

Harshal P. Mahajan, PhD.

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RESEARCH INTERESTS

Smart home environments and cognitive orthoses for older adults with disabilities, assistive technologies, virtual and augmented reality for rehabilitation interventions, participatory design and clinical validation of rehabilitation tools, universal design, rehabilitation engineering, human computer interaction.

EDUCATION

PhD, Rehabilitation Science

April, 2012

School of Health & Rehabilitation Sciences, University of Pittsburgh, PA

Advisors: Dr. Rory Cooper & Dr. Brad Dicianno

Dissertation: Development And Validation Of Simulators For Power Wheelchair Driving Evaluations.

B. Eng, Biomedical Engineering

July 2004

University of Mumbai, India.

EXPERIENCE

Assistant Director of Research

2019-present

McKechnie Family Living in Interactive Future Environments (LIFE) smart home research center.

Research Assistant Professor

College of Applied Health Sciences,

University of Illinois at Urbana-Champaign.

- Manage research technology infrastructure and set up research processes.
- Managed research activities with robots and smart home technologies.

Research Scientist

2015-2019

*College of Design, Center for Assistive Technology and Environmental Access,
Georgia Institute of Technology*

- Evaluated Smart Bathroom testbed part of TechSAGE Rehabilitation Engineering Research Center on Technologies to Support Aging-in-Place for People with Long-Term Disabilities.
- Evaluated usability and perceptions towards wearable and assistive robots and mHealth apps
- Developed surveys for universal design assessments of physical & social environments at workplaces.
- Took research initiatives to inform policies and environment design guidelines for older adults aging with disabilities.
- Received two seed grants and published 4 conference papers and abstracts.

Post-Doctoral Researcher

2012-2014

School of Health and Rehabilitation Sciences, University of Pittsburgh

Human Engineering Research Laboratories, VA Pittsburgh Healthcare System, Pittsburgh, PA.

- Led cutting-edge research initiatives in National Science Foundation funded Quality of Life Engineering Research Center
- Developed and evaluated a Smart Cueing Kitchen system and other rehabilitation products for people with cognitive impairments
- Collaborated with multidisciplinary professionals (engineers, therapists, counsellors etc.) and managed several clinical research projects
- Published 3 manuscripts in peer reviewed journals and 5 conference papers and abstracts.

Researcher Associate

2005-2012

University of Pittsburgh, Pittsburgh, PA.

- Developed and evaluated virtual reality systems for wheelchair driving assessment and training
- Established validity & reliability of a novel rehabilitation outcomes measurement tool.
- Conducted Human Computer Interaction usability evaluations and mathematical Modeling
- Published 9 manuscripts in peer reviewed journals and 12 conference papers and abstracts.

