [C7] Alex Burka, Abhinav Rajvanshi, Sarah Allen, and Katherine J. Kuchenbecker. Proton 2: Increasing the sensitivity and portability of a visuo-haptic surface interaction recorder. In *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, pages 439–445, Singapore, Singapore, June 2017. Interactive presentation given by Burka.
- [C8] Naomi T. Fitter and Katherine J. Kuchenbecker. Designing and assessing expressive open-source faces for the Baxter robot. In A. Agah, J.-J. Cabibihan, A. Howard, M.A. Salichs, and H. He, editors, *Social Robotics: 8th International Conference, ICSR 2016, Kansas City, MO, USA, November 1-3, 2016 Proceedings*, volume 9979 of *Lecture Notes in Artificial Intelligence*, pages 340–350. Springer International Publishing, November 2016. Oral presentation given by Fitter.
- [C9] Naomi T. Fitter and Katherine J. Kuchenbecker. Qualitative user reactions to a hand-clapping humanoid robot. In A. Agah, J.-J. Cabibihan, A. Howard, M.A. Salichs, and H. He, editors, *Social Robotics: 8th International Conference, ICSR 2016, Kansas City, MO, USA, November 1-3, 2016 Proceedings*, volume 9979 of *Lecture Notes in Artificial Intelligence*, pages 317–327. Springer International Publishing, November 2016. Oral presentation given by Fitter.
- [C10] Naomi T. Fitter, Dylan T. Hawkes, and Katherine J. Kuchenbecker. Rhythmic timing in playful human-robot social motor coordination. In A. Agah, J.-J. Cabibihan, A. Howard, M.A. Salichs, and H. He, editors, *Social Robotics: 8th International Conference, ICSR 2016, Kansas City, MO, USA, November 1-3, 2016 Proceedings*, volume 9979 of *Lecture Notes in Artificial Intelligence*, pages 296–305. Springer International Publishing, November 2016. Oral presentation given by Fitter.

- [C11] Alex Burka, Siyao Hu, Stuart Helgeson, Shweta Krishnan, Yang Gao, Lisa Anne Hendricks, Trevor Darrell, and Katherine J. Kuchenbecker. Proton: A visuo-haptic data acquisition system for robotic learning of surface properties. In *Proceedings of the IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI)*, pages 58–65, September 2016. Oral presentation given by Burka.
- [C12] Naomi T. Fitter and Katherine J. Kuchenbecker. Using IMU data to demonstrate hand-clapping games to a robot. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) (Overall Acceptance Rate = 48%)*, pages 851 – 856, October 2016. Interactive presentation given by Fitter.
- [C13] Naomi T. Fitter and Katherine J. Kuchenbecker. Equipping the Baxter robot with human-inspired hand-clapping skills. In *Proceedings of the IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*, pages 105–112, August 2016. Oral presentation given by Fitter.
- [C14] Siyao Hu and Katherine J. Kuchenbecker. Reproducing a laser pointer dot on a secondary projected screen. In *Proceedings of the IEEE International Conference on Advanced Intelligent Mechatronics (AIM)*, pages 1645–1650, July 2016. Oral presentation given by Hu.
- [C15] Yang Gao, Lisa Anne Hendricks, Katherine J. Kuchenbecker, and Trevor Darrell. Deep learning for tactile understanding from visual and haptic data. In *Proceedings of the IEEE International Conference on Robotics and Automation (Acceptance Rate = 34.7%)*, pages 536–543, May 2016. Oral presentation given by Gao.
- [C16] Jeremy D. Brown, Mary Ibrahim, Elyse D. Z. Chase, Claudio Pacchierotti, and Katherine J. Kuchenbecker. Data-driven comparison of four cutaneous displays for pinching palpation in robotic surgery. In *Proceedings of the IEEE Haptics Symposium (Acceptance Rate = 49%)*, pages 147–154, Philadelphia, Pennsylvania, USA, April 2016. Oral presentation given by Brown.
- [C17] Jennifer C. T. Hui, Alexis E. Block, Camillo J. Taylor, and Katherine J. Kuchenbecker. Robust tactile perception of artificial tumors using pairwise comparisons of sensor array readings. In *Proceedings of the IEEE Haptics Symposium (Acceptance Rate = 49%)*, pages 305–312, Philadelphia, Pennsylvania, USA, April 2016. Oral presentation given by Hui.
- [C18] Heather Culbertson and Katherine J. Kuchenbecker. Should haptic texture vibrations respond to user force and speed? In *IEEE World Haptics Conference (Acceptance Rate = 42.5%)*, pages 106 – 112, Evanston, Illinois, USA, June 2015. Oral presentation given by Culbertson.
- [C19] Jennifer C. T. Hui and Katherine J. Kuchenbecker. Evaluating the BioTac’s ability to detect and characterize lumps in simulated tissue. In M. Auvray and C. Duriez, editors, *Haptics: Neuroscience, Devices, Modeling, and Applications, Proceedings of the EuroHaptics (Overall Acceptance Rate = 65%), Part II*, volume 8619 of *Lecture Notes in Computer Science*, pages 295–302, Berlin Heidelberg, June 2014. Springer-Verlag. Poster presentation given by Hui in Versailles, France.
- [C20] Claudio Pacchierotti, Domenico Prattichizzo, and Katherine J. Kuchenbecker. A data-driven approach to remote tactile interaction: From a BioTac sensor to any fingertip cutaneous device. In M. Auvray and C. Duriez, editors, *Haptics: Neuroscience, Devices, Modeling, and Applications, Proceedings of the EuroHaptics (Overall Acceptance Rate = 65%), Part I*, volume 8618 of *Lecture Notes in Computer Science*, pages 418–424, Berlin Heidelberg, June 2014. Springer-Verlag. Poster presentation given by Pacchierotti in Versailles, France.
- [C21] 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 *Proceedings of the IEEE Haptics Symposium (Overall Acceptance Rate = 68%)*, pages 319–325, Houston, Texas, USA, February 2014. Poster presentation given by Culbertson. Finalist for Best Poster Award.
- [C22] William McMahan and Katherine J. Kuchenbecker. Dynamic modeling and control of voice-coil actuators for high-fidelity display of haptic vibrations. In *Proceedings of the IEEE Haptics Symposium (Acceptance Rate for Oral Presentations = 27%)*, pages 115–122, Houston, Texas, USA, February 2014. Oral presentation given by Kuchenbecker.

- [C23] Rebecca M. Pierce, Elizabeth A. Fedalei, and Katherine J. Kuchenbecker. A wearable device for controlling a robot gripper with fingertip contact, pressure, vibrotactile, and grip force feedback. In *Proceedings of the IEEE Haptics Symposium (Acceptance Rate for Oral Presentations = 27%)*, pages 19–25, Houston, Texas, USA, February 2014. Oral presentation given by Pierce.
- [C24] Joseph M. Romano and Katherine J. Kuchenbecker. Methods for robotic tool-mediated haptic surface recognition. In *Proceedings of the IEEE Haptics Symposium (Acceptance Rate for Oral Presentations = 27%)*, pages 49–56, Houston, Texas, USA, February 2014. Oral presentation given by Kuchenbecker. Finalist for Best Paper Award.
- [C25] Yosuke Kurihara, Taku Hachisu, Katherine J. Kuchenbecker, and Hiroyuki Kajimoto. Virtual robotization of the human body via data-driven vibrotactile feedback. In Dennis Reidsma, Haruhiro Katayose, and Anton Nijholt, editors, *Advances in Computer Entertainment, Proceedings of the International Conference on Advances in Computer Entertainment Technology (ACE2013, Acceptance Rate for Long Papers = 22%)*, volume 8253 of *Lecture Notes in Computer Science*, pages 109–122, Enschede, Netherlands, November 2013. Springer. Oral presentation given by Kurihara. Best Paper Silver Award.
- [C26] Yosuke Kurihara, Taku Hachisu, Katherine J. Kuchenbecker, and Hiroyuki Kajimoto. Virtual robotization of the human body using vibration recording, modeling and rendering. In *Proceedings of the Virtual Reality Society of Japan Annual Conference (Unknown Acceptance Rate)*, Osaka, Japan, September 2013. Paper written in Japanese. Presentation given by Kurihara.
- [C27] Yosuke Kurihara, Taku Hachisu, M. Sato, S. Fukushima, Katherine J. Kuchenbecker, and Hiroyuki Kajimoto. Virtual alteration of body material by reality-based periodic vibrotactile feedback. In *Proceedings of the JSME Robotics and Mechatronics Conference (ROBOMECH, Unknown Acceptance Rate)*, Tsukuba, Japan, May 2013. Paper written in Japanese. Poster presentation given by Kurihara.
- [C28] Vivian Chu, Ian McMahon, Lorenzo Riano, Craig G. McDonald, Qin He, Jorge Martinez Perez-Tejada, Michael Arrigo, Naomi Fitter, John Nappo, Trevor Darrell, and Katherine J. Kuchenbecker. Using robotic exploratory procedures to learn the meaning of haptic adjectives. In *Proceedings of the IEEE International Conference on Robotics and Automation (Acceptance Rate = 39%)*, pages 3048–3055, Karlsruhe, Germany, May 2013. Oral presentation given by Chu. Best Cognitive Robotics Paper Award.
- [C29] Heather Culbertson, Juliette Unwin, Benjamin E. Goodman, and Katherine J. Kuchenbecker. Generating haptic texture models from unconstrained tool-surface interactions. In *Proceedings of the IEEE World Haptics Conference (Overall Acceptance Rate = 59%)*, pages 295–300, Daejeon, South Korea, April 2013. Oral presentation given by Culbertson. Finalist for Best Paper Award.
- [C30] Craig G. McDonald and Katherine J. Kuchenbecker. Dynamic simulation of tool-mediated texture interaction. In *Proceedings of the IEEE World Haptics Conference (Overall Acceptance Rate = 59%)*, pages 307–312, Daejeon, South Korea, April 2013. Oral presentation given by McDonald.
- [C31] Diane Tam, Karon E. MacLean, Joanna McGrenere, and Katherine J. Kuchenbecker. The design and field observation of a haptic notification system for oral presentations. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI, Acceptance Rate  $\approx$  20%)*, pages 1689–1698, Paris, France, May 2013. ACM. Oral presentation given by Tam.
- [C32] Rahul Chaudhari, Burak Çizmeçi, Katherine J. Kuchenbecker, Seungmoon Choi, and Eckehard Steinbach. Low bitrate source-filter model based compression of vibrotactile texture signals in haptic teleoperation. In *Proceedings of the ACM Multimedia (Acceptance Rate = 20%)*, pages 409–418, Nara, Japan, 2012. Oral presentation given by Chaudhari.
- [C33] Rebecca M. Pierce and Katherine J. Kuchenbecker. A data-driven method for determining natural human-robot motion mappings in teleoperation. In *Proceedings of the IEEE International Conference on Biomedical Robotics and Biomechatronics (Acceptance Rate  $\approx$  60%)*, pages 169–176, Rome, Italy, 2012. Poster presentation given by Pierce.
- [C34] William McMahan and Katherine J. Kuchenbecker. Spectral subtraction of robot motion noise for improved vibrotactile event detection. In P. Isakoski and J. Springare, editors, *Haptics: Perception, Devices, Mobility, and Communication: Proceedings of the EuroHaptics (Acceptance Rate for Oral*



- Presentations = 24%*), Part I, volume 7282 of *Lecture Notes in Computer Science*, pages 326–337, Tampere, Finland, June 2012. Springer. Oral presentation given by Kuchenbecker.
- [C35] 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 *Proceedings of the IEEE Haptics Symposium (Overall Acceptance Rate = 61%)*, pages 385–391, Vancouver, Canada, March 2012. Poster presentation given by Culbertson.
- [C36] Andrew A. Stanley, Simon K. Healey, Matthew R. Maltese, and Katherine J. Kuchenbecker. Recreating the feel of the human chest in a CPR manikin via programmable pneumatic damping. In *Proceedings of the IEEE Haptics Symposium (Acceptance Rate for Oral Presentations = 26%)*, pages 37–44, Vancouver, Canada, March 2012. Oral presentation given by Stanley.
- [C37] Yunqing Wang and Katherine J. Kuchenbecker. HALO: Haptic alerts for low-hanging obstacles in white cane navigation. In *Proceedings of the IEEE Haptics Symposium (Overall Acceptance Rate = 61%)*, pages 527–532, Vancouver, Canada, March 2012. Poster presentation given by Kuchenbecker.
- [C38] Steven R. Gray, Joseph M. Romano, Jordan Brindza, Soonkyum Kim, Katherine J. Kuchenbecker, and Vijay Kumar. Planning manipulation and grasping tasks with a redundant arm. In *Proceedings of the ASME International Design Engineering Technical Conferences (Acceptance Rate = 86%)*, Washington, D.C., USA, August 2011. DETC2011-47453. Oral presentation given by Gray.
- [C39] Karlin Bark, Preeya Khanna, Rikki Irwin, Pulkit Kapur, Steven A. Jax, Laurel J. Buxbaum, and Katherine J. Kuchenbecker. Lessons in using vibrotactile feedback to guide fast arm motions. In *Proceedings of the IEEE World Haptics Conference (Overall Acceptance Rate = 55%)*, pages 355–360, Istanbul, Turkey, June 2011. Poster presentation given by Bark.
- [C40] Peter Y. Huang, Jacquelyn A. Kunkel, Jordan Brindza, and Katherine J. Kuchenbecker. Haptically assisted golf putting through a planar four-cable system. In *Proceedings of the IEEE World Haptics Conference (Overall Acceptance Rate = 55%)*, pages 191–196, Istanbul, Turkey, June 2011. Poster presentation given by Kuchenbecker.
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- [C42] Katherine J. Kuchenbecker, Jamie Gewirtz, William McMahan, Dorsey Standish, Paul Martin, Jonathan Bohren, Pierre J. Mendoza, and David I. Lee. VerroTouch: High-frequency acceleration feedback for telerobotic surgery. In Astrid M. L. Kappers, Jan B. F. van Erp, Wouter M. Bergmann Tiest, and Frans C. T. van der Helm, editors, *Haptics: Generating and Perceiving Tangible Sensations, Proceedings of the EuroHaptics (Acceptance Rate for Oral Presentations  $\approx$  30%)*, Part I, volume 6191 of *Lecture Notes in Computer Science*, pages 189–196, Amsterdam, Netherlands, July 2010. Springer. Oral presentation given by Kuchenbecker.
- [C43] Nils Landin, Joseph M. Romano, William McMahan, and Katherine J. Kuchenbecker. Dimensional reduction of high-frequency accelerations for haptic rendering. In Astrid M. L. Kappers, Jan B. F. van Erp, Wouter M. Bergmann Tiest, and Frans C. T. van der Helm, editors, *Haptics: Generating and Perceiving Tangible Sensations, Proceedings of the EuroHaptics (Overall Acceptance Rate  $\approx$  60%)*, Part II, volume 6192 of *Lecture Notes in Computer Science*, pages 79–86, Amsterdam, Netherlands, July 2010. Springer. Poster presentation given by Landin.
- [C44] Joseph M. Romano, Takashi Yoshioka, and Katherine J. Kuchenbecker. Automatic filter design for synthesis of haptic textures from recorded acceleration data. In *Proceedings of the IEEE International Conference on Robotics and Automation (Acceptance Rate  $\approx$  40%)*, pages 1815–1821, Anchorage, Alaska, USA, May 2010. Oral presentation given by Romano.
- [C45] Kyle N. Winfree, Joseph M. Romano, Jamie Gewirtz, and Katherine J. Kuchenbecker. Control of a high fidelity ungrounded torque feedback device: The iTorqU 2.1. In *Proceedings of the IEEE International Conference on Robotics and Automation (Acceptance Rate  $\approx$  40%)*, pages 1347–1352, Anchorage, Alaska, May 2010. Oral presentation given by Winfree.

- [C46] Pulkit Kapur, Mallory Jensen, Laurel J. Buxbaum, Steven A. Jax, and Katherine J. Kuchenbecker. Spatially distributed tactile feedback for kinesthetic motion guidance. In *Proceedings of the IEEE Haptics Symposium (Overall Acceptance Rate  $\approx$  60%)*, pages 519–526, Waltham, Massachusetts, USA, March 2010. Poster presentation given by Kapur. Finalist for Best Poster Award.
- [C47] William McMahan, Joseph M. Romano, Amal M. Abdul Rahuman, and Katherine J. Kuchenbecker. High frequency acceleration feedback significantly increases the realism of haptically rendered textured surfaces. In *Proceedings of the IEEE Haptics Symposium (Acceptance Rate for Oral Presentations  $\approx$  25%)*, pages 141–148, Waltham, Massachusetts, March 2010. Oral presentation given by McMahan.
- [C48] Quentin Lindsey, Neil Tenenholtz, David I. Lee, and Katherine J. Kuchenbecker. Image-enabled force feedback for robotic teleoperation of a flexible tool. In *Proceedings of the IASTED International Conference on Robotics and Applications (Unknown Acceptance Rate)*, pages 224–233, Boston, Massachusetts, November 2009. Oral presentation given by Lindsey.
- [C49] Meng Yang, Jingwan Lu, Alla Safonova, and Katherine J. Kuchenbecker. GPU methods for real-time haptic interaction with 3D fluids. In *Proceedings of the IEEE International Workshop on Haptic Audio-Visual Environments and Games (Unknown Acceptance Rate)*, pages 24–29, Lecco, Italy, November 2009. Oral presentation given by Kuchenbecker.
- [C50] William McMahan and Katherine J. Kuchenbecker. Haptic display of realistic tool contact via dynamically compensated control of a dedicated actuator. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS, Acceptance Rate = 55%)*, pages 3171–3177, St. Louis, Missouri, USA, October 2009. Oral presentation given by McMahan.
- [C51] ★ Katherine J. Kuchenbecker, Joseph M. Romano, and William McMahan. Haptography: Capturing and recreating the rich feel of real surfaces. In Cédric Pradalier, Roland Siegwart, and Gerhard Hirzinger, editors, *Robotics Research: the 14th International Symposium (ISRR 2009) (Unknown Acceptance Rate for Invited Papers)*, volume 70 of *Springer Tracts in Advanced Robotics*, pages 245–260. Springer, 2011. Oral presentation given by Kuchenbecker in Lucerne, Switzerland, August 2009.
- [C52] Joseph M. Romano and Katherine J. Kuchenbecker. The AirWand: Design and characterization of a large-workspace haptic device. In *Proceedings of the IEEE International Conference on Robotics and Automation (Acceptance Rate = 43%)*, pages 1461–1466, Kobe, Japan, May 2009. Oral presentation given by Romano.
- [C53] Netta Gurari, Katherine J. Kuchenbecker, and Allison M. Okamura. Stiffness discrimination with visual and proprioceptive cues. In *Proceedings of the IEEE World Haptics Conference (Overall Acceptance Rate = 55%)*, pages 121–126, Salt Lake City, Utah, USA, March 2009. Poster presentation given by Gurari.
- [C54] Joseph M. Romano, Steven R. Gray, Nathan T. Jacobs, and Katherine J. Kuchenbecker. Toward tactilely transparent gloves: Collocated slip sensing and vibrotactile actuation. In *Proceedings of the IEEE World Haptics Conference (Overall Acceptance Rate = 55%)*, pages 279–284, Salt Lake City, Utah, USA, March 2009. Poster presentation given by Romano, Gray, and Jacobs.
- [C55] Kyle N. Winfree, Jamie Gewirtz, Thomas Mather, Jonathan Fiene, and Katherine J. Kuchenbecker. A high-fidelity ungrounded torque feedback device: The iTorqU 2.0. In *Proceedings of the IEEE World Haptics Conference (Overall Acceptance Rate = 55%)*, pages 261–266, Salt Lake City, Utah, USA, March 2009. Poster presentation given by Winfree and Gewirtz.
- [C56] Katherine J. Kuchenbecker, David Ferguson, Michael Kutzer, Matthew Moses, and Allison M. Okamura. The Touch Thimble: Providing fingertip contact feedback during point-force haptic interaction. In *Proceedings of the IEEE Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems (Acceptance Rate for Oral Presentations  $\approx$  30%)*, pages 239–246, Reno, Nevada, USA, March 2008. Oral presentation given by Kuchenbecker.
- [C57] Katherine J. Kuchenbecker, Netta Gurari, and Allison M. Okamura. Effects of visual and proprioceptive position feedback on human control of targeted movement. In *Proceedings of the IEEE International Conference on Rehabilitation Robotics (Unknown Acceptance Rate)*, pages 513–524, Noordwijk, Netherlands, June 2007. Oral and poster presentations given by Kuchenbecker.

- [C58] Jonathan P. Fiene and Katherine J. Kuchenbecker. Shaping event-based haptic transients via an improved understanding of real contact dynamics. In *Proceedings of the IEEE World Haptics Conference (Acceptance Rate for Oral Presentations = 30%)*, pages 170–175, Tsukuba, Japan, March 2007. Oral presentation given by Fiene. Best Haptic Technology Paper Award.
- [C59] Katherine J. Kuchenbecker and Günter Niemeyer. Improving telerobotic touch via high-frequency acceleration matching. In *Proceedings of the IEEE International Conference on Robotics and Automation (Acceptance Rate = 39%)*, pages 3893–3898, Orlando, Florida, USA, May 2006. Oral presentation given by Kuchenbecker.
- [C60] Jonathan P. Fiene, Katherine J. Kuchenbecker, and Günter Niemeyer. Event-based haptic tapping with grip force compensation. In *Proceedings of the IEEE Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems (Acceptance Rate for Oral Presentations = 36%)*, pages 117–123, Arlington, Virginia, USA, March 2006. Oral presentation given by Fiene.
- [C61] Katherine J. Kuchenbecker and Günter Niemeyer. Modeling induced master motion in force-reflecting teleoperation. In *Proceedings of the IEEE International Conference on Robotics and Automation (Acceptance Rate = 45%)*, pages 348–353, Barcelona, Spain, April 2005. Oral presentation given by Kuchenbecker.
- [C62] Katherine J. Kuchenbecker, Jonathan P. Fiene, and Günter Niemeyer. Event-based haptics and acceleration matching: Portraying and assessing the realism of contact. In *Proceedings of the IEEE World Haptics Conference (Acceptance Rate = 40%)*, pages 381–387, Pisa, Italy, March 2005. Oral presentation given by Kuchenbecker.
- [C63] Katherine J. Kuchenbecker and Günter Niemeyer. Canceling induced master motion in force-reflecting teleoperation. In *Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Symposium on Advances in Robot Dynamics and Control (Unknown Acceptance Rate)*, volume 2, paper number 60049, Anaheim, California, USA, November 2004. Oral presentation given by Kuchenbecker. Best Student Paper Award.
- [C64] Katherine J. Kuchenbecker, William R. Provancher, Günter Niemeyer, and Mark R. Cutkosky. Haptic display of contact location. In *Proceedings of the IEEE Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems (Acceptance Rate for Oral Presentations  $\approx$  30%)*, pages 40–47, Chicago, Illinois, USA, March 2004. Oral presentation given by Kuchenbecker.
- [C65] Katherine J. Kuchenbecker, June Gyu Park, and Günter Niemeyer. Characterizing the human wrist for improved haptic interaction. In *Proceedings of the ASME International Mechanical Engineering Congress and Exposition, Symposium on Advances in Robot Dynamics and Control (Unknown Acceptance Rate)*, volume 2, paper number 42017, Washington, D.C., USA, November 2003. Oral presentation given by Kuchenbecker.
- [C66] William R. Provancher, Katherine J. Kuchenbecker, Günter Niemeyer, and Mark R. Cutkosky. Perception of curvature and object motion via contact location feedback. In Paolo Dario and Raja Chatila, editors, *Robotics Research: the Eleventh International Symposium (ISRR 2003) (Unknown Acceptance Rate)*, volume 15 of *Springer Tracts in Advanced Robotics*, pages 456–465. Springer, Siena, Italy, 2005. Oral presentation given by Provancher.

*Education-Oriented Papers and Abstracts (Acceptance Rates Not Known)*

- [E1] Katherine J. Kuchenbecker. Reducing student anonymity and increasing engagement. *University of Pennsylvania Almanac*, 62(18):8, November 24, 2015.
- [E2] Denise Wong, Philip Dames, and Katherine J. Kuchenbecker. Teaching forward and inverse kinematics of robotic manipulators via MATLAB. Presented at *ICRA Workshop on MATLAB/Simulink for Robotics Education and Research*. Oral presentation given by Dames and Wong, June 2014.
- [E3] Mark Yim, Katherine J. Kuchenbecker, Paulo Arratia, John Bassani, Jonathan P. Fiene, Vijay Kumar, and Jennifer Lukes. A practice-integrated curriculum in mechanical engineering. In *Proceedings of the ASEE Annual Conference and Exposition*, Pittsburgh, Pennsylvania, USA, June 2008. Oral presentation given by Yim.

- [E4] Carol B. Muller, Elisa H. Barney Smith, Jennifer Chou-Green, T. Daniels-Race, A. Drummond, and Katherine J. Kuchenbecker. The power of external mentors for women pursuing academic careers in engineering and science: Stories of MentorNet ACE and its proteges and mentors. In *Proceedings of the Women in Engineering Programs and Advocates Network (WEPAN) National Conference*, Lake Buena Vista, Florida, USA, June 2007. Oral presentation given by Muller.

*Short Peer-Reviewed Conference Papers and Abstracts (Acceptance Rates Rarely Known)*

- [S1] Rachael Burns and Katherine J. Kuchenbecker. Designing a haptic empathetic robot animal for children with autism. Proceedings of the *Robotics: Science and Systems* Workshop on Robot-Mediated Autism Intervention: Hardware, Software, and Curriculum, June 2018. Workshop paper (4 pages). Oral presentation given by Burns.
- [S2] Eric Young and Katherine J. Kuchenbecker. Delivering 6-DOF fingertip tactile cues, June 2018. Work-in-progress paper (5 pages) presented at *EuroHaptics*, Pisa, Italy. Poster presentation given by Young.
- [S3] Alex Burka and Katherine J. Kuchenbecker. Can humans infer haptic surface properties from images? In *Companion Proceedings of the IEEE Haptics Symposium (Acceptance Rate for WIP Papers = 79%)*, March 2018. Work-in-progress paper (3 pages). Poster presentation given by Burka.
- [S4] David Gueorguiev, Dimitrios Tzionas, Claudio Pacchierotti, Michael J. Black, and Katherine J. Kuchenbecker. Towards a statistical model of fingertip contact deformations from 4d data. In *Companion Proceedings of the IEEE Haptics Symposium (Acceptance Rate for WIP Papers = 79%)*, March 2018. Work-in-progress paper (3 pages). Poster presentation given by Gueorguiev.
- [S5] Hasti Seifi, Karon MacLean, Katherine J. Kuchenbecker, and Gunhyuk Park. Haptipedia: An expert-sourced interactive device visualization for haptic designers. In *Companion Proceedings of the IEEE Haptics Symposium (Acceptance Rate for WIP Papers = 79%)*, March 2018. Work-in-progress paper (3 pages). Poster presentation given by MacLean and Park.
- [S6] Katherine J. Kuchenbecker. Arm-worn tactile displays. In *Companion Proceedings of the IEEE Haptics Symposium*, March 2018. Extended Abstract (1 page) for a Cross-cutting Challenge (CCC) Interactive Discussion. Poster presentation given by Kuchenbecker.
- [S7] Naomi T. Fitter, Mayumi Mohan, Katherine J. Kuchenbecker, and Michelle J. Johnson. Exercising with Baxter: Design and evaluation of assistive social-physical human-robot interaction. In *Proceedings of the HRI 2018 Workshop on Personal Robots for Exercising and Coaching (PREC)*, Chicago, USA, March 2018. Workshop paper (6 pages). Oral presentation given by Fitter.
- [S8] Alexis E. Block and Katherine J. Kuchenbecker. Physical and behavioral factors improve robot hug quality. In *Proceedings of the RO-MAN Workshop on Social Interaction and Multimodal Expression for Socially Intelligent Robots*, August 2017. Workshop paper (2 pages). Oral presentation given by Block.
- [S9] Alexis E. Block and Katherine J. Kuchenbecker. How should robots hug? In *Proceedings of the IEEE World Haptics Conference*, June 2017. Work-in-progress paper (2 pages). Poster presentation given by Block.
- [S10] Siyao Hu and Katherine J. Kuchenbecker. Teaching a robot to collaborate with a human via haptic teleoperation. In *Proceedings of the IEEE World Haptics Conference*, June 2017. Work-in-progress paper (2 pages). Poster presentation given by Hu.
- [S11] Jaimie Carlson and Katherine J. Kuchenbecker. An interactive augmented-reality video training platform for the da Vinci surgical system, June 2017. Workshop paper (2 pages). Interactive presentation given by Kuchenbecker.
- [S12] Yousi A. Oquendo, Elijah W. Riddle, Dennis Hiller, Thane A. Blinman, and Katherine J. Kuchenbecker. Automatic OSATS rating of trainee skill at a pediatric laparoscopic suturing task. In *Proceedings of the Annual Meeting of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)*, March 2017. Abstract. Podium presentation by Oquendo.



- [S13] [Naomi T. Fitter](#), [Dylan T. Hawkes](#), [Michelle J. Johnson](#), and [Katherine J. Kuchenbecker](#). Designing human-robot exercise games for Baxter. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Daejeon, Korea, October 2016. Late-breaking results report. Interactive presentation given by [Fitter](#).
- [S14] [Naomi T. Fitter](#), [Yi-Lin E. Huang](#), [Jamie P. Mayer](#), and [Katherine J. Kuchenbecker](#). IMU-mediated real-time human-Baxter hand-clapping interaction. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Daejeon, Korea, October 2016. Late-breaking results report. Interactive presentation given by [Fitter](#).
- [S15] [Krista Fjeld](#), [Siyao Hu](#), [Katherine J. Kuchenbecker](#), and [Erin V. Vasudevan](#). Design and evaluation of a novel mechanical device to improve hemiparetic gait: a case report. In *Proceedings of the Biomechanics and Neural Control of Movement Conference (BANCOM)*, June 2016. Extended abstract. Poster presentation given by [Fjeld](#).
- [S16] [Alex Burka](#), [Siyao Hu](#), [Stuart Helgeson](#), [Shweta Krishnan](#), [Yang Gao](#), [Lisa Anne Hendricks](#), [Trevor Darrell](#), and [Katherine J. Kuchenbecker](#). Design and implementation of a visuo-haptic data acquisition system for robotic learning of surface properties. In *Proceedings of the IEEE Haptics Symposium (Acceptance Rate for WIP Papers = 70%)*, pages 350–352, April 2016. Work-in-progress paper. Poster presentation given by [Burka](#).
- [S17] [Naomi T. Fitter](#) and [Katherine J. Kuchenbecker](#). Using IMU data to teach a robot hand-clapping games. In *Proceedings of the IEEE Haptics Symposium (Acceptance Rate for WIP Papers = 70%)*, pages 353–355, April 2015. Work-in-progress paper. Poster presentation given by [Fitter](#).
- [S18] [Alex Burka](#), [Siyao Hu](#), [Shweta Krishnan](#), [Katherine J. Kuchenbecker](#), [Lisa Anne Hendricks](#), [Yang Gao](#), and [Trevor Darrell](#). Toward a large-scale visuo-haptic dataset for robotic learning. In *Proceedings of the CVPR Workshop on the Future of Datasets in Vision*, June 2015.
- [S19] [Jeremy D. Brown](#), [Conor O'Brien](#), [Kiyoyuki Miyasaka](#), [Kristoffel R. Dumon](#), and [Katherine J. Kuchenbecker](#). Analysis of the instrument vibrations and contact forces caused by an expert robotic surgeon doing FRS tasks. In *Proceedings of the Hamlyn Symposium on Medical Robotics*, pages 75–76, London, England, June 2015. Poster presentation given by [Brown](#).
- [S20] [Naomi T. Fitter](#), [Michelle Neuburger](#), and [Katherine J. Kuchenbecker](#). Enabling the Baxter robot to play hand-clapping games. In *Proceedings of the IEEE World Haptics Conference (Acceptance rate for WIP Papers  $\approx$  60%)*, June 2015. Work-in-progress paper. Poster presentation given by [Fitter](#).
- [S21] [Jennifer Hui](#), [Alexis Block](#), and [Katherine J. Kuchenbecker](#). Detecting lumps in simulated tissue via palpation with a BioTac. In *Proceedings of the IEEE World Haptics Conference (WIP Paper Acceptance Rate  $\approx$  60%)*, June 2015. Work-in-progress paper. Poster presentation given by [Hui](#).
- [S22] [Andrés M. Bur](#), [Ernest D. Gomez](#), [Christopher H. Rassekh](#), [Jason G. Newman](#), [Gregory S. Weinstein](#), and [Katherine J. Kuchenbecker](#). Haptic feedback in transoral robotic surgery: A feasibility study. In *Proceedings of the Annual Meeting of the Triological Society at COSM*, April 2015. Poster presentation given by [Bur](#).
- [S23] [Andrés M. Bur](#), [Ernest D. Gomez](#), [Ara A. Chalian](#), [Jason G. Newman](#), [Gregory S. Weinstein](#), and [Katherine J. Kuchenbecker](#). Design and validation of a practical simulator for transoral robotic surgery. In *Proceedings of the Society for Robotic Surgery Annual Meeting: Transoral Program*, number T8, February 2015. Oral presentation given by [Bur](#).
- [S24] [Sarah Leung](#) and [Katherine J. Kuchenbecker](#). Automatic skill evaluation for a needle passing task in robotic surgery. In *Proceedings of the IROS Workshop on the Role of Human Sensorimotor Control in Robotic Surgery (Acceptance Rate Unknown)*, Chicago, Illinois, September 2014. Poster presentation given by [Kuchenbecker](#). Best Poster Award.
- [S25] [Claudio Pacchierotti](#), [Priyanka Shirsat](#), [Jacqueline K. Koehn](#), [Domenico Prattichizzo](#), and [Katherine J. Kuchenbecker](#). Cutaneous feedback of planar fingertip deformation and vibration on a da Vinci surgical robot. In *Proceedings of the IROS Workshop on the Role of Human Sensorimotor Control in Robotic Surgery (Acceptance Rate Unknown)*, Chicago, Illinois, September 2014. Poster presentation given by [Koehn](#).

- [S26] Naomi T. Fitter and Katherine J. Kuchenbecker. Analyzing human high-fives to create an effective high-fiving robot. In *Proceedings of the ACM/IEEE International Conference on Human-Robot Interaction (HRI) (Acceptance Rate for Late-Breaking Reports  $\approx$  85%)*, pages 156–157, Bielefeld, Germany, March 2014. Poster presentation given by Fitter.
- [S27] Ernest D. Gomez, Gregory S. Weinstein, Bert W. O'Malley, Jr., William McMahan, Liting Chen, and Katherine J. Kuchenbecker. A practical system for recording instrument contacts and collisions during transoral robotic surgery. In *Proceedings of the Annual Meeting of the Triological Society*, Orlando, Florida, USA, April 2013. Poster presentation given by Gomez.
- [S28] Ernest D. Gomez, Rajesh Aggarwal, William McMahan, Eza Koch, Daniel A. Hashimoto, Ara Darzi, Kenric M. Murayama, Kristoffel R. Dumon, Noel N. Williams, and Katherine J. Kuchenbecker. Instrument contact vibrations are a construct-valid measure of technical skill in fundamentals of laparoscopic surgery training tasks. In *Proceedings of the Annual Meeting of the Association for Surgical Education (ASE)*, Orlando, Florida, USA, April 2013. Oral presentation given by Gomez.
- [S29] William McMahan, Ernest D. Gomez, Liting Chen, Karlin Bark, John C. Nappo, Eza I. Koch, David I. Lee, Kristoffel Dumon, Noel Williams, and Katherine J. Kuchenbecker. A practical system for recording instrument interactions during live robotic surgery. In *Proceedings of the Medicine Meets Virtual Reality (Acceptance Rate  $\approx$  40%)*, 2013. Poster presentation given by McMahan.
- [S30] Ian McMahan, Vivian Chu, Lorenzo Riano, Craig G. McDonald, Qin (Karen) He, Jorge Martinez Perez-Tejada, Michael Arrigo, Naomi Fitter, John Nappo, Trevor Darrell, and Katherine J. Kuchenbecker. Robotic learning of haptic adjectives through physical interaction. In *Proceedings of the IROS Workshop on Advances in Tactile Sensing and Touch-based Human-robot Interaction*, Vilamoura, Algarve, Portugal, 2012. Oral presentation given by McMahon.
- [S31] Ernest D. Gomez, Karlin Bark, Charlotte Rivera, William McMahan, Austin Remington, David I. Lee, Noel Williams, Kenric Murayama, Kristoffel Dumon, and Katherine J. Kuchenbecker. Construct validity of instrument vibrations as a measure of robotic surgical skill. *Journal of the American College of Surgeons*, 215(3):S119–120, 2012. Oral presentation given by Gomez at the *American College of Surgeons (ACS) Clinical Congress (Acceptance Rate  $\approx$  10%)*.
- [S32] Karlin Bark, Ernest D. Gomez, Charlotte Rivera, William McMahan, Austin Remington, Kenric Murayama, David I. Lee, Kristoffel Dumon, Noel Williams, and Katherine J. Kuchenbecker. Surgical instrument vibrations are a construct-valid measure of technical skill in robotic peg transfer and suturing tasks. In *Proceedings of the Hamlyn Symposium on Medical Robotics (Acceptance Rate = 59%)*, pages 50–51, London, England, July 2012. Oral presentation given by Bark.
- [S33] Margrit P. Maggio, Robert Parajon, and Katherine J. Kuchenbecker. VerroTeach: Visuo-audio-haptic training for dental caries detection. In *Proceedings of the Annual American Dental Educator's Association (ADEA) Conference*, Orlando, Florida, March 2012. Oral presentation given by Maggio.
- [S34] Ernest D. Gomez, Karlin Bark, William McMahan, Charlotte Rivera, Austin Remington, David I. Lee, and Katherine J. Kuchenbecker. VerroTouch: Detection of instrument vibrations for haptic feedback and skill assessment in robotic surgery. In *Proceedings of the Annual Meeting of the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES)*, San Diego, California, USA, March 2012. Emerging Technology Poster presentation given by Gomez. Poster available at <http://thesagesmeeting.org/>.
- [S35] William McMahan, Joseph M. Romano, and Katherine J. Kuchenbecker. Using accelerometers to localize tactile contact events on a robot arm. In *Proceedings of the Workshop on Advances in Tactile Sensing and Touch-Based Human-Robot Interaction, ACM/IEEE International Conference on Human-Robot Interaction*, Boston, Massachusetts, March 2012. Oral presentation given by McMahan.
- [S36] William McMahan, Karlin Bark, Jamie Gewirtz, Dorsey Standish, Paul D. Martin, Jacquelyn A. Kunkel, Magalie Lilavois, Alexei Wedmid, David I. Lee, and Katherine J. Kuchenbecker. Tool vibration feedback may help expert robotic surgeons apply less force during manipulation tasks. In G. Z. Yang and A. Darzi, editors, *Proceedings of the Hamlyn Symposium on Medical Robotics (Acceptance Rate = 66%)*, pages 37–38, London, England, June 2011. Oral Presentation given by Kuchenbecker.