GRANT FUNDING

1. Principal Investigator (2020-2025): Feasibility and Efficacy of a Fear of Falling Intervention for Wheelchair Users with Multiple Sclerosis. National Institute of Disability, Independent Living and Rehabilitation Research, Disability and Rehabilitation Research Projects Program: Health and Function (90DPHF0010), \$2,463,767
2. Co-Investigator (2015-Present): Monitoring and managing falls project, Smart Bathroom development project and Aging with mobility impairments project, Technologies to Support Aging-in-Place for People with Long-Term Disabilities Rehabilitation Engineering Research Center (90RE5016-01-00 & #90REGE0006-01-00), PI: Jon Sanford, M.Arch, Co-PI Wendy A. Rogers, PhD, Co-PI Tracy L. Mitzner, PhD.
3. Co-Investigator (2019-Present): Enhancing Neurocognitive Health, Abilities, Networks and Community Engagement (ENHANCE) Rehabilitation Engineering Research Center (90REGE0012), PI: Sara J. Czaja, PhD.
4. Principal Investigator (2019): An automated smart cooking coach for people with cognitive impairments, Research Faculty Development Grant, Georgia Institute of Technology, \$9,999.
5. Co-Investigator (2018-2019): Pilot Study on Bias and Trust in AI Systems, National Science Foundation Early Concept Grant for Exploratory Research Award (1849101), PI: Ayanna Howard, PhD and Jason Borenstein, PhD, \$74,529.
6. Principal Investigator (2017-2018): Preliminary psychometric evaluation of a clinical instrument for estimating fear of falling in older adults using wheelchairs, Research Faculty Development Grant, Georgia Institute of Technology, \$7,961.
7. Co-Investigator (2015-2018): Disability and Rehabilitation Research Project on Universal Design in the Workplace, National Institute on Disability and Rehabilitation Research (90DP0049/H133A120120), PI: Jon Sanford, M.Arch.
8. Co-Investigator (2012-2014): Smart Cueing Kitchen Project, National Science Foundation funded Quality of Life Engineering Research Center (EEEC-0540865), Project PI: Dan Ding, PhD; Rory Cooper, PhD, \$125,156.
9. Co-Investigator (2009-2012): Computer Based and Virtual Assessments of Power Wheelchair Mobility. Department of Veterans Affairs VA RR&D Service Merit Review, PI: Brad Dicianno, MS, MD, \$446,500.
10. Co-Investigator (2005-2007): Isometric Controls with Personalized Algorithms for Driving Electric Powered Wheelchairs. Department of Veterans Affairs VA RR&D Service Merit Review, PI: Rory Cooper, PhD, \$323,100.

PUBLICATIONS

Peer reviewed journals

14. Borenstein, J., **Mahajan, H. P.**, Wagner, A. R., Howard, A. (2020) Trust and Pediatric Exoskeletons: A Comparative Study of Clinician and Parental Perspectives. IEEE Transactions on Technology and Society.

13. Park, D., Hoshi, Y., **Mahajan, H. P.**, Kim, HK., Erickson, Z., Rogers, W. A., Kemp C. C. (2020) Active robot-assisted feeding with a general-purpose mobile manipulator: Design, evaluation, and lessons learned. *Robotics and Autonomous Systems* 124, 103344.
12. Wang, J., **Mahajan, H. P.**, Toto, P. E., McCue, M. P. & Ding, D. (2019). The feasibility of an automatic prompting system in assisting people with traumatic brain injury in cooking tasks. *Disability and Rehabilitation: Assistive Technology*. 1–9.
11. Kamaraj, D. C., Dicianno, B. E., **Mahajan, H. P.**, Buhari, A. M., & Cooper, R. A. (2016a). Interrater Reliability of the Power Mobility Road Test in the Virtual Reality-Based Simulator-2. *Archives of Physical Medicine and Rehabilitation*, 97(7), 1078–1084.
10. Kamaraj, D. C., Dicianno, B. E., **Mahajan, H. P.**, Buhari, A. M., & Cooper, R. A. (2016b). Stability and Workload of the Virtual Reality-Based Simulator-2. *Archives of Physical Medicine and Rehabilitation*, 97(7), 1085–1092.
9. Wang, J., Ding, D., Teodorski, E. E., **Mahajan, H. P.**, & Cooper, R. A. (2016). Use of Assistive Technology for Cognition Among People With Traumatic Brain Injury: A Survey Study. *Military Medicine*, 181(6), 560–566.
8. Dicianno, B. E., **Mahajan, H. P.**, & Cooper, R. A. (2015). Advanced Joystick Algorithms for Computer Access Tasks. *PM & R: The Journal of Injury, Function, and Rehabilitation*, 7(6), 555–561.
7. Wang, J., **Mahajan, H. P.**, Toto, P., McKeon, A., McCue, M., & Ding, D. (2014b). Comparison of Two Prompting Methods in Guiding People with Traumatic Brain Injury in Cooking Tasks. In C. Bodine, S. Helal, T. Gu, & M. Mokhtari (Eds.), *Smart Homes and Health Telematics* (pp. 83–92). Springer International Publishing.
6. **Mahajan, H. P.**, Spaeth, D. M., Dicianno, B. E., Brown, K. W., & Cooper, R. A. (2014). Preliminary Evaluation of a Variable Compliance Joystick for People with Multiple Sclerosis. *Journal of Rehabilitation Research and Development*, 51(6).
5. **Mahajan, H. P.**, Dicianno, B. E., Cooper, R. A., & Ding, D. (2013). Assessment of wheelchair driving performance in a virtual reality-based simulator. *The journal of spinal cord medicine*, 36(4), 322–332.
4. Dicianno, B. E., **Mahajan, H. P.**, Guirand, A. S., & Cooper, R. A. (2012). Virtual Electric Power Wheelchair Driving Performance of Individuals with Spastic Cerebral Palsy. *American Journal of Physical Medicine & Rehabilitation*, 91(10), 823–830.
3. **Mahajan, H. P.**, Cooper, R. A., Spaeth, D. M., Dicianno, B. E., Collins, D. M., & Boninger, M. (2011). Comparison of virtual wheelchair driving performance of people with TBI using an isometric and a conventional joystick. *Archives of Physical Medicine and Rehabilitation*, 92(8).
2. Guirand, A. S., Dicianno, B. E., **Mahajan, H. P.**, & Cooper, R. A. (2011). Tuning algorithms for control interfaces for users with upper-limb impairments. *American journal of physical medicine & rehabilitation / Association of Academic Physiatrists*, 90(12), 992–998.
1. Spaeth, D. M., **Mahajan, H. P.**, Karmarkar, A., Collins, D., Cooper, R., & Boninger, M. (2008). Development of a wheelchair virtual driving environment: trials with subjects with traumatic brain injury. *Archives of Physical Medicine and Rehabilitation*, 89(5), 996–1003.