- [S37] William McMahan, Jamie Gewirtz, Dorsey Standish, Paul Martin, Jacquelyn Kunkel, Magalie Lilavois, Alexei Wedmid, David I. Lee, and Katherine J. Kuchenbecker. VerroTouch: Vibrotactile feedback for robotic minimally invasive surgery. *Journal of Urology (Impact Factor = 3.746)*, 185(4, Supplement):e373, May 2011. Poster presentation given by McMahan at the Annual Meeting of the American Urological Association (Acceptance Rate  $\approx$  10%) in Washington, D.C., USA.
- [S38] Katherine J. Kuchenbecker, Jamie Gewirtz, William McMahan, Dorsey Standish, Jonathan Bohren, Paul Martin, Alexei Wedmid, Pierre J. Mendoza, and David I. Lee. VerroTouch: A vibrotactile feedback system for minimally invasive robotic surgery. In *Proceedings of the 28th World Congress of Endourology*, September 2010. PS8-14. Poster presentation given by Wedmid.
- [S39] Joseph M. Romano, Alla Safonova, and Katherine J. Kuchenbecker. Real-time graphic and haptic simulation of deformable tissue puncture. In *Proceedings of the Medicine Meets Virtual Reality*, Long Beach, California, USA, January 2009. Poster presentation given by Romano.
- [S40] Meng Yang, Jingwan Lu, Zehua Zhou, Alla Safonova, and Katherine J. Kuchenbecker. A GPU-based approach for real-time haptic rendering of 3D fluids. In *Proceedings of the SIGGRAPH Asia Conference*, Singapore, December 2008. Oral presentation given by Yang.
- [S41] Amy Blank, Allison M. Okamura, and Katherine J. Kuchenbecker. Effects of proprioceptive motion feedback on sighted and unsighted control of a virtual hand prosthesis. In *Proceedings of the IEEE Symposium on Haptic Interfaces for Virtual Environment and Teleoperator Systems*, pages 141–142, Reno, Nevada, USA, March 2008. Poster presentation given by Blank.
- [S42] ★ Katherine J. Kuchenbecker. Haptography: Capturing the feel of real objects to enable authentic haptic rendering. In *Proceedings of the Haptic in Ambient Systems (HAS) Workshop, in conjunction with the First International Conference on Ambient Media and Systems*, Montreal, Canada, February 2008.
- [S43] Katherine J. Kuchenbecker, Netta Gurari, and Allison M. Okamura. Quantifying the value of visual and haptic position feedback in force-based motion control. In *Proceedings of the IEEE World Haptics Conference*, pages 561–562, Tsukuba, Japan, March 2007. Poster presentation given by Kuchenbecker.
- [S44] Günter Niemeyer, Katherine J. Kuchenbecker, Raymond Bonneau, Probal Mitra, Andrew Reid, Jonathan Fiene, and Grant Weldon. THUMP: An immersive haptic console for surgical simulation and training. In *Proceedings of the Medicine Meets Virtual Reality*, pages 272–274, Newport Beach, California, USA, January 2004. Poster presentation given by Niemeyer. Best Poster Award.

#### Hands-On Demonstrations

- [D1] Hyosang Lee\*, Kyungseo Park\*, Jung Kim, and Katherine J. Kuchenbecker. A large-scale fabric-based tactile sensor using electrical resistance tomography. Hands-on demonstration (3 pages) presented at AsiaHaptics, Songdo, Korea. \*These authors contributed equally to this work, November 2018.
- [D2] Gunhyuk Park and Katherine J. Kuchenbecker. Reducing 3D vibrations to 1D in real time. Hands-on demonstration (4 pages) presented at AsiaHaptics, Songdo, Korea, November 2018.
- [D3] Gunhyuk Park and Katherine J. Kuchenbecker. Reducing 3D vibrations to 1D in real time. Hands-on demonstration presented at EuroHaptics, Pisa, Italy, June 2018.
- [D4] Hasti Seifi, Farimah Fazlollahi, Gunhyuk Park, Katherine J. Kuchenbecker, and Karon E. MacLean. Haptipedia: Exploring haptic device design through interactive visualizations. Hands-on demonstration presented at EuroHaptics, Pisa, Italy, June 2018.
- [D5] Alex Burka and Katherine J. Kuchenbecker. Proton Pack: Visuo-haptic surface data recording. Hands-on demonstration presented at the IEEE World Haptics Conference, Fürstfeldbruck (Munich), Germany, June 2017.
- [D6] Naomi T. Fitter and Katherine J. Kuchenbecker. Physically interactive exercise games with a Baxter robot. Hands-on demonstration presented at the IEEE World Haptics Conference, Fürstfeldbruck (Munich), Germany, June 2017.

- [D7] Naomi T. Fitter and Katherine J. Kuchenbecker. Hand-clapping games with a Baxter robot. Hands-on demonstration presented at the ACM/IEEE International Conference on Human-Robot Interaction, Vienna, Austria, March 2017.
- [D8] Jeremy D. Brown, Mary Ibrahim, Elyse D. Z. Chase, Claudio Pacchierotti, and Katherine J. Kuchenbecker. One sensor, three displays: A comparison of tactile rendering from a BioTac sensor. Hands-on demonstration presented at IEEE Haptics Symposium, Philadelphia, Pennsylvania, USA, April 2016.
- [D9] Heather Culbertson and Katherine J. Kuchenbecker. Haptic textures for online shopping. Interactive demonstrations in The Retail Collective exhibit, presented 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, USA, February 2014.
- [D11] Katherine J. Kuchenbecker, Alexandre Miranda Anon, Tyler Barkin, Kent deVillafranca, and Michael Lo. A modular tactile motion guidance system. Hands-on demonstration presented at IEEE Haptics Symposium, Houston, Texas, USA, February 2014.
- [D12] Rebecca M. Pierce, Elizabeth A. Fedalei, and Katherine J. Kuchenbecker. Control of a virtual robot with fingertip contact, pressure, vibrotactile, and grip force feedback. Hands-on demonstration presented at IEEE Haptics Symposium, Houston, Texas, USA, February 2014.
- [D13] Yosuke Kurihara, Taku Hachisu, Katherine J. Kuchenbecker, and Hiroyuki Kajimoto. Jointonation: Robotization of the human body by vibrotactile feedback. Emerging Technologies Demonstration with Talk at ACM SIGGRAPH Asia, November 2013. Hands-on demonstration given by Kurihara, Takei, and Nakai. Best Demonstration Award as voted by the Program Committee.
- [D14] Katherine J. Kuchenbecker (Station Coordinator) with Anna Brzezinski, Ernest D. Gomez, Michael Gosselin, Jennifer Hui, Eza Koch, Jackie Koehn, William McMahan, Kunal Mahajan, John Nappo, and Neel Shah. Adding haptics to robotic surgery. Learning Center Station at SAGES (Society of American Gastrointestinal and Endoscopic Surgeons) Annual Meeting, Baltimore, Maryland, USA, April 2013.
- [D15] 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 Demonstration Award (by audience vote).
- [D16] Karlin Bark, Elizabeth Cha, Frank Tan, Steven A. Jax, Laurel J. Buxbaum, and Katherine J. Kuchenbecker. StrokeSleeve: Real-time vibrotactile feedback for motion guidance. Hands-on demonstration presented at IEEE Haptics Symposium, Vancouver, Canada, March 2012.
- [D17] Pablo Castillo, Joseph M. Romano, and Katherine J. Kuchenbecker. Simon game with data-driven visuo-audio-haptic buttons. Hands-on demonstration presented at IEEE Haptics Symposium, Vancouver, Canada, March 2012.
- [D18] 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.
- [D19] Simon K. Healey, William McMahan, and Katherine J. Kuchenbecker. Haptic vibration feedback for a teleoperated ground vehicle. Hands-on demonstration presented at IEEE Haptics Symposium, Vancouver, Canada, March 2012.
- [D20] Margrit P. Maggio, Robert Parajon, and Katherine J. Kuchenbecker. VerroTeach: Visuo-audio-haptic training for dental caries detection. Hands-on demonstration presented at IEEE Haptics Symposium, Vancouver, Canada, March 2012. Best Demonstration Award (three-way tie).
- [D21] Andrew A. Stanley, Simon K. Healey, Matthew R. Maltese, and Katherine J. Kuchenbecker. A biofidelic CPR manikin with programmable pneumatic damping. Hands-on demonstration presented at IEEE Haptics Symposium, Vancouver, Canada, March 2012. Finalist for Best Hands-on Demonstration Award.



- [D22] Diane Tam, Katherine J. Kuchenbecker, Karon MacLean, and Joanna McGrenere. Exploring presentation timing through haptic reminders. Hands-on demonstration presented at IEEE Haptics Symposium, Vancouver, Canada, March 2012.
- [D23] Yunqing Wang, Eza Koch, and Katherine J. Kuchenbecker. HALO: Haptic alerts for low-hanging obstacles in white cane navigation. Hands-on demonstration presented at IEEE Haptics Symposium, Vancouver, Canada, March 2012. Finalist for Best Hands-on Demonstration Award.
- [D24] Joseph M. Romano and Katherine J. Kuchenbecker. Please ~~do not~~ touch the robot. Hands-on demonstration presented at IEEE/RSJ Conference on Intelligent Robots and Systems (IROS), San Francisco, California, September 2011.
- [D25] Andrew A. Stanley and Katherine J. Kuchenbecker. Body-grounded tactile actuators for playback of human physical contact. Hands-on demonstration presented at IEEE World Haptics Conference, Istanbul, Turkey, June 2011.
- [D26] Joseph M. Romano, Nils Landin, William McMahan, and Katherine J. Kuchenbecker. TexturePad: Realistic rendering of haptic textures. Hands-on demonstration presented at EuroHaptics, Amsterdam, Netherlands, July 2010.
- [D27] Katherine J. Kuchenbecker, Jamie Gewirtz, William McMahan, Dorsey Standish, Paul Martin, Jonathan Bohren, Pierre J. Mendoza, and David I. Lee. VerroTouch: High-frequency acceleration feedback for telerobotic surgery. Hands-on demonstration presented at EuroHaptics, Amsterdam, Netherlands, July 2010.
- [D28] Joseph M. Romano and Katherine J. Kuchenbecker. Realistic haptic contacts and textures for tablet computing. Hands-on demonstration presented at the Stanford Medical Innovation Conference on Medical Robotics, Stanford, California, April 2010.
- [D29] Dorsey Standish, Jamie Gewirtz, William McMahan, Paul Martin, and Katherine J. Kuchenbecker. High-frequency tactile feedback for the da Vinci surgical system. Hands-on demonstration presented at the Stanford Medical Innovation Conference on Medical Robotics, April 2010.
- [D30] Zhihao Jiang, Mohit Bhoite, and Katherine J. Kuchenbecker. The haptic board. Hands-on demonstration presented at IEEE Haptics Symposium, Waltham, Massachusetts, USA, March 2010.
- [D31] Saurabh Palan, Ruoyao Wang, Nathaniel Naukam, Edward Li, and Katherine J. Kuchenbecker. Tactile gaming vest (TGV). Hands-on demonstration presented at IEEE Haptics Symposium, Waltham, Massachusetts, March 2010.
- [D32] Joseph M. Romano and Katherine J. Kuchenbecker. Realistic haptic contacts and textures for tablet computing. Hands-on demonstration presented at IEEE Haptics Symposium, Waltham, Massachusetts, March 2010. Best Teaser Award.
- [D33] Dorsey Standish, Jamie Gewirtz, William McMahan, Paul Martin, and Katherine J. Kuchenbecker. High-frequency tactile feedback for the da Vinci surgical system. Hands-on demonstration presented at IEEE Haptics Symposium, Waltham, Massachusetts, March 2010.
- [D34] Meng Yang, Jingwan Lu, Alla Safonova, and Katherine J. Kuchenbecker. GPU-based haptic rendering of 3D smoke. Hands-on demonstration presented at IEEE Haptics Symposium, Waltham, Massachusetts, March 2010.
- [D35] Joseph M. Romano, Steven R. Gray, Nathan T. Jacobs, and Katherine J. Kuchenbecker. The SlipGlove. Hands-on demonstration presented at IEEE World Haptics Conference, Salt Lake City, Utah, March 2009.
- [D36] William McMahan and Katherine J. Kuchenbecker. Displaying realistic contact accelerations via a dedicated vibration actuator. Hands-on demonstration presented at IEEE World Haptics Conference, Salt Lake City, Utah, Proceedings of the IEEE World Haptics Conference, pp. 613–614, March 2009. Best Demonstration Award.

- [D37] Pulkit Kapur, Sunthar Premakumar, Steven A. Jax, Laurel J. Buxbaum, Amanda M. Dawson, and Katherine J. Kuchenbecker. Vibrotactile feedback system for intuitive upper-limb rehabilitation. Hands-on demonstration presented at IEEE World Haptics Conference, Salt Lake City, Utah, USA, Proceedings of the IEEE World Haptics Conference, pp. 621–622, March 2009.
- [D38] Kyle N. Winfree, Jamie Gewirtz, Thomas Mather, Jonathan Fiene, and Katherine J. Kuchenbecker. The iTorqU 1.0 and 2.0. Hands-on demonstration presented at IEEE World Haptics Conference, Salt Lake City, Utah, March 2009.
- [D39] Joseph M. Romano, Alla Safonova, and Katherine J. Kuchenbecker. Real-time graphic and haptic simulation of deformable tissue puncture. Hands-on demonstration presented at Medicine Meets Virtual Reality, Long Beach, California, USA, January 2009.
- [D40] Katherine J. Kuchenbecker, David Ferguson, Michael Kutzer, Matthew Moses, and Allison M. Okamura. The Touch Thimble. Hands-on demonstration presented at IEEE Haptics Symposium, Reno, Nevada, USA, March 2008.
- [D41] Katherine J. Kuchenbecker, Netta Gurari, and Allison M. Okamura. Comparing visual and haptic position feedback. Hands-on demonstration at IEEE World Haptics Conference, Tsukuba, Japan, March 2007.
- [D42] Katherine J. Kuchenbecker, Jonathan P. Fiene, and Günter Niemeyer. Event-based haptic feedback. Hands-on demonstration at IEEE World Haptics Conference, Pisa, Italy, March 2005.

## PATENTS

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1. K. J. Kuchenbecker, Steven D. Domenikos, Jean-Samuel Chenard, and Ilann Derche. ***Systems and methods for providing fingertip tactile feedback from virtual objects***. United States provisional patent pending under application #62/287,506, filed January 27, 2016.
2. K. J. Kuchenbecker, Vivienne Clayton, Siyao Hu, Ilana Teicher, and Erin Vasudevan. ***Gait Rehabilitation systems, methods, and apparatuses thereof***. United States provisional patent pending under application #62/201,799, filed August 6, 2015.
3. K. J. Kuchenbecker and Siyao Hu. ***Reproducing a laser pointer dot on multiple projected screens***. United States provisional patent pending under application #62/186,640, filed June 30, 2015.
4. A. Brzezinski, K. J. Kuchenbecker, E. D. Gomez, N. Blumenfeld, B. H. Horwich, Z. E. Shurden. ***Electrocautery tactile feedback systems and methods***. International patent application PCT/US2014/034443, filed April 17, 2014. United States provisional patent pending under application #61/813,670, filed April 19, 2013.
5. K. J. Kuchenbecker, D. Standish, W. McMahan, and J. Gewirtz. ***Systems and methods for providing vibration feedback in robotic systems***. International patent application PCT/US2011/023995, filed February 8, 2011. United States national phase patent pending under application #13/577,581, filed August 7, 2012. European and Korean national phase patent applications filed in September, 2012. United States patent 9,333,039 due to issue on May 10, 2016.
6. K. J. Kuchenbecker, J. Romano, W. McMahan, and N. Landin. ***Systems and methods for capturing and recreating the feel of surfaces***. United States patent 8,988,445, issued on March 24, 2015.
7. B. G. MacGregor, J. C. B. Novoa, L. Cheng, E. Cruse, T. B. Eich, J. A. Fourt, D. M. Gresham, A. T. Grishaver, J. L. Hei, M. D. Inouye, K. J. Kuchenbecker, J. N. Ludwig, S. D. Newman, T. A. Pelman, A. Salamini, F. N. Schultz, B. J. V. Tarbell, S. A. Whitman, and D. M. Webster. ***Partition panel with modular appliance mounting arrangement***. United States Patent #6,851,226, issued February 8, 2005. International patents also issued.
8. A. Calder, L. Bayer, K. Kuchenbecker, and E. Froelich. ***Self-service terminal***. European Patent #1,258,842, issued November 20, 2002. United States patent pending under application #10/101,582.

## ENTREPRENEURSHIP

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- ***Tactai, Inc.***

Chief Science Advisor

Co-founded in stealth mode in September 2014 with CEO Steven Domenikos

Tactai is pioneering the world's first wearable device that enables users to touch and feel virtual objects with life-like realism. Based on IP from the Kuchenbecker lab at the University of Pennsylvania, our hardware and software products help create compelling immersive experiences in Augmented Reality and Virtual Reality applications for gaming, e-commerce, training, film, architecture, and education.

Phase I NSF SBIR grant of \$150,000 from July to December 2015.

Phase II NSF SBIR grant of \$750,000 awarded in September 2016.

Website: <http://tactai.com>

- ***VerroTouch Medical, Inc.***

Chief Science Advisor

Co-founded in March 2016 with CEO Steve Davis

VerroTouch Medical is developing a revolutionary device to add touch feedback to robotic surgery. Based on IP from the Kuchenbecker lab at the University of Pennsylvania, our technology measures the vibrations caused by surgical tool contact during robotically assisted minimally invasive surgery and relays them to a haptic feedback system at the control console. The surgeon controlling the robot gains important information through the sense of touch.

Website: <http://www.verrotouch.com>

## GRANTS AND CONTRACTS

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### *Current*

1. DFG Cluster of Excellence

***Integrative Computational Design and Construction for Architecture***

Role: One of 25 investigators at Uni. Stuttgart    PI: Achim Menges (University of Stuttgart) and MPI-IS

Sponsor: German Research Foundation (DFG)    Funding to Kuchenbecker Lab: ~270,000 EUR

Dates: July 1, 2019, – June 30, 2025

2. NIH Grant #R03HD092822

***Improving paretic leg walking propulsion post-stroke with a mechanical device***

Role: Co-Principal Investigator    Co-PI: Erin Vasudevan (Stony Brook U.)

Sponsor: Eunice Kennedy Shriver National Institute Of Child Health & Human Development    Funding to Kuchenbecker Lab: \$0

Funding to Vasudevan Lab: \$154,306

Dates: August 16, 2017, – July 31, 2019

3. NIH Grant #R21NS099645

***Virtual Reality Treatment of Phantom Leg Pain***

Role: Senior Personnel    PI: H. Branch Coslett (U. of Pennsylvania)

Sponsor: National Institute of Neurological Disorders and Stroke    Funding to Kuchenbecker Lab: \$0

Funding to Collaborating Labs: \$415,456

Dates: July 1, 2017, – June 30, 2019

### *Completed*

1. NSF National Robotics Initiative #IIS-1426787

***“Shall I Touch This?”: Navigating the Look and Feel of Complex Surfaces***

Role: Principal Investigator at Penn    Co-PI: Trevor Darrell (U.C. Berkeley)

Sponsor: National Science Foundation    Funding to Penn: \$400,000

Dates: October 1, 2014, – September 30, 2018    Plus \$8,000 in REU Supplements

2. Intuitive Surgical 2015 Technology Research Award

***Comparison of Cutaneous Feedback Methods for Pinching Palpation in Robotic Surgery***

Role: Principal Investigator    Co-PI: Domenico Prattichizzo (U. Siena)

Sponsor: Intuitive Surgical, Inc.    Funding to Penn: \$35,600

Dates: January 1, 2015, – June 30, 2016    Indirect costs limited to \$5,933

3. IERION Research Contract  
*Prototype of a Fingertip Tactile Feedback System for Virtual Reality*  
 Role: Principal Investigator Co-PIs: None  
 Sponsor: IERION, Inc. Funding: \$14,815  
 Dates: March 1, 2016, – March 31, 2016
4. Subcontract from NSF #IIP-1519938  
*SBIR Phase I: Enabling Natural Tactile Interaction Across the Internet*  
 Role: PI of Penn Subcontract PI at IERION: Steven Domenikos  
 Sponsor: National Science Foundation Funding: \$50,000  
 Dates: July 1, 2015, – December 31, 2015
5. Rolls-Royce Research Contract  
*Force, Displacement and Degrees of Freedom (DoF) Assessment of Boreblending*  
 Role: Principal Investigator Co-PIs: None  
 Sponsor: Rolls-Royce, Inc. Funding: \$23,239  
 Dates: March 1, 2015, – June 1, 2015
6. IERION Research Contract  
*Prototype of a Tactile Transmission System for Project Touch<sup>TM</sup>*  
 Role: Principal Investigator Co-PIs: None  
 Sponsor: IERION, Inc. Funding: \$24,000  
 Dates: February 2, 2015, – May 1, 2015
7. NSF REU Site #CNS-1156366  
*Perception, Planning, Mobility, and Interaction for Next Generation Robotics*  
 Role: Co-PI PI: Max Mintz (Penn)  
 Sponsor: National Science Foundation Funding: \$349,200  
 Dates: April 1, 2012, – March 31, 2015
8. Intuitive Surgical 2014 Technology Research Award  
*Objective Assessment of Robotic Surgical Skill Using Instrument Contact Vibrations*  
 Role: Principal Investigator Co-PIs: None  
 Sponsor: Intuitive Surgical, Inc. Funding: \$40,000  
 Dates: January 1, 2014, – March 31, 2015 Indirect costs limited to \$6,666
9. Coulter Translational Research Award  
*Vibrotactile and Auditory Feedback for Robotic Minimally Invasive Surgery*  
 Role: Principal Investigator Clinical Co-PI: David I. Lee (Penn Presbyterian)  
 Sponsor: Wallace H. Coulter Foundation Funding: \$180,000  
 Dates: September 1, 2011, – August 30, 2014 Indirect costs limited to \$30,000
10. NSF #IIS-0845670  
*CAREER: Haptography: Capturing and Recreating the Rich Feel of Real Surfaces*  
 Role: Principal Investigator Co-PIs: None  
 Sponsor: National Science Foundation Funding: \$499,495  
 Dates: July 15, 2009, – June 30, 2014 Funded via the American Recovery and Reinvestment Act (ARRA)
11. NSF #IIS-0915560  
*HCC: Small: Modular Tactile Feedback for Whole-Body Motion Guidance*  
 Role: Principal Investigator Co-PIs: None  
 Sponsor: National Science Foundation Funding: \$500,000  
 Dates: July 1, 2009, – June 30, 2014 Plus \$32,000 in REU supplements
12. DARPA BOLT Activity E Subcontract  
*Perceptual Grounding of Language using Probabilistic Models*  
 Role: Co-PI PI: Trevor Darrell (U.C. Berkeley)  
 Other Co-PIs: P. Abbeel, T. Griffiths, and D. Klein (U.C. Berkeley) and G. Friedland (ICSI)  
 Sponsor: Defense Advanced Research Projects Agency, via U.C. Berkeley Funding to Kuchenbecker Lab: \$150,000  
 Dates: October 1, 2011, – December 31, 2012



13. ARL RCTA  
***Robotics Collaborative Technology Alliance***  
Role: Co-PI, ~40 Co-PIs  
Sponsor: Army Research Laboratory  
Dates: July 1, 2010 – June 30, 2013  
Consortium Manager: Bill Borgia (GDRS)  
Funding to Kuchenbecker Lab: ~\$400,000
14. Willow Garage PR2 Beta Program  
***PR2GRASP: From Perception to Reasoning to Grasping***  
Role: Co-PI  
Other Co-PIs: K. Daniilidis, V. Kumar, D. D. Lee, J. Shi, C. J. Taylor, and M. Yim (Penn)  
Sponsor: Willow Garage  
Dates: July 1, 2010, – June 30, 2012  
PI: Maxim Likhachev (Penn)  
Funding: One PR2 two-handed mobile robot  
Equipment only, worth ~\$400,000
15. DARPA ARM-S  
***DHARMA: Dexterous Hand-Arm Robotic Manipulation Autonomy***  
Role: Co-PI  
Other Co-PIs: V. Kumar, K. Daniilidis, M. Likhachev, and D. D. Lee (Penn), R. Grupen (UMass-Amherst), and C. Geyer (iRobot)  
Sponsor: Defense Advanced Research Projects Agency  
Dates: July 1, 2010, – September 30, 2011  
PI: Wes Huang (iRobot)  
Funding to Kuchenbecker Lab: ~\$60,000
16. PDH Health Research Formula Funds  
***Vibrotactile and Auditory Feedback for Robotic Minimally Invasive Surgery***  
Role: Principal Investigator  
Sponsor: Pennsylvania Department of Health  
Dates: July 1, 2010, – December 31, 2010  
Clinical Co-PI: David I. Lee (Penn Presbyterian)  
Funding: \$75,000
17. NSF CRI #CNS-0855210  
***II-EN: Mobile Manipulation***  
Role: Co-PI  
Other Co-PIs: D. D. Lee, J. Shi, and K. Daniilidis (Penn)  
Sponsor: National Science Foundation  
Dates: September 1, 2009, – August 31, 2010  
PI: Maxim Likhachev (Penn)  
Funding: \$298,050 (for shared equipment)
18. Subcontract from PDH Health Research Formula Fund  
***Development of a Low Cost Haptic Virtual Environment for Upper Limb Rehabilitation***  
Role: Co-PI  
Other Co-PI: L. Buxbaum (Moss Rehab)  
Sponsor: Pennsylvania Department of Health, via Moss Rehab  
Dates: January 1, 2009, – December 31, 2009  
PI: Steven A. Jax (Moss Rehab)  
Funding: \$10,041
19. Subcontract from NSF #EEC-9731748  
***Haptic Effects of Nonideal Slave Dynamics in Robotic Surgery***  
Role: Principal Investigator on Subcontract  
Sponsor: National Science Foundation, via Johns Hopkins University  
Dates: September 1, 2007, – June 30, 2008  
PI: Russ Taylor (JHU)  
Funding: \$19,976

## INVITED RESEARCH PRESENTATIONS

### *Keynote Talks at Academic Conferences*

1. Plenary talk, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Macau, China. November 3–8, 2019.
2. “Haptic Interactions Matter.” Keynote, RehabWeek (combined IFESS, ICORR, IISART, ACRM, RESNA, and ISPO Canada), Toronto, Canada. June 24–28, 2019.
3. “Telerobotic Touch.” Keynote, AsiaHaptics, Songdo, South Korea. November 15, 2018.

4. “Tactile Reality.” Keynote, Hand, Brain and Technology: the Somatosensory System, Monte Verità, Switzerland. August 29, 2018.
5. “Telerobotic Touch.” Keynote, Robotics: Science and Systems (RSS), Pittsburgh, Pennsylvania, USA. June 28, 2018.
6. “Tactile Reality.” Keynote, IEEE Virtual Reality (VR), Reutlingen, Germany. March 21, 2018.
7. “Haptography: Capturing and Displaying Touch.” Keynote, Annual Meeting of the Vision Sciences Society (VSS), St. Pete Beach, Florida, USA. May 20, 2017.
8. “Haptics: The Technology of Touch.” Presidential Invited Lecture, Annual Meeting of the American Society of Hand Therapists, Boston, Massachusetts, USA. September 20, 2014.
9. “Robotics, Haptics, and Beyond.” Chevalier Jackson Lecture, Annual Meeting of the American Broncho-Esophagological Association (ABEA), Las Vegas, Nevada, USA. May 14, 2014.
10. “Innovation and Breakthrough Technologies of the Future.” Keynote, 7th International NOTES (Natural Orifice Translumenal Endoscopic Surgery) Summit, Chicago, Illinois, USA. July 13, 2012.
11. “Haptics: Touch Feedback for Robotic Surgery, Tablet Computers, and More.” Distinguished lecture, Drexel IEEE Graduate Forum’s Annual Research Symposium, Drexel University, Philadelphia, Pennsylvania, USA. March 3, 2011.
12. “Haptography: Creating Authentic Haptic Feedback from Recordings of Real Interactions.” Early Career Spotlight Talk, Robotics: Science and Systems Conference, Seattle, Washington, USA. July 1, 2009.

*Seminars at Universities, Institutes, and Industry*

1. “Haptic Intelligence.” Invited talk, Special Workshop on Haptics and Smart Interactive Systems, Department of Mechanical Engineering and School of Computing, KAIST, Daejeon, Korea. November 12, 2018.
2. “Tactile Reality.” Invited talk, Robotics Research Jam Sessions, University of Pisa, Pisa, Italy. June 12, 2018.
3. “Telerobotic Touch.” Invited seminar, Institute of Robotics and Intelligent Systems (IRIS), ETH Zurich, Switzerland. Simultaneously broadcast to NCCR Robotics researchers at EPFL. June 1, 2018.
4. “Haptic Intelligence.” Invited seminar, Department of Neuroscience, University of Tübingen, Germany. January 15, 2018.
5. “Tactile Reality.” Invited seminar, Department of Cognitive Science, University of Ulm, Germany. November 16, 2017.
6. “Haptics: The Technology of Touch.” Invited seminar on Human and Artificial Intelligence, University of Tübingen, Germany. November 13, 2017.
7. “Haptography: Capturing and Displaying Touch.” Invited seminar, Institute for Systems Theory and Automatic Control, University of Stuttgart, Germany. November 7, 2017.
8. “Haptography: Capturing and Displaying Touch.” Invited talk, Intelligent Systems Colloquium, Max Planck Institute for Intelligent Systems. July 7, 2017.
9. “Haptic Intelligence in Robotic Surgery.” Grand rounds, Department of Women’s Health, University Clinic of Tübingen, Germany. June 12, 2017.
10. “Haptography: Capturing and Displaying Touch.” Invited seminar, Department of Computer Science, University of Tübingen, Germany. May 8, 2017.
11. “Haptics: The Technology of Touch.” Invited seminar, Department of Biomedical Engineering, George Washington University, Washington, DC. November 28, 2016.
12. “Haptics: The Technology of Touch.” Invited seminar, Department of Mechanical and Aerospace Engineering, Princeton University, Princeton, New Jersey. November 18, 2016.

13. "Haptics: The Technology of Touch." Invited seminar, Maryland Robotics Center, University of Maryland, College Park, Maryland. September 23, 2016.
14. "Haptics: The Technology of Touch." Distinguished seminar for the 125th Anniversary of the Department of Mechanical Engineering, University of Delaware, Newark, Delaware. September 16, 2016.
15. "Haptic Texture Rendering." Invited seminar, Apple, Inc., Cupertino, California, May 17, 2016.
16. "Comparison of Cutaneous Feedback Methods for Pinching Palpation in Robotic Surgery." Grant summary presentation, Principal Investigator Meeting, Intuitive Surgical, Inc., Sunnyvale, California, USA. Jointly presented with Jeremy Brown, Domenico Prattichizzo, and Claudio Pacchierotti. January 8, 2016.
17. "Objective Assessment of Robotic Surgical Skill Using Instrument Contact Vibrations." Grant summary presentation, Principal Investigator Meeting, Intuitive Surgical, Inc., Sunnyvale, California, USA. Jointly presented with Jeremy Brown. January 8, 2016.
18. "Adding a Sense of Touch to Robotics in Medicine." Invited seminar, FOCUS Lunchtime Seminar Series, Perelman School of Medicine, Philadelphia, Pennsylvania. November 16, 2015.
19. "Tactile Feedback for Telerobotic Surgery." Invited seminar, Distinguished Lecture Series (DLS), University of Tennessee, Knoxville, Tennessee. September 21, 2015.
20. "Tactile Feedback and Skill Analysis in Robotic Surgery." Guest lecture, ME/CS 571: Surgical Robotics Seminar, Stanford University, Stanford, California. May 1, 2015.
21. "Haptic Feedback and Skill Evaluation in Robotic Surgery." Grand rounds, Department of Otorhinolaryngology: Head and Neck Surgery, University of Pennsylvania, Philadelphia, Pennsylvania. February 26, 2015.
22. "Haptics: The Technology of Touch." Invited seminar, Max Planck Institute for Intelligent Systems, Stuttgart, Germany, simultaneously broadcast to the MPI-IS site in Tübingen, Germany. January 26, 2015.
23. "Human-Centered Control Interfaces for Teleoperation." Invited seminar, Prattichizzo Research Group, University of Siena, Siena, Italy. December 18, 2014.
24. "The Value of Tactile Sensations in Haptics and Robotics." Invited seminar, Control Theory Seminar Series, Department of Electrical Engineering and Computer Science, University of California, Berkeley, California. April 7, 2014.
25. "The Value of Tactile Sensations in Haptics and Robotics." Invited seminar, Department of Mechanical Engineering, Rice University, Houston, Texas. March 12, 2014.
26. "The Value of Tactile Sensations in Haptics and Robotics." Invited seminar, Perceptual Science Talk Series, Rutgers University, Piscataway, New Jersey. October 7, 2013.
27. "Haptic Feedback and Analysis of Tool Vibrations in Robotic Surgery." Surgical Grand Rounds, Drexel University College of Medicine, Philadelphia, Pennsylvania. August 20, 2013.
28. "The Value of Tactile Sensations in Haptics and Robotics." Invited seminar, Robotics Colloquium, Department of Computer Science and Engineering, University of Washington, Seattle, Washington. May 24, 2013.
29. "Overview of Penn Haptics Research: The Value of Tactile Sensations in Haptics and Robotics." Invited seminar, Robotics Research Group, Johns Hopkins University Applied Physics Laboratory (JHUAPL), Baltimore, Maryland. May 21, 2013.
30. "Haptic Feedback and Analysis of Tool Vibrations in Robotic Surgery." Grand Rounds, Department of Obstetrics and Gynecology, Pennsylvania Hospital, Philadelphia, Pennsylvania. April 24, 2013.
31. "Using Robotic Exploratory Procedures to Learn the Meaning of Haptic Adjectives." Invited seminar, Department of Mechanical Engineering, Villanova University, Philadelphia, Pennsylvania. November 9, 2012.

32. "Tactile Acceleration Cues for Haptic and Robotic Systems." Invited seminar, Department of Mechanical and Civil Engineering, California Institute of Technology, Pasadena, California. May 24, 2012.
33. "Tactile Acceleration Cues for Haptic and Robotic Systems." Invited seminar, Department of Mechanical and Aerospace Engineering, University of California at Los Angeles, Los Angeles, California. March 16, 2012.
34. "Tactile Acceleration Cues for Biomedical Robotics." Invited seminar, Biomed Seminar Series, Drexel University, Philadelphia, Pennsylvania. February 3, 2012.
35. "Three Good Reasons to Buy an Accelerometer." Invited seminar, Laboratory for Computational Sensing and Robotics, Johns Hopkins University, Baltimore, Maryland. April 27, 2011.
36. "Haptics: Touch Feedback for Robotic Surgery, Tablet Computers, and More." Invited seminar, Women in Human-Computer Interaction Lecture Series, Iowa State University, Ames, Iowa. April 14, 2011. <http://vimeo.com/channels/190937#226>
37. "High-Fidelity Haptic Interfaces: Haptography, VerroTouch, StrokeSleeve, and Tactile Grasping." Invited seminar, Center for Injury Research and Prevention at The Children's Hospital of Philadelphia (CHOP). February 15, 2011.
38. "High-Fidelity Haptic Interfaces: Haptography, VerroTouch, StrokeSleeve, and Tactile Grasping." Invited seminar, Institute for Research on Cognitive Science, University of Pennsylvania. January 21, 2011.
39. "High-Fidelity Haptic Interfaces: Haptography, VerroTouch, StrokeSleeve, and Tactile Grasping." Invited seminar, Center for Robotics and Intelligent Machines, Georgia Institute of Technology, Atlanta, Georgia. November 23, 2010.
40. "Robotics in the 21st Century: From the Lab to the OR and Back." Invited seminar, Anesthesiology Grand Rounds, Main Line Health Anesthesia Departments (Lankenau, Bryn Mawr, and Paoli Hospitals), Philadelphia, Pennsylvania. November 16, 2010.
41. "Creating Realistic Virtual Textures from Contact Acceleration Data." Invited seminar, Mechanical Engineering Department, University of Maine, Orono, Maine. October 1, 2010.
42. "Creating Realistic Virtual Textures from Contact Acceleration Data." Invited seminar, Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania. September 23, 2010.
43. "High-Fidelity Haptic Interfaces for Surgical Applications." Invited seminar, Neurosurgery Grand Rounds, Hospital of the University of Pennsylvania. August 12, 2010.
44. "High-Fidelity Haptic Interfaces for Medical Applications." Invited seminar, Center for Simulation, Advanced Education, and Innovation, Children's Hospital of Philadelphia. July 21, 2010.
45. "High-Fidelity Haptic Feedback: Haptography, VerroTouch, and Stroke Sleeve." Invited seminar, Robotics Lab, Stanford University, Stanford, California. April 9, 2010.
46. "High-Fidelity Haptic Feedback for Robotic Surgery: Haptography and VerroTouch." Invited seminar, Intuitive Surgical, Inc., Sunnyvale, California. April 9, 2010.
47. "New Trends in Medical Robotics and Haptic Feedback." Invited seminar, Lankenau Hospital, Philadelphia, Pennsylvania. February 23, 2010.
48. "High-Fidelity Haptic Interfaces for Real, Remote, and Virtual Environments." Invited seminar, QinetiQ North America (QNA) / Foster-Miller, Waltham, Massachusetts. November 20, 2009.
49. "High-Fidelity Haptic Feedback for Surgical Teleoperation." Invited seminar (delivered twice), Electrical Engineering Department, University of Calgary, and Neurosurgery Department, Foothills Hospital, Calgary, Alberta, Canada. May 1, 2009.
50. "Overview of Current Research: High-Fidelity Haptic Interfaces for Real, Remote, and Virtual Environments." Invited seminar, Robotics Program, Engineering and Systems Division, SRI International, Menlo Park, California. February 10, 2009.

51. “Realistic Haptic Feedback for Virtual Environments and Teleoperation.” Invited seminar, City College of New York, New York, New York. February 7, 2008.
52. “High-Frequency Acceleration Matching for Realistic Haptic Interaction.” Invited seminar, Somatosensory Group, Krieger Mind/Brain Institute, Johns Hopkins University, Baltimore, Maryland. November 29, 2006.
53. “Characterizing and Controlling the High-Frequency Dynamics of Haptic Interfaces.” Invited seminar, ERC-CISST Seminar Series, Johns Hopkins University, Baltimore, Maryland. October 11, 2006.
54. “Characterizing and Controlling the High-Frequency Dynamics of Haptic Interfaces.” Invited seminar, Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania, Philadelphia, Pennsylvania. April 13, 2006.
55. “Realistic Haptic Feedback for Virtual Environments and Teleoperation.” Invited seminar, University of British Columbia, Vancouver, Canada, January 30; University of California, Riverside, February 6; University of California, Santa Cruz, February 8; University of Pennsylvania, February 14; Johns Hopkins University, February 16; Northwestern University, February 20; Cal Poly San Luis Obispo, February 27; Tufts University, March 2; University of Maryland, College Park, March 9; University of Michigan, Ann Arbor, March 21; Carnegie Mellon University, March 23; Massachusetts Institute of Technology, April 5; Columbia University, April 12; Duke University, April 17; Georgia Tech, April 18, 2006.

*Talks at Academic Conferences and Workshops (omitting keynotes and conference paper presentations)*

1. “The Proton Visuo-Haptic Surface Interaction Dataset.” Presentation, Workshop on Data-Driven Haptic Rendering with Multimodal Improvements for Highly Realistic Virtual Experiences, Asia-Haptics, Songdo, Korea. November 14, 2018.
2. “Haptic Intelligence.” Invited talk, Retreat for the Max Planck ETH Center for Learning Systems (CLS), Stoos, Switzerland. October 4, 2017.
3. “Haptic Intelligence for Robots.” Invited talk, Workshop of the Intel Network on Intelligent Systems (NIS), Munich, Germany. August 31, 2017.
4. “Cognitive: Physical Instrument Interactions Strongly Relate to Robotic Surgical Skill.” Invited presentation, Workshop on C4 Surgical Robots: Compliant, Continuum, Cognitive, and Collaborative, International Conference on Robotics and Automation (ICRA), Singapore, Singapore. June 2, 2017.
5. “Haptic Intelligence for Robots.” Invited presentation, Workshop on the Robotic Sense of Touch: From Sensing to Understanding, International Conference on Robotics and Automation (ICRA), Singapore, Singapore. May 29, 2017.
6. “Workshop on Interactive Multisensory Object Perception for Embodied Agents.” Plenary session (chosen by organizers to summarize our workshop to all attendees), AAAI Spring Symposia, Stanford, California, USA. March 29, 2017.
7. “Haptic Intelligence in Robotics.” Invited talk, Workshop on Interactive Multisensory Object Perception for Embodied Agents, AAAI Spring Symposia, Stanford, California, USA. March 29, 2017.
8. “Haptic Intelligence in Robotics.” Invited talk, Conference on Robotics and Autonomous Systems – Vision, Challenges, and Actions, organized by the Royal Society, London, England. November 13, 2015. Online video.
9. “Tactile Feedback of Tool Vibrations in Robotic Surgery.” Presentation, Workshop on Cutaneous Feedback for Teleoperation in Medical Robotics, IEEE World Haptics Conference, Chicago, Illinois. June 22, 2015.
10. “Key Barriers to Haptic Intelligence in Robotics.” Invited presentation, NSF Workshop on Locomotion and Manipulation: Why the Great Divide?, Arlington, Virginia. April 2, 2015.



11. "The Future of Haptics in Robotic Surgery." Invited presentation, Transoral Program, Society of Robotic Surgery Annual Meeting, Orlando, Florida. February 21, 2015.
12. "Robotic Learning of Haptic Adjectives Through Physical Interaction." Invited presentation, Workshop on Active Touch Sensing in Animals and Robots, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Chicago, Illinois. September 18, 2014.
13. "Haptic Feedback and Analysis of Tool Vibrations in Robotic Surgery." Invited presentation and panel discussion, Workshop on the Role of Human Sensorimotor Control in Surgical Robotics, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Chicago, Illinois. September 18, 2014.
14. "Where Are We and Where Are We Going With Haptics in Robotic Surgery?" Invited presentation, Johns Hopkins Symposium on Head and Neck Robotic Surgery, Adjuvant Therapy and Emerging Technologies, Baltimore, Maryland. July 25, 2014.
15. "Haptic Feedback and Skill Assessment in Robotic Surgery." Invited presentation, CHOP Airway Endoscopy Course, Philadelphia, Pennsylvania. March 22, 2014.
16. "Haptic Rendering of Textures." Half-day tutorial presented jointly with Heather Culbertson, IEEE Haptics Symposium, Houston, Texas, USA. February 23, 2014.
17. "Adding Haptics to Robotic Surgery." Invited presentation and panel discussion on robotic surgery, 5th Research Summit, American Association of Oral and Maxillofacial Surgeons (AAOMS), Chicago, Illinois. May 2, 2013.
18. "The Future of Surgical Robotics: Haptic Feedback." Invited presentation and panel discussion on robotic surgery, Annual Meeting, Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), Baltimore, Maryland. April 19, 2013.
19. "Effects of Vibrotactile Feedback on Human Learning of Arm Motions." Invited presentation, Piper Health Solutions Workshop on Rehabilitation Robotics, Arizona State University, Tempe, Arizona. February 22, 2013.
20. "Haptic Systems in Surgical Robotics." Invited presentation, IDEAS (Innovation, Design, and Emerging Alliances in Surgery) Symposium: Opportunities and Challenges in Surgical Robotics, Beth Israel Deaconess Medical Center, Boston, Massachusetts. April 21, 2012. Talk begins 47 minutes into the online video.
21. "Sensors and Sensor Interfaces." Invited presentation, Workshop on Tools and Techniques for Prototyping Haptic Interfaces, IEEE Haptics Symposium. March 4, 2012.
22. "Collaborating with Engineers." Invited presentation, Surgical Innovation and Entrepreneurship Conference, University of Pennsylvania. September 24, 2011.
23. "VerroTouch: Tool Contact Acceleration Feedback for Telerobotic Surgery." Invited presentation, Workshop on Haptics in Surgical Robotics, IEEE World Haptics Conference, Istanbul, Turkey. June 21, 2011.
24. "Human-Inspired Robotic Grasp Control with Tactile Sensing." Invited presentation, Workshop on Mobile Manipulation, IEEE International Conference on Robotics and Automation, Shanghai, China. May 13, 2011.
25. "High-Fidelity Haptic Feedback for Robotic Surgery." Invited presentation, Medical Robotics Innovation Forum, Stanford Medical Innovation Conference on Medical Robotics, Stanford University, Stanford, California. April 10, 2010.
26. "Application: Haptics." Invited presentation, Workshop on Contact Models for Manipulation and Locomotion, IEEE International Conference on Robotics and Automation, Pasadena, California. May 19, 2008.
27. "Rendering Realistic Contact with Virtual Surfaces Via Event-Based Haptic Feedback." Invited presentation, Workshop on Integration of Haptics in Virtual Environments: from Perception to Rendering. IEEE Virtual Reality Conference, Reno, Nevada. March 8, 2008.

*Talks at Conferences for Broader Audiences*

1. “3D Printing: Enabling Innovation in Tactile Technology.” Invited presentation, Philadelphia Magazine’s ThinkFest U. November 14, 2014.
2. “Adding Touch Feedback to Robotic Surgery.” Invited presentation, Pennovation Event, University of Pennsylvania. October 31, 2014.
3. Invited presentation, State of University City, Philadelphia, Pennsylvania. October 15, 2014.
4. “Haptic Feedback for Robotic Surgery.” Invited presentation with hands-on demonstrations, TEDxYouth @ Bridge Street, Phoenixville, Pennsylvania. June 6, 2014.
5. “When AR Meets the OR: Robotics and AR in Surgery.” Panel presentation, IEEE Technology for Humanity Series at South By Southwest (SXSW) Interactive, Austin, Texas. March 10, 2014.
6. “Haptics: Touch Technology.” Invited presentation, TEDYouth, New York City, New York. November 17, 2012. [http://www.ted.com/talks/katherine\\_kuchenbecker\\_the\\_technology\\_of\\_touch.html](http://www.ted.com/talks/katherine_kuchenbecker_the_technology_of_touch.html)
7. “Haptics.” PopTech Science and Public Leadership Fellow talk, PopTech Conference, Camden, Maine. October 20, 2011. [http://poptech.org/popcasts/katherine\\_j.kuchenbecker\\_haptic\\_interfaces](http://poptech.org/popcasts/katherine_j.kuchenbecker_haptic_interfaces)
8. “Touching Reality: Haptic Feedback for Robotic Surgery, Tablet Computers, and More.” Invited presentation, TEDxPenn, University of Pennsylvania. October 7, 2011.

EDUCATIONAL PRESENTATIONS AND WORKSHOPS

*Technical Lectures for Students, Alumni, Parents, and Other Groups*

1. “Tactile Feedback for Telerobotic Surgery.” Invited lecture, dinner discussion series, Kings Court English College House, University of Pennsylvania. March 16, 2016.
2. “Innovation through Touch Feedback.” Lecture with hands-on demonstrations, Wharton Executive Education, University of Pennsylvania. February 25, 2016.
3. “Haptics: The Technology of Touch.” Invited lecture for the Philomathean Society, University of Pennsylvania. April 13, 2015.
4. “The AddLab: 3-D Printing in Teaching and Research.” Invited presentation, co-presented with Nick Parrotta, Penn IT Staff Conference, University of Pennsylvania. November 17, 2014.
5. “Current Trends in Robotic Surgery.” Expert call for technology investors, ISI Group LLC. October 9, 2014.
6. “The AddLab: 3-D Printing in Teaching and Research.” Invited presentation, co-presented with Nick Parrotta and Jonathan Fiene, Penn Science Café, University of Pennsylvania. September 23, 2014.
7. “Haptics: Innovation through Touch Feedback.” Lecture, English Language Program, University of Pennsylvania. September 22, 2014.
8. “Haptic Feedback for Natural User Interfaces.” Invited presentation with hands-on demonstrations, co-presented with Heather Culbertson, meeting of NUI Central, New York, New York. July 21, 2014.
9. “Haptics: Innovation through Touch Feedback.” Lecture, Summer English Intensive Program, University of Pennsylvania. July 15, 2014.
10. “Haptics: Innovation through Touch Feedback.” Lecture with hands-on demonstrations, Wharton Executive Education, University of Pennsylvania. June 25, 2014.
11. “Haptics: Enhancing Computer Interfaces and Robotic Systems with Touch Feedback.” Invited presentation, meeting of the Philadelphia Chapter of the Association for Women in Science (AWIS). November 21, 2013.
12. “Haptics: Touch Technology.” Invited presentation with hands-on demonstrations, Penn Academy, West Palm Beach, Florida. February 9, 2013.

13. "Haptics: Touch Technology." Invited presentation, Graduate Society of Women Engineers Tech Talks, University of Pennsylvania. December 5, 2012.
14. "Haptics: Touch Feedback for Robotic Surgery, Tablet Computers, and More." Invited presentation, Ivy+ STEM Symposium for Diversity Scholars, University of Pennsylvania. October 5, 2012.
15. "Tactile Acceleration Cues for Haptic and Robotic Systems." Invited presentation, Summer Science Research Program, Bryn Mawr College. July 18, 2012.
16. "Haptics: Touch-Based Interaction." Lecture and lab tour, IRCS Undergraduate Summer Workshop on Cognitive Science, University of Pennsylvania. June 7, 2012.
17. "Haptics: Touch Technology." Lecture for alumni, Homecoming Weekend, University of Pennsylvania. November 5, 2011.
18. "Penn Haptics Research." Guest Lecture, IPD 561: Integrated Product Design Theories and Methods I, University of Pennsylvania. November 1, 2011.
19. "Three Good Reasons to Buy an Accelerometer." Master lecture for high-school-age participants in the Summer Academy in Applied Science and Technology (SAAST), University of Pennsylvania. July 22, 2011.
20. "Haptics: Touch-Based Interaction." Lecture and lab tour, IRCS Undergraduate Summer Workshop on Cognitive Science, University of Pennsylvania. June 6, 2011.
21. "Penn Haptics Research: Touch Feedback for Robotic Surgery, Tablet Computers, and More." Lecture and hands-on demonstrations for high-school-age participants in the Robotics Leadership Academy at GRASP, University of Pennsylvania. February 17, 2011.
22. "Haptics: Touch-Based Interaction with Real, Remote, and Virtual Environments." Guest lecture, EMTM 695: Robotics, Executive Masters in Technology and Management program, University of Pennsylvania. February 4, 2011.
23. "Haptics: Touch Feedback for Robotic Surgery, Tablet Computers, and More" Online lecture (webinar) for the Penn Alumni Association. November 9, 2010.
24. "Haptics: Touch-Based Interaction." Lecture and lab tour, IRCS Undergraduate Summer Workshop on Cognitive Science, University of Pennsylvania. June 16, 2010.
25. "Introduction to Haptics: Touch-Based Interaction with Real, Remote, and Virtual Environments." Guest lecture, CIS 563: Physically Based Animation, University of Pennsylvania. March 29, 2010.
26. "Haptics: Touch Feedback for Robotic Surgery and More." Invited presentation, Society of Women Engineers (SWE) Region E Conference, University of Pennsylvania. March 20, 2010.
27. "Haptics: Touch-Based Interaction with Real, Remote, and Virtual Environments." Guest lecture, EMTM 695: Robotics, Executive Masters in Technology and Management program, University of Pennsylvania. October 30, 2009.
28. "Haptography: Capturing and Recreating the Rich Feel of Real Surfaces." Master lecture for high-school-age participants in the Summer Academy in Applied Science and Technology (SAAST), University of Pennsylvania. July 24, 2009.
29. "Please Touch! Haptic Technology for Games, Surgery, and More." Keynote speech, RobotGames Competition, University of Calgary, Calgary, Alberta. May 2, 2009.
30. "Introduction to Haptics: Touch-Based Interaction with Real, Remote, and Virtual Environments." Guest lecture, CIS 563: Physically Based Animation, University of Pennsylvania. March 2, 2009.
31. "Haptics: Touch-Based Interaction with Real, Remote, and Virtual Environments." Lecture for participant parents, Science and Technology Series, Center for Talented Youth Robotics Program, University of Pennsylvania. November 15, 2008.

32. “Haptics: Touch-Based Interaction with Real, Remote, and Virtual Environments.” Guest lecture, EMTM 695: Robotics, Executive Masters in Technology and Management program, University of Pennsylvania. October 31, 2008.
33. “Haptics: Touch-Based Interaction with Real, Remote, and Virtual Environments.” Master lecture for high-school-age participants in the Summer Academy in Applied Science and Technology (SAAST), University of Pennsylvania. July 25, 2008.
34. “Haptics: Touch-Based Interaction with Real, Remote, and Virtual Environments.” Guest lecture, EMTM 695: Robotics, Executive Masters in Technology and Management program, University of Pennsylvania. October 26, 2007.

#### *Educational Lectures and Outreach Activities*

1. “Debugging.” Co-presenter (with Georg Martius), retreat for the International Max Planck Research School for Intelligent Systems (IMPRS-IS). October 13, 2017.
2. “Research Ethics.” Presenter, retreat for the International Max Planck Research School for Intelligent Systems (IMPRS-IS). October 11, 2017.
3. “Creating Meaningful Assignments.” Leader, workshop for graduate students and postdocs, sponsored by the MEAM Department and the Center for Teaching and Learning, University of Pennsylvania. October 14, 2015.
4. “Effective Lecturing.” Co-presenter (with Sanjeev Khanna), workshop for SEAS faculty, Center for Teaching and Learning, University of Pennsylvania. February 24, 2015.
5. Invited guest, “Women@Work” radio show on Business Radio Powered by the Wharton School, SiriusXM channel 111. September 10, 2014.
6. “The Joy of Being a Faculty Member.” Panelist, School of Engineering and Applied Science, University of Pennsylvania. February 7, 2014.
7. “Effective Lecturing.” Leader, workshop for graduate students and postdocs, sponsored by the MEAM Department and the Center for Teaching and Learning, University of Pennsylvania. November 15, 2013.
8. “Women in STEM 2013.” Panel moderator, Annenberg Center for the Performing Arts, University of Pennsylvania. October 3, 2013.
9. “Research Ethics.” Presenter or Co-Presenter (with Max Mintz), workshop for undergraduate researchers in various programs such as Rachleff Scholars and SUNFEST REU Site. Given five times: October 27, 2016, July 12, 2016, October 15, 2015, June 26, 2014, June 27, 2013.
10. “Earning an NSF Graduate Research Fellowship.” Co-Presenter (with Jason Burdick), School of Engineering and Applied Science, University of Pennsylvania. Given seven times: October 6, 2015, October 7, 2014, October 8, 2013, October 9, 2012, October 14, 2011, October 16, 2009, and October 10, 2008.
11. “Mechanical Engineering in Action!” Hands-on design activities for PennGEMS: Girls in Engineering Math and Science Camp, University of Pennsylvania. Given nine pairs of times: July 25 and 29, 2016, July 30 and 31, 2015, July 30 and August 1, 2014, July 30, 2013, July 30 and August 2, 2012, August 2 and 3, 2011, August 3 and 4, 2010, August 6 and 7, 2009, and August 7, 2008.

#### MEDIA HIGHLIGHTS

- June 2018 IEEE Spectrum published an article by Evan Ackerman featuring research by Prof. Kuchenbecker and her Ph.D. student Alexis Block: *The Importance of Teaching Robots to Hug*. Many other media outlets then ran related stories, as documented in the following press release by Linda Behringer: *Alexis Block is Teaching Robots to Give Good Hugs*
- July 2017 Ira Flatow did a Science Friday interview with Prof. Kuchenbecker that was broadcast on NPR in the USA: *Can You Feel Me Now? The Science Of Digitizing Touch*

- July 2017 German magazine GEO published a long article about the sense of touch that included an interview of Prof. Kuchenbecker, a headshot of her, and a photograph of her da Vinci robot.
- September 2016 Rolling Stone published an article by John Gaudiosi about Tactai, one of Prof. Kuchenbecker's start-up companies: *Virtual Touch: Inside Technology That Makes VR Feel Real*
- September 2016 Philadelphia Magazine published a long article by Sandy Hingston featuring Prof. Kuchenbecker, Naomi Fitter, and other local roboticists: *Welcome to Philly's Robot Revolution*
- May 2016 The New Yorker published a long article by Adam Gopnik featuring Prof. Kuchenbecker and her lab's research: *Feel Me: What the New Science of Touch Says about Ourselves*
- April 2016 The PennCurrent published an online article and video about the Penn Haptics Group: *Penn Researchers Get Hands-on Experience at Haptics Symposium*
- April 2016 Philly.com published an article about the 2016 IEEE Haptics Symposium, which Prof. Kuchenbecker co-chaired: *The Technology of Touch: Mini-motors Enhance Tactile World*
- March 2016 Polygon's Christopher Grant published an article about Professor Kuchenbecker's Tactai demo: *On Eve of VR Launches, Hands-on With a New Haptic Ideal*
- March 2015 Circuit Cellar magazine published a six-page profile on Professor Kuchenbecker and her lab: *Advances in Haptics Research*
- October 2014 ECRI Institutes Health Technology Trends publication highlighted the Kuchenbecker lab's research: *More Than a Feeling? Can Haptics Improve Robot-Assisted Surgery?*
- May 2014 Penn created a four-part multimedia feature on current research in the GRASP Lab, highlighting several projects in the Kuchenbecker lab: *Robotics at the University of Pennsylvania*
- January 2014 Along with Professors Vijay Kumar and Dan Lee, Professor Kuchenbecker was a guest on Radio Times with Marty Moss-Coane, which broadcasts live on WHY? *Robotic Roundup*
- January 2014 The international magazine Future by Semcon published a three-page Q&A interview about haptics with Professor Kuchenbecker: *Introducing Touch to the Computer World*
- May 2013 IEEE Spectrum highlighted the Kuchenbecker lab's ICRA paper, which won the Best Cognitive Robotics Paper award: *Finally: Robots Learn What 'Squishy' Really Means*
- May 2013 Alok Jha and a BBC film crew recorded demonstrations of robotics research project in the Kuchenbecker lab for an episode of Dara O Briain's Science Club.
- March 2013 Professor Kuchenbecker's TEDYouth talk was featured on TED.com on March 29, 2013, and was highlighted as the TED talk of the week: *Katherine Kuchenbecker's talk on TED.com*
- December 2012 Professor Kuchenbecker's TEDYouth talk was the lead item in Penn News Today on December 14, 2012: *Katherine Kuchenbecker Presents at TEDYouth 2012*
- November 2012 PBS NOVA featured the Kuchenbecker lab's research on touch feedback for robotic surgery in a video hosted by David Pogue: *Augmented Reality With a Sense of Touch*
- November 2012 Time For Kids highlighted Professor Kuchenbecker's presentation and hands-on demonstrations at TEDYouth: *TEDYouth challenges New York City students to think outside the box*
- April 2012 The Philadelphia City Paper featured Professor Kuchenbecker and her lab's research as the cover story in their Science and Technology Issue: *Are You Ready For A New Sensation?*
- April 2012 The National Science Foundation worked with Penn Publicity to create an NSF Innovators video about the Kuchenbecker Lab's Haptography research project. This video was also featured as a multimedia news item on the Penn homepage for several weeks.
- March 2012 The Electric Playground produced a video on the 2012 IEEE Haptics Symposium. The Kuchenbecker Lab's TexturePad, StrokeSleeve, and VerroTeach projects are all visible in the video.
- October 2011 Willow Garage prominently featured the Kuchenbecker Lab's demo of the PR2 giving hugs, handing out business cards, and giving high-fives in their video montage of IROS 2011.
- October 2011 The Urology Times published an article summarizing the Kuchenbecker Lab's VerroTouch project: *Vibrotactile feedback enhances robotic urologic surgery, according to study.*
- August 2011 SmartPlanet blogger Reena Jana wrote about Professor Kuchenbecker: *Why design is key in haptics innovation*
- January 2011 The Philadelphia Inquirer ran an article about the projects presented at the open house for Professor Kuchenbecker's haptics class: *Haptics offer the sensation of touch without touching*
- December 2010 MentorNet ran an article about Professor Kuchenbecker's career path: *MentorNet Alumna: Being a Woman in Engineering is "Fun"*



- November 2010 Many news outlets featured Professor Kuchenbecker's selection to the Popular Science Brilliant Ten, including the Daily Pennsylvanian, Stanford Women's Volleyball, and the Penn Current.
- August 2010 The Kuchenbecker Lab's research was featured in the cover article for the July/August issue of the Pennsylvania Gazette, Penn's alumni magazine: *Touching the Virtual Frontier*
- April 2010 Many online news outlets mentioned the Tactile Gaming Vest demo shown by the Kuchenbecker Lab at the IEEE Haptics Symposium, including IEEE Spectrum, Wired, Make, Gizmodo, Slash Gear, Slashdot, and Ubergizmo
- March 2009 Professor Kuchenbecker and the iTorqU 2.0 were featured on the back cover of the Pennsylvania Gazette, Penn's alumni magazine.

## ADVISING

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### *Visiting Faculty*

Brent Gillespie, Ph.D., Professor of Mechanical Engineering at the University of Michigan, Ann Arbor, USA.

Visiting Professor at the Max Planck Institute for Intelligent Systems, September 2017 through early 2019.

Supported by a 2018 Humboldt Research Award (nominated by Kuchenbecker).

Seungmoon Choi, Ph.D., Associate Professor of Computer Science and Engineering at Pohang University of Science and Technology (POSTECH), South Korea.

Visiting Associate Professor in Mechanical Engineering and Applied Mechanics at the University of Pennsylvania, July 2011 through July 2012.

### *Postdoctoral Fellows*

Gökhan Serhat, Ph.D., December 2018 through present.

Haliza Mat Husin, March 2018 through present.

Yasemin Vardar, Ph.D., February 2018 through present.

Selected for Sign-Up! 2019, a career-building program for excellent female postdocs in MPG.

David Gueorguiev, Ph.D., October 2017 through present.

Hyosang Lee, Ph.D., October 2017 through present.

Hasti Seifi, Ph.D., July 2017 through present.

Postdoctoral Fellowship from the National Sciences and Engineering Research Council (NSERC) of Canada, 2018–2020.

EuroHaptics Society Award for Best Ph.D. Thesis in 2017.

Gunhyuk Park, Ph.D., April 2017 through January 2019.

Starting in February 2019 as an Assistant Professor at Gwangju Institute of Science and Technology (GIST) in Gwangju, South Korea.

Jeremy D. Brown, Ph.D., July 2014 through December 2016.

Penn Postdoctoral Fellowship for Academic Diversity, 2014–2017.

Now an Assistant Professor at the Johns Hopkins University in Baltimore, Maryland, USA.

Karlin Bark, Ph.D., September 2010 through August 2012.

L'Oréal Postdoctoral "For Women in Science" Fellowship (\$54,000 research grant) 2011–2012.

Now at Apple, Inc., in Sunnyvale, California, USA.

### *Doctoral Students*

Rachael Bevill Burns, Spring 2018 through present. Anticipated graduation March 2021.

Ph.D. Student in the International Max Planck Research School for Intelligent Systems.

Initial stay at MPI-IS supported by a Whitaker Award.

Mayumi Mohan, Fall 2017 through present. Anticipated graduation September 2020.

Ph.D. Student in the International Max Planck Research School for Intelligent Systems.

- Saekwang Nam, Fall 2017 through present. Anticipated graduation September 2020.  
Ph.D. Student in the International Max Planck Research School for Intelligent Systems.  
Co-advised by Metin Sitti, Max Planck Institute for Intelligent Systems.
- Ben Richardson, Fall 2017 through present. Anticipated graduation September 2020.  
Ph.D. Student in the International Max Planck Research School for Intelligent Systems.
- Alexis E. Block, Summer 2017 through present. Anticipated graduation June 2020.  
Ph.D. Student in the Max Planck ETH Center for Learning Systems (CLS).  
Co-advised by Otmar Hilliges and Roger Gassert, both at ETH Zürich.  
CLS Fellowship.
- Eric Young, Fall 2015 through present. Anticipated graduation May or August 2020.  
Ph.D. Student in Mechanical Engineering and Applied Mechanics at Penn.  
NSF Graduate Research Fellowship 2015–2020 (two years deferred).  
Intern at Oculus Research in Fall of 2018.
- Siyao “Nick” Hu, Fall 2015 through present. Anticipated graduation August 2019.  
Ph.D. Student in Mechanical Engineering and Applied Mechanics at Penn.  
MEAM Masters Merit Scholarship (when pursuing a MEAM Masters at Penn).  
Intern at Schlumberger-Doll Research in Fall of 2018.
- Alex Burka, Fall 2014 through August 2018.  
Ph.D. Student in Electrical and Systems Engineering at Penn.  
NSF IGERT Traineeship in Complex Scene Perception 2013–2015.  
Participated in the Machine Learning Summer School in Tübingen, Germany, 2015.  
Dissertation: “Instrumentation, Data, and Algorithms for Visually Understanding Haptic Surface Properties”  
Now a robotics engineer at Exyn Technologies in Philadelphia, USA.
- Naomi Fitter, 2012 through 2017.  
Ph.D. in Mechanical Engineering and Applied Mechanics at Penn.  
NSF IGERT Traineeship in Complex Scene Perception 2012–2014.  
NSF Graduate Research Fellowship 2013–2017 (one year deferred).  
Participated in the Human-Robot Interaction (HRI) Pioneers Workshop, 2014.  
MEAM Department John A. Goff Prize 2016.  
Dissertation: “Design and Evaluation of Interactive Hand-Clapping Robots”  
Now a postdoctoral researcher with Maja Mataric at USC, Los Angeles, California, USA.  
Will become an Assistant Professor at Oregon State University in Corvallis, Oregon, USA, in January 2019.
- Rebecca Pierce Khurshid, 2010 through 2015.  
Ph.D. in Mechanical Engineering and Applied Mechanics at Penn, October 2015.  
NSF Graduate Research Fellowship 2011–2015 (one year deferred).  
Best Teaching Assistant, Mechanical Engineering and Applied Mechanics, Spring 2013.  
CTL Fellow Graduate Fellow for Teaching Excellence, 2013–2014.  
Dissertation: “Increasing Transparency and Presence in Teleoperation Through Human-Centered Design”  
Was a postdoctoral researcher with Julie Shah at MIT, Boston, Massachusetts, USA.  
Now an Assistant Professor at Boston University in Boston, Massachusetts, USA.
- Heather Culbertson, 2010 through 2015.  
Ph.D. in Mechanical Engineering and Applied Mechanics at Penn, August 2015.  
NSF Graduate Research Fellowship 2011–2015 (one year deferred).  
Best Demonstration, IEEE World Haptics Conference 2013.  
Finalist for Best Paper, IEEE World Haptics Conference 2013.  
Dissertation: “Data-Driven Haptic Modeling and Rendering of Realistic Virtual Textured Surfaces”  
Was a postdoctoral researcher with Allison Okamura at Stanford University, Stanford, California, USA.  
Now an Assistant Professor at the University of Southern California in Los Angeles, California, USA.

William McMahan, 2008 through 2013.

Ph.D. in Mechanical Engineering and Applied Mechanics at Penn, May 2013.

Best Poster in Session (of 17 posters), American Urological Association Annual Meeting 2011.

Best Demonstration, IEEE World Haptics Conference 2009.

Dissertation: “Providing Haptic Perception to Telerobotic Systems via Tactile Acceleration Signals”

Was at Neocis (medical robotics start-up) in Miami, Florida, USA.

Now at a stealth robotics startup in Boston, Massachusetts, USA.

Joseph M. Romano, 2007 through 2012.

Ph.D. in Mechanical Engineering and Applied Mechanics at Penn, May 2012.

Best Teaching Assistant, Mechanical Engineering and Applied Mechanics, Fall 2008.

Best Teaser Presentation, IEEE Haptics Symposium 2010.

Intern at Willow Garage in Summer 2010.

Intern at Rethink Robotics in Winter 2012.

Dissertation: “Combining Tactile and Kinesthetic Information in Human and Machine Haptic Systems”

Now at a stealth robotics startup in Boston, Massachusetts, USA.

#### *Masters Thesis Students*

Maria Paola Forte, graduated July 2018.

M.S. in Biomedical Engineering at Politecnico di Milano.

Thesis: “Robust Visual Augmented Reality for Robot-Assisted Surgery”

Now an engineer in the Haptic Intelligence Department at MPI-IS.

Alexis E. Block, graduated May 2017.

M.S.E. in Robotics at Penn.

Thesis: “How Should Robots Hug?”

Now a Ph.D. student in the Center for Learning Systems at MPI-IS / ETH-Zurich.

Ernest (Ted) Gomez, graduated May 2013.

M.D./M.T.R. (Masters in Translational Research) at Penn.

Thesis: “The Role of Haptic Tool Vibrations in Skill Acquisition and Assessment in Minimally Invasive Robotic Surgery”

Now a Resident in Otorhinolaryngology, Hospital of the University of Pennsylvania.

Diane Tam, graduated September 2012.

M.S. Student with HCI Sub-Specialization at the University of British Columbia.

Co-advised by Karon MacLean and Joanna McGrenere.

Thesis: “The Design and Field Observation of a Haptic Notification System for Timing Awareness During Oral Presentations”

Yunqing (David) Wang, graduated December 2011.

M.S.E. in Bioengineering at Penn.

Thesis: “HALO: Haptic Alerts for Low-hanging Obstacles in White Cane Navigation”

Now at the U.S. Patent Office in Alexandria, Virginia, USA.

Pulkit Kapur, graduated May 2010.

M.S.E. in Mechanical Engineering and Applied Mechanics at Penn.

Thesis: “StrokeSleeve: Spatially Distributed Tactile Feedback for Kinesthetic Motion Guidance”

Kyle N. Winfree, graduated August 2009.

M.S.E. in Robotics at Penn.

Thesis: “An Ungrounded Haptic Torque Feedback Device: The iTorqU”

Was a Postdoc at the University of Delaware, USA.

Now an Assistant Professor at Northern Arizona University in Flagstaff, Arizona, USA.

#### *Undergraduate Thesis Students*

Austin Remington, graduated May 2014.

B.S. in Biological Basis of Behavior (BBB) at Penn, with honors.

Honors Thesis: “The Effect of Audio Tool Vibrations on Performance in Laparoscopic Surgery”

Now a Medical Student at Stanford University, California, USA.

*Visiting and Rotating Graduate Students*

Kyungseo Park, June 2018 – November 2018.

Ph.D. student in Mechanical Engineering at KAIST, South Korea.

Rachael L’Orsa, May 2018 – August 2018.

Ph.D. student in Electrical Engineering at the University of Calgary, Canada.

Exchange funded by a Deutscher Akademischer Austauschdienst (DAAD) scholarship.

Maria-Paola Forte, September 2017 – July 2018.

Masters thesis student in Bioengineering – Technologies for Electronics at Politecnico di Milano, Milan, Italy.

Canaan Ng, September 2016 – December 2016.

Masters student in Mechanical Engineering at the University of Calgary, Canada.

Exchange funded by a Canada Graduate Scholarship Michael Smith Foreign Study Supplement.

Andrés Bur, M.D., July 2014 – December 2014.

Resident in Otorhinolaryngology (ENT) at the University of Pennsylvania.

Claudio Pacchierotti, January 2014 – July 2014.

Ph.D. student in Advanced Robotics at the Italian Institute of Technology, Italy, and in Information Engineering and Mathematical Sciences at the University of Siena, Italy, under Professor Domenico Prattichizzo.

EuroHaptics Society Best Ph.D. Thesis Award 2015.

Was a postdoctoral researcher at IIT, Genoa, Italy.

Now a CNRS scientist at IRISA and Inria, Rennes, France.

Yosuke Kurihara, September 2012 – December 2012.

Masters student in Informatics at The University of Electro-Communications (UEC), Japan, under Professor Hiroyuki Kajimoto.

Now an R&D engineer at Sony Computer Entertainment, Tokyo, Japan.

Gabjong Han, October 2011 – January 2012.

Ph.D. student in Computer Science and Engineering at Pohang University of Science and Technology (POSTECH), Korea, under Professor Seungmoon Choi.

Rahul Chaudhari, September 2011 – November 2011.

Ph.D. student in Media Technology at Technische Universität München (TUM), Germany, under Professor Eckehard Steinbach.

Supported by a \$2,000 student exchange award from the IEEE Technical Committee on Haptics.

*Research Engineers, Technicians, and Administrative Staff*

Maria Paola Forte, July 2018 – present.

Post-masters research engineer at the Max Planck Institute for Intelligent Systems.

Farimah Fazlollahi, March 2018 – present.

Post-masters research engineer at the Max Planck Institute for Intelligent Systems.

Joey Burns, November 2017 – present.

IT administrator at the Max Planck Institute for Intelligent Systems.

Ildikó Papp-Wiedmann, October 2017 – present.

Administrative assistant (50%-75% position) for my Managing Director duties at the Max Planck Institute for Intelligent Systems.

Gemma Ciabattoni, September 2017 – August 2018..

Post-bachelors research engineer at the Max Planck Institute for Intelligent Systems.

Bernard Javot, Ph.D., September 2017 – present.

Post-doctoral research engineer at the Max Planck Institute for Intelligent Systems.

Iлона Jacobi, January 2017 – present.

Administrative assistant for my department at the Max Planck Institute for Intelligent Systems.

Paul Kress, October 2016 – present.

Post-masters research engineer at the Max Planck Institute for Intelligent Systems.

Michaela Wieland, October 2016 – present.

Technician at the Max Planck Institute for Intelligent Systems.

Craig McDonald, June 2012 – July 2013.

Post-bachelors research engineer at the University of Pennsylvania.

Jamie Gewirtz, June 2010 – August 2010.

Post-masters resesarch engineer at the University of Pennsylvania.

#### *Non-thesis Graduate Students*

As listed below in reverse chronological order, many additional graduate students work with me without writing a thesis. Research is performed for independent study course credit, for salaried or hourly pay, or on a volunteer basis. Individuals who simultaneously complete an undergraduate degree at Penn are listed in the undergraduate category.

#### *Graduation in 2018*

Myles Cai · MEAM at Penn, April 2017 – June 2017.

#### *Graduation in 2017*

Xiaozhuo “Laura” Cheng · MEAM and CIS at Penn, August 2015 – December 2015. MEAM Masters Merit Scholarship. Now at SAS Institute.

Abhinav Rajvanshi · Robotics at Penn, May 2016 – September 2016.

Haoran Shao · MEAM at Penn, October 2015 – March 2016.

Brian Wright · Robotics at Penn, August 2015 – May 2017. NSF Fellowship. Now at MPI-IS.

#### *Graduation in 2016*

Mary Ibrahim · MEAM at Penn, January 2015 – May 2016. Now at Draper.

Alex Miller · MCIT & CGGT at Penn, May 2015 – May 2016. Now at the Hospital of the University of Pennsylvania.

#### *Graduation in 2015*

Siyao “Nick” Hu · MEAM at Penn, August 2014 – August 2015. MEAM Masters Merit Scholarship.

Yunyun “Stephany” Hsu · MEAM at Penn, October 2015 – December 2015. Now at Amgen.

Shweta Krishnan · MEAM at Penn, May 2014 – May 2015. Now at Lumacyte.

Conor O’Brien · Robotics at Penn, January 2014 – May 2015. Now at Otherlab.

Priyanka Shirsat · MEAM at Penn, December 2013 – May 2014. Now at Cummins, Inc.

#### *Graduation in 2014*

Alexandre Miranda Añon · Robotics at Penn, May 2013 – October 2014. Now at Honda Research Institute.

Tyler Barkin · Robotics at Penn, May 2013 – December 2013. Now at Portal Instruments.

Liting Chen · Medicine at Penn, June 2012 – August 2012.

Vivienne Clayton · MEAM at Penn, September 2012 – May 2014. Now at Stryker Medical.

Kent deVillafranca · Robotics at Penn, May 2013 – July 2014, October 2014 – July 2015 (on staff).

Sarah Leung · Robotics at Penn, May 2014 – December 2014. Now at Boeing.

#### *Graduation in 2013*

Vivian Chu · Robotics at Penn, January 2012 – May 2013. Now a Ph.D. student at Georgia Tech.

Michael Gosselin · MEAM at Penn, September 2012 – December 2013. Now at Transcriptic.

Karen Qin He · MEAM at Penn, August 2012 – January 2013.

Jennifer Hui · Robotics at Penn, August 2011 – August 2016. NSF graduate research fellowship and NSF IGERT Traineeship in Complex Scene Perception. Also completed many requirements toward a Ph.D. in Computer and Information Science before leaving the program.

Neel Shah · Robotics at Penn, May 2012 – May 2013. Now at Apple.

Ryan Wilson · Robotics at Penn, June 2012 – May 2013. Now at Boeing.

#### *Graduation in 2012*

Ian McMahon · Robotics at Penn, January 2012 – May 2013. Now at Rethink Robotics.



*Graduation in 2011*

Ben Goodman · Robotics at Penn, May 2011 – January 2012. Now at Intuitive Surgical.  
Brina Goyette · Post-Bac Pre-Health at Penn, September 2010 – August 2011. Now at Calgary Med. School.  
Tim Herrmann · Electrical Engineering at Penn, January 2011 – May 2011. Now at Northrop Grumman.  
Peter Huang · MEAM at Penn, June 2010 – August 2010.  
Jackie Kunkel · MEAM at Penn, June 2010 – September 2010.  
Kyle Maroney · Robotics at Penn, January 2011 – May 2011. Now at Rethink Robotics.

*Graduation in 2010*

Jacob Levinson · MEAM at Penn, September 2009 – April 2010. Now at Boeing.  
Edward Li · MEAM at Penn, February 2010 – June 2010.  
Saurabh Palan · Robotics at Penn, June 2009 – May 2010.

*Graduation in 2009*

Jamie Gewirtz · Robotics at Penn, May 2008 – May 2010. Now at a medical device startup.  
Sunthar Premakumar · Robotics at Penn, September 2008 – May 2009. Now at Piazza.

*Undergraduate Research Students*

Over 60 undergraduate researchers have been recruited and mentored since 2007, as listed below. Most are Penn students; non-Penn students are marked with a  $\diamond$ . Research is performed for independent study course credit, for hourly pay, or on a volunteer basis. Many of the undergraduate researchers have been co-authors on papers or abstracts, and several of them have gone on to Ph.D. research with competitive national fellowships.

*Class of 2019*

Dylan Hawkes · MEAM and CIS at Penn, May 2016 – August 2016. PURM fellowship.  
Yi-Lin “Eileen” Huang · EE at Penn, May 2016 – August 2016. PURM fellowship.

*Class of 2018*

Sarah Allen · MEAM at Penn, May 2016 – September 2016.  
Jaimie Carlson · BE and CIS at Penn, November 2015 – June 2017. Rachleff Scholar.  
Kwame Owusu · MEAM at Penn, June 2016 – September 2016.

*Class of 2017*

Elyse Chase · MEAM at Penn, May 2015 – May 2017. Abraham Award. Goldwater Scholarship. Now at Stanford.  
Sean Cohen · MEAM at Penn, January 2015 – August 2015. Rachleff Scholar.  
Lindsay Gardner · MEAM at Penn, October 2015 – May 2016.  
Ilana Teicher · MEAM at Penn, January 2015 – August 2015. Rachleff Scholar.

*Class of 2016*

Romer Beato · MEAM at Penn, June 2014 – August 2014.  
Alexis Block · Robotics masters and MEAM at Penn, May 2014 – May 2017. University Scholar. Penn Student Award of Merit.  
Stu Helgeson · Robotics masters and MEAM at Penn, May 2015 – August 2015.  
Yousi “Josey” Oquendo · Robotics masters and BE at Penn, April 2015 – August 2017. Now at Stanford Medical School.  
Lan Pham  $\diamond$  Mechanical Engineering at Syracuse, June 2014 – August 2014. GRASP REU.  
Juhanna Robberts · MEAM masters and BE at Penn, May 2016 – May 2017.

*Class of 2015*

Raven Hooper  $\diamond$  Electrical and Computer Engineering at Temple, June 2012 – August 2012. GRASP REU.  
Jackie Koehn · MEAM masters and Cognitive Science at Penn, May 2012 – December 2014. Now at Specialized Bicycle Components.  
Adrian Lievano · Robotics masters and MEAM at Penn, September 2012 – May 2013, May 2014 – May 2015. Littlejohn Fellowship. Winner of the 2015 Penn President’s Engagement Prize.  
John Nappo · MEAM at Penn, May 2012 – May 2013. Now at Walt Disney Imagineering.  
Michelle Neuburger  $\diamond$  Computer Science at Bryn Mawr, June 2014 – August 2014. GRASP REU.

*Class of 2014*

Jonathan Blutinger · IPD masters and MEAM at Penn, October 2014 – May 2015. Now at Macron Dynamics.

Andrew Botelho · EE at Penn, September 2012 – May 2013. Lockheed Martin.

Liz Fedalei · MEAM at Penn, June 2012 – May 2014. Now at Schlumberger.

Naomi Hachen · MEAM masters and Bioengineering at Penn, September 2014 – December 2014. Now at Lincoln Labs.

Emily Hyman · Systems Engineering at Penn, June 2012 – August 2012. Rachleff Scholar.

Eza Koch · Robotics masters and MEAM at Penn, August 2011 – May 2013, September 2014 – July 2015.

Michael Lautman · Computer Engineering at Penn, June 2011 – May 2012.

Juan José Lopez Delgado · Robotics masters and Computer Science at Penn, May 2013 – February 2014.

Kunal Mahajan · Computer Engineering at Penn, May 2012 – May 2013. Now at Columbia.

Jorge Martinez Perez-Tejada · Cognitive Science and Electrical Engineering at Penn, July 2012 – August 2013.

Julieth Ochoa-Canizares ◊ Robotics at WPI, May 2013 – August 2013. GRASP REU. GEM Fellowship. Now at MIT.

Nick Pesta · MEAM at Penn, May 2012 – December 2012. Now at Habitat for Humanity Philadelphia.

Austin Remington · Biological Basis of Behavior at Penn, October 2010 – May 2014. Now at Stanford Medical School.

Tommy Sisson · Robotics masters and MEAM at Penn, September 2014 – May 2015. Now at Fluor Corporation.

Julie Walker ◊ Mechanical Engineering at Rice, June 2012 – August 2012. GRASP REU. NSF Fellowship. Now at Stanford.

*Class of 2013*

Michael Arrigo · Linguistics masters and Cognitive Science and Linguistics at Penn, July 2012 – May 2013. Now at LDC.

Anna Brzezinski · Bioengineering at Penn, January 2012 - May 2012. Now at Cleveland Clinic.

Pablo Castillo · MEAM at Penn, February 2011 – May 2012. PURM fellowship. Now at Lutron.

Hannah Korus ◊ Computer Science at Stanford, July 2011 – August 2011.

Michael Lo · Robotics masters and MEAM at Penn, May 2013 – December 2013. Now at Schlumberger.

Robert Parajon · MEAM at Penn, January 2011 – May 2013. Now at Rochester University.

Thamolwan Surakiatchanukul · Biochemistry, Biology, and Finance at Penn, May 2012 – August 2013. Now at UVA Medical School.

Ettie Unwin ◊ Mechanical Eng. at U. Southampton, August 2012 – September 2012. Now at Cambridge.

Connie Wu · Electrical Engineering at Penn, January 2011 – April 2011. NSF Fellowship. Now at Stanford.

*Class of 2012*

Anat Bordoley · MEAM at Penn, September 2009 – April 2010. Now at Boeing.

Karan Desai · MEAM at Penn, June 2011 – August 2011. Now at Goodyear.

Max Effron · MEAM at Penn, March 2010 – March 2011. Now at Betterment.

Andy Guenin · MEAM at Penn, May 2010 – May 2011. Now at BlackRock.

Rikki Irwin · MEAM at Penn, September 2009 – June 2010. Now at Industrial Automation, Inc.

Christine Kappeyne · MEAM at Penn, November 2008 – May 2009. Now at SpaceX.

Preeya Khanna · Bioengineering at Penn, May 2010 – September 2010. NSF Fellowship. Now at UCSF.

Adam Libert · MEAM at Penn, June 2010 – August 2010. Now at SpaceX.

Magalie Lilavois · Bioengineering at Penn, May 2010 – December 2010. LS-AMP program. Now at Memorial Sloan Kettering.

Craig McDonald · MEAM at Penn, June 2010 – May 2012. Now at Rice University.

Charlotte Rivera · Bioengineering at Penn, June 2011 – May 2012. LS-AMP program. Now at Recombine.

Dorsey Standish · MEAM at Penn, June 2009 – May 2011. PURM fellowship. Now at TI.

Ian Stephens · MEAM at Penn, September 2009 – August 2010. Now at Flowserve.

Frank Tan · MEAM masters and Bioengineering at Penn, October 2010 – May 2013. Now at the Recurse Center.

*Class of 2011*

Elizabeth Cha ◊ BE and CS at JHU, June 2011 – August 2011. NSF and NASA Fellowships. Now at USC.

Simon Healey · MEAM masters and MEAM at Penn, June 2011 – December 2011. Now at DMC Engineering.

Paul D. Martin · Electrical Engineering at Penn, October 2009 – May 2011. Now at UCLA.

Ned Naukam · MEAM at Penn, September 2009 – May 2010. Now at SIG.

Andrew A. Stanley · MEAM at Penn, May 2012 – August 2011. NSF Fellowship. Stanford Ph.D.

#### *Class of 2010*

Amal Abdul Rahuman · MEAM masters and MEAM and Economics at Penn, May 2009 – October 2009.

Mallory Jensen · MEAM at Penn, May 2009 – October 2009. NSF Fellowship. Now at MIT.

Nils Landin ◊ Vehicular Engineering at KTH, January 2009 – December 2009 & June 2010 – August 2010. Now at Volvo Cars.

Rebecca Pierce ◊ Mechanical Engineering at JHU, May 2008 – August 2008. NSF fellowship. Penn Ph.D. Now at MIT.

#### *Class of 2009*

Neil Tenenholtz · MEAM, Finance, & Math at Penn, May 2008 – March 2009. Harvard Ph.D. Now at Fitbit.

#### *Selected Senior Design Projects at the University of Pennsylvania*

2015–2016: “PoDSaR: A Portable and Distributed Search and Report Robotic Platform” by Alexis E. Block, Daniel Krupka, Jordan Martin, and Aravind Rao. Interdisciplinary senior design project hosted by MEAM. Finalists for the 2016 Penn President’s Innovation Prize (Block and Krupka).

2014–2015: “BionUX: Bionic Upper Extremity: A Transhumeral Prosthesis with Sensory Feedback” by Freddy Hernandez, Adrian Lievano, Matt Lisle, Aadu Prakash, and Steven Xing. Interdisciplinary senior design project hosted by MEAM. Winners of PennVention 2015. Finalists and first place (seven such awards given) in the Intel/Cornell Cup USA. Couloucondis prize for best presentation of a senior design project in MEAM.

2014–2015: “AutoBCD: Automatic Buoyancy Compensation Device for SCUBA Diving” by Pete Furlong, Matt Gus, Nick Pirri, and James Sui. MEAM senior design project.

2014–2015: “ForceField” by David Baker, Tyler Caron, Colin Feo, and Preston Morris. Interdisciplinary senior design project hosted by ESE and co-advised by Heather Culbertson. Ketterer prize for best design in ESE. First honorable mention in SEAS Senior Design Competition.

2013–2014: “VITAL: Continuous Noninvasive Data Acquisition System to Monitor Cardiovascular Health” by Monica Cho, Eza Koch, Michael Lautman, and Nicole Xu. Interdisciplinary senior design project hosted by BE. Participated in the Intel/Cornell Cup USA (only twenty teams from across the country).

2012–2013: “Tactile Feedback for Monopolar Electrocautery in Minimally Invasive Surgery” by Nicki Blumenfeld, Anna Brzeszinski, Brian Horwich, and Zach Shurden. BE senior design project co-advised by Ernest D. Gomez. One of the best three projects in BE. First place overall in SEAS senior design competition.

2012–2013: “KneeCAP: Catching ACL Tears Before They Happen” by Josh Black, Pablo Castillo, Kun He Lee, and Dan Zhou. Interdisciplinary senior design project hosted by BE and co-advised by Dr. Erin Vasudevan.

2011–2012: “D1GIT: Automated, Temperature-Calibrated Measurement of Capillary Refill Time” by Annett Bordoley, Rikki Irwin, Viraj Kalyani, Craig McDonald, and Dorsey Standish. MEAM senior design project sponsored by Dr. Vinay Nadkarni. Tatnall Prize for most outstanding project. Fifth place overall in SEAS senior design competition. Second honorable mention in the Diagnostic Devices Category of the 2012 DEBUT (Design by Biomedical Undergraduate Teams) Competition.

2011–2012: “Weight-Bearing Casting System for Transfemoral Prostheses” by Melissa Cedarholm, Duyun Chen, Gregory Lee, and Zameer Merchant. BE senior design project. One of the best three projects in BE. Advanced to SEAS senior design competition.

2010–2011: “High-Fidelity Mannequin Chest for CPR Training” by Michael Boyle, Nihar Dharamsey, Simon Healey, Nihar Naik, and Andrew Stanley. MEAM senior design project co-advised by Matt Maltese. Couloucondis prize for best presentation of a senior design project in MEAM. Tied for fourth place overall in SEAS senior design competition. Gold Award in James F. Lincoln Arc Welding Foundation Division IV Design Competition.

2009–2010: “Robotic Self-Feeder for Children with Cerebral Palsy” by Cynthia Ericksen, Mallory Jensen, Monica Sachs, and Monica Thomas. MEAM senior design project.

2008–2009: “ROGER: Rapidly Orienting Green-Eyed Robot” by Kate Chovanetz, Matthew MacMillan, and Travis Van Schoyck. MEAM senior design project co-advised by Mark Yim. Couloucondis prize for best presentation of a senior design project in MEAM. Advanced to SEAS senior design competition.

#### *Thesis and Exam Committees*

2019: Ph.D. dissertation committee for Jenifer Miehlsbradt (student of Silvestro Micera, EPFL)

2018: Ph.D. dissertation committee for Matteo Rossi (student of Antonio Bicchi, University of Pisa)  
Ph.D. dissertation committee for Wenzhen Yuan (student of Edward Adelson and Mandayam Srinivasan, MIT)

Ph.D. dissertation committee for Alex Burka (Kuchenbecker advisee, ESE, Penn)

Ph.D. dissertation committee for Mabel Zhang (Daniilidis advisee, CIS, Penn)

Ph.D. dissertation committee for Firas Abi-Farraj (student of Paolo Robuffo Giordano and Claudio Pacchierotti, CNRS/Irisa/Inria)

2017: Ph.D. dissertation committee for Naomi Fitter (Kuchenbecker advisee, MEAM, Penn)

Ph.D. dissertation committee for Marco Janko (student of Yon Visell and Moshe Kam, ECE, Drexel)

2016: Ph.D. qualifying exam committee for Siyao Hu (Kuchenbecker advisee, MEAM, Penn)

Ph.D. qualifying exam committee for Eric Young (Kuchenbecker advisee, MEAM, Penn)

Ph.D. WPE II committee for Mabel Zhang (Daniilidis advisee, CIS, Penn)

BE Department Ph.D. qualifying exam for one student.

2015: Ph.D. dissertation committee for Pengfei Huang (student of Norm Badler, CIS, Penn)

Ph.D. dissertation committee for Heather Culbertson (Kuchenbecker advisee, MEAM, Penn)

Ph.D. dissertation committee for Rebecca Pierce (Kuchenbecker advisee, MEAM, Penn)

Ph.D. qualifying exam committee for Yitian Shao (student of Yon Visell, ECE, Drexel)

Ph.D. proposal committee for Marco Janko (student of Yon Visell, ECE, Drexel)

MEAM Department Ph.D. qualifying exam for one student.

2014: Ph.D. dissertation committee for Francesco Chinello (student of Domenico Prattichizzo, University of Siena)

Ph.D. dissertation committee for Claudio Pacchierotti (student of Domenico Prattichizzo, University of Siena)

Ph.D. dissertation committee for Adrian Ramos Peon (student of Domenico Prattichizzo, University of Siena)

Ph.D. proposal committee for Heather Culbertson (Kuchenbecker advisee, MEAM, Penn)

Ph.D. proposal committee for Rebecca Pierce (Kuchenbecker advisee, MEAM, Penn)

Ph.D. qualifying exam committee for Jeff Gregorio (student of Youngmoo Kim, ECE, Drexel)

MEAM Department Ph.D. qualifying exams for two students.

2013: Ph.D. dissertation committee for Will McMahan (Kuchenbecker advisee, MEAM, Penn)

Ph.D. qualifying exam committee for Matthew Prockup (student of Youngmoo Kim, ECE, Drexel)

Ph.D. qualifying exam committee for Bin Li (student of Adam Fontecchio, ECE, Drexel)

M.T.R. thesis committee for Daniel Hashimoto (student of Noel Williams, Surgery, Penn)

MEAM Department Ph.D. qualifying exams for six students

2012: Ph.D. dissertation committee for Joe Romano (Kuchenbecker advisee, MEAM, Penn)

Ph.D. dissertation committee for Amy Blank (student of Louis Whitcomb and Allison Okamura, ME, Johns Hopkins University)

Ph.D. proposal committee for William McMahan (Kuchenbecker advisee, MEAM, Penn)

Ph.D. proposal committee for Pengfei Huang (student of Norm Badler, CIS, Penn)

MEAM Department Ph.D. qualifying exam for one student

2011: Ph.D. proposal and dissertation committee for Paul White (student of Mark Yim, MEAM, Penn)  
Ph.D. proposal and dissertation committee for Chris Thorne (student of Mark Yim, MEAM, Penn)  
Ph.D. proposal committee for Joe Romano (Kuchenbecker advisee, MEAM, Penn)  
MEAM Department Ph.D. qualifying exams for three students

2010: Ph.D. dissertation committee for Netta Gurari (student of Allison Okamura, ME, Johns Hopkins University)  
MEAM Department Ph.D. qualifying exam for one student

2009: MEAM Department Ph.D. qualifying exams for two students

2008: MEAM Department Ph.D. qualifying exams for three students

## INSTRUCTION AND COURSE DEVELOPMENT

### *Undergraduate Courses*

**Engineering Mechanics: Dynamics** This sophomore-level lecture course investigates the motion of bodies and the forces involved in their motion, focusing on particle and rigid body models. Students attend lectures and recitation, complete weekly problem sets, do individual and pair-programming dynamic simulation problems using Matlab, and take three examinations. *MEAM 211 at the University of Pennsylvania: 68 students in Spring 2010, 58 in Spring 2011, 72 in Spring 2012, 75 in Spring 2013, 81 in Spring 2014, 93 in Spring 2015, and 85 in Spring 2016.*

**Introduction to Mechanics Lab (new course)** This freshman-level laboratory class investigates the concepts of classical mechanics through weekly hands-on experiments, many of which use Matlab and a custom camera-based motion-capture system. Each week, students read the lab workbook, take an in-class pre-lab quiz, work through the lab's activities in teams of three, and complete a follow-on post-lab assignment. *MEAM 147 at the University of Pennsylvania: 38 students in Fall 2007, 71 in Fall 2008, 70 in Fall 2009, and 78 in Fall 2010.*

I also taught a three-week version of this class in a summer program that helps prepare incoming undergraduate students for college-level engineering classes. *PPF at the University of Pennsylvania: 15 students in Summer 2008, 14 in Summer 2009, and 13 in Summer 2010.*

**Assorted Other Topics (as a teaching assistant)** I worked as a teaching assistant for eight quarters as a graduate student at Stanford University. Five quarters were spent as a TA in the Product Realization Laboratory, teaching mechanical design and manufacturing in affiliation with the ME 203 course. The other courses I helped teach were Computer-Aided Design and Prototyping (ME 213), Control System Design and Simulation (E 206), Statics (E 14), and Dynamics (E 15).

### *Graduate Courses*

**Introduction to Robotics** This course presents the fundamental kinematic, dynamic, and computational principles underlying most modern robotic systems. The main topics include coordinate transformations, forward kinematics of manipulators, inverse kinematics of manipulators, trajectory planning, motion planning, velocity kinematics and jacobians, sensing and actuation, joint dynamics, feedback control, and haptic interfaces. The material is reinforced with hands-on lab exercises including robot arm control and haptic rendering. *MEAM 520 at the University of Pennsylvania: 103 students in Fall 2012, 94 students in Fall 2013, 99 students in Fall 2014, 117 in Fall 2015, and 150 in Fall 2016.*

**Haptic Interfaces (new course)** This course provides an introduction to research in the field of haptics, which involves human interaction with real, remote, and virtual objects through the sense of touch. The course includes lectures, written and hands-on homework assignments, research paper discussion and presentation, and semester-long team projects. Many of these student projects lead to further research and conference publications. *MEAM 625 at the University of Pennsylvania: 19 students in Spring 2008, 14 in Spring 2009, and 28 in Fall 2010.*



## PROFESSIONAL SERVICE

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### *Conference Chairing*

- 2018 Co-Chair, IEEE Haptics Symposium, which took place in San Francisco, California, USA, from March 25 to March 28, 2018. In this role, I worked closely with Co-Chair Gregory Gerling (University of Virginia, USA) to oversee all aspects of this independent conference. The duties were similar to those of 2016, as described below.
- 2016 Co-Chair, IEEE Haptics Symposium, which took place in Philadelphia, Pennsylvania, USA. In this role, I worked closely with Co-Chair Seungmoon Choi (POSTECH, South Korea) to oversee all aspects of this independent conference, including the following items:
- Recruited and managed the 22-member Organizing Committee, the 20-member Program Committee, and the 13-member WIP Editorial Board.
  - Managed the scientific review process and made final acceptance/rejection decisions on 107 technical paper submissions and 44 work-in-progress paper submissions.
  - Helped arrange the program of oral presentations, poster presentations, hands-on demonstrations, student innovation challenge entries, and exhibits.
  - Recruited plenary speakers Ken Salisbury and Bobby Klatzky.
  - Led all local arrangements work, including selecting conference venue, selecting banquet venue, scheduling room use, planning food and entertainment, handling on-site supplies and logistics, and organizing technical tours.
  - Planned and hosted the VIP dinner at my house.
  - Worked with others to secure \$27,000 in sponsorship from industry and academia.
  - Oversaw publicity and email communication with authors and attendees.
  - Created and edited content for the conference website.
  - Curated and posted galleries of about 2500 photographs from the conference.
  - Conducted a post-conference survey of the 233 attendees. Of the 87 respondents, 57% rated the conference as Excellent, 41% rated it Good, and 1% rated it Neutral. None rated it Poor or Terrible.

### *Program Committees, Conference Organization, and Other Research Leadership Roles*

- 2018 Co-Organizer (with Hasti Seifi, Karon MacLean, Farimah Fazlollahi, Gunhyuk Park, and Michael Opperman), half-day workshop on “Haptipedia: An interactive database for selecting, ideating, and learning about grounded force-feedback devices,” AsiaHaptics.
- 2018 Member, Best Paper Awards Committee, Robotics Science and Systems (RSS) Conference.
- 2017 Judge, Best Hands-on Demonstration Award, IEEE World Haptics Conference.
- 2017 Program Committee, IEEE World Haptics Conference.
- 2016–present Member, Advisory Board, EuroHaptics Conference.
- 2016–present Member, Management Committee, IEEE Transactions on Haptics.
- 2016–2017 Member, Advisory Board, ExCITE Center, Drexel University.
- 2016 Associate Editor, IEEE RO-MAN Conference.
- 2015 Judge, Best Hands-on Demonstration Award, IEEE World Haptics Conference.
- 2015 Co-Organizer (with Claudio Pacchierotti and Domenico Prattichizzo), half-day workshop on “Cutaneous Feedback for Teleoperation in Medical Robotics,” IEEE World Haptics Conference.
- 2015 Work-in-Progress Editor, IEEE World Haptics Conference.
- 2015–2017 Co-Chair, IEEE Technical Committee on Haptics.
- 2014 Program Committee, EuroHaptics.
- 2014 Co-Organizer (with Heather Culbertson), half-day tutorial on “Haptic Rendering of Textures,” IEEE Haptics Symposium.
- 2014 Publications Chair, IEEE Haptics Symposium.
- 2014 Associate Editor, IEEE Haptics Symposium.
- 2013 Associate Editor, IEEE World Haptics Conference.
- 2012 Participant, Second Roadmapping Workshop on US Medical and Healthcare Robotics.
- 2012 Area Chair, Robotics: Science and Systems (RSS) Conference.
- 2012 Associate Editor, IEEE International Conference on Robotics and Automation (ICRA).
- 2012 Program Committee, IEEE Haptics Symposium.
- 2012 Website Advisor and Organizing Committee Member, IEEE Haptics Symposium.
- 2011 Co-chair (with Marcia O’Malley and Yasu Yokokohji), special sessions on haptic interfaces, IEEE/RSJ Conference on Intelligent Robots and Systems (IROS).

- 2011 Associate Editor, IEEE World Haptics Conference.
- 2011 Associate Editor, IEEE International Conference on Robotics and Automation (ICRA).
- 2010 Publicity Chair, Robotics: Science and Systems (RSS) Conference.
- 2010 Co-Chair of Posters, Demonstrations and Exhibits, IEEE Haptics Symposium.
- 2010 Program Committee, IEEE Haptics Symposium.
- 2008 Program Committee, IEEE Haptics Symposium.

### *Reviews*

Site reviewer: National Centre of Competence in Research (NCCR) Robotics at ETH Zurich and EPFL in Switzerland, beginning in fall 2016.

Journal paper reviews: IEEE Transactions on Haptics, IEEE Transactions on Robotics, International Journal of Robotics Research, IEEE Robotics and Automation Letters, IEEE Transactions on Visualization and Computer Graphics, IEEE/ASME Transactions on Mechatronics, IEEE Transactions on Neural Systems and Rehabilitation Engineering, IEEE Transactions on Biomedical Engineering, IEEE Transactions on Systems, Man, and Cybernetics, IEEE Transactions on Human-Machine Systems, IEEE Transactions on Control Systems Technology, IEEE Transactions on Instrumentation and Measurement, Proceedings of the IEEE, Autonomous Robots, Presence: Teleoperators and Virtual Environments, Human-Computer Interaction, International Journal of Human-Computer Interaction, ASME Journal of Computing and Information Science in Engineering, ACM Transactions on Applied Perception, PLoS ONE, Science, Science Robotics.

Conference paper reviews: In addition to the conference program committees listed earlier, occasional reviews are provided for numerous annual and biannual conferences, including IEEE World Haptics Conference (WHC), IEEE International Conference on Robotics and Automation (ICRA), IEEE Human-Robot Interaction (HRI), Robotics: Science and Systems (RSS), IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), IEEE Virtual Reality (VR), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), IEEE/RAS-EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob), EuroHaptics, MobileHCI, ACM Conference on Human Factors in Computing Systems (CHI), ACM International Conference on Interactive Tabletops and Surfaces (ITS), ASME Dynamic Systems and Controls Conference (DSC), IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI), International Symposium on Robotics Research (ISRR), International Symposium on Experimental Robotics (ISER), International Conference on Social Robotics (ICSR).

Grant proposal reviews: four review panels for the U.S. National Science Foundation; ad hoc proposal reviews for the U.S. National Science Foundation, the U.S. National Institutes of Health, the Canadian Natural Sciences and Engineering Research Council, the Israel Science Foundation, and the European Commission.

## UNIVERSITY/INSTITUTE SERVICE

### *Max Planck Institute for Intelligent Systems*

Managing Director (2018–present) for the Stuttgart site, which involves the following main duties:

- Planning and leading triannual meetings of the Board of Directors.
- Managing the allocation and reallocation of space in institute buildings.
- Planning personnel assignments and budgetary decisions.
- Planning, running, and presenting at internal and external institute events.
- Working closely with other leaders and public relation team to manage crises that arise.
- Successfully nominated Prof. Marc Toussaint as a Max Planck Fellow.
- Representing our institute in meetings with visiting politicians, faculty, and other leaders.

Spokesperson (2017–present) for the International Max Planck Research School (IMPRS-IS), which involved the following main duties:

- Led the seven-member IMPRS-IS Executive Board.
- Managed the creation and refinement of the IMPRS-IS website.
- Interviewed candidates and hired the IMPRS-IS Coordinator, Leila El Masri, Ph.D.
- Managed all rounds of doctoral student recruitment.
- Co-planned yearly on-site interviews for more than 40 candidates.
- Co-planned yearly five-day boot camp for IMPRS-IS students and faculty.

*University of Stuttgart*

Member (2018–present) of the Cooperation Council (Kooperationsrat).

*Department of Mechanical Engineering and Applied Mechanics at the University of Pennsylvania*

Undergraduate Curriculum Chair (2013–2016), which involved the following main duties:

- Served as the public face of the MEAM undergrad program, giving many presentations and meeting with many prospective students and their parents.
- Instantiated and organized a wide range of events for students, including the MEAM Summer Showcase and the MEAM Women’s Dinner.
- Created and edited a weekly email newsletter for the 330 students in our program.
- Composed and sent course selection advice to each class of students (freshmen through seniors) at the start of each semester and during advance registration.
- Advised hundreds of students on academic and professional topics through one-on-one meetings and periodic drop-in advising sessions.
- Reinvigorated and managed MEAM Study Hall, evening sessions where MEAM Mentors help younger students with their homework.
- Handled all petitions submitted by MEAM students.
- Guided many students in crisis to receive support and manage their academic obligations.
- Created and organized the MEAM Student Teaching Award, which goes to the undergraduate or masters student who has contributed most to the educational mission of the MEAM undergraduate program each semester.
- Handled nominations and selection of all existing SEAS-wide and MEAM Department awards for undergraduate students.
- Ran an anonymous online survey of all MEAM undergraduates every summer, repeatedly earning an average overall grade of A- (on a scale from F to A+).

Faculty Hiring Committee (2014–2016)

Machine Shop Committee (2013–2016)

Senior Design Committee (2008–2010, 2012–2016)

Faculty Advisor for the American Society of Mechanical Engineers (ASME) Student Chapter (2013–present)

Search Committee, Coordinator for Instructional Labs (2015)

Chair, Curriculum Subcommittee on Mechanical Systems and Design (2012–2013)

Search Committee, Part-time Lecturer for Senior Design (2012)

Search Committee, Department Chair for Mechanical Engineering and Applied Mechanics (2011)

Search Committee, Associate Director for Integrated Product Design masters program (2010–2011)

Graduate Admissions Committee (2007–2008, 2010, 2012, 2015)

Website Redesign Committee (2008–2010)

*School of Engineering and Applied Science at the University of Pennsylvania*

Co-organizer (with Ravi Radhakrishnan and Andrew Tsourkas), Workshop on Engineering Human Health, which involved about 40 faculty from Penn Engineering and 40 faculty from other schools at Penn (2015)

Consultative Search Committee, Dean of the School of Engineering and Applied Science (2014)

Co-Director of the NSF-Funded GRASP REU Site on Robotics (2012–2014)

Faculty Advisor for the Society of Women Engineers (SWE) Student Chapter (2009–2014)

Faculty Advisory Board, Advancing Women in Engineering (2007–2014)

Library Redesign Committee (2008–2009)

*University of Pennsylvania*

Faculty Advisor for the Trustees’ Council on Penn Women (2009–2016)

Executive Committee, Institute for Research on Cognitive Science (2011–2013)

Numerous presentations to alumni, industrial partners, and prospective donors, plus interviews and lab tours for internal and external audiences