Peer reviewed conferences and abstracts

22. **Mahajan, H. P.**, Milchus, K., Harris, F., Linden, M., Moon, N., & Sanford, J. (2019). Do coworker interactions impact workplace participation of people with disabilities?. *Assistive Technology* 31 (5), 239-239.
21. **Mahajan, H.**, Zuniga, E. I., & Sanford, J. (2018). Fear of Falling and Age Related Activity Challenges in Older Wheelchair Users. *Archives of Physical Medicine and Rehabilitation*, 99(10), e105.
20. Ruzic, L., **Mahajan, H. P.**, & Sanford, J. A. (2018). Universally Designed mHealth App for Individuals Aging with Multiple Sclerosis. In *The Third International Conference on Universal*

- Accessibility in the Internet of Things and Smart Environments - SMART ACCESSIBILITY 2018 (pp. 29–35). Rome, Italy: International Academy, Research, and Industry Association (IARIA).
19. Kamaraj, D. C., Dicianno, B. E., **Mahajan, H. P.**, & Cooper, R. A. (2017). Psychometric Properties of the Quantitative Driving Metrics in VRSIM-2 (Vol. 96). Presented at the Association of Academic Physiatrists Annual Meeting, Las Vegas, USA.
 18. Jones, B. D., Pandey, S., Presti, P., Taylor, R., Natarajan, P., Mahajan, S., **Mahajan, H. P.**, Sanford, J. A. (2017). SmartBathroom: Developing A Smart Environment To Study Bathroom Transfers. In Proceedings of the Rehabilitation Engineering and Assistive Technology Society of North America Annual Conference. Arlington VA: RESNA
 17. Kamaraj, D. C., **Mahajan, H. P.**, Dicianno, B., Terhorst, L., & Cooper, R. (2016). Discriminative Ability of The Quantitative Electric Powered Wheelchair Driving Metrics In VRSIM-2. Archives of Physical Medicine and Rehabilitation, 97(10), e47.
 16. Sanath A. A, **Mahajan, H.P**, Gonzalez E., Sanford J. A & Fain, W.B. (2016). Analysis of the effect of a rear wall grab bar configuration on the fall risk associated with toilet transfers in older adults with mobility impairment. In Proceedings of the Annual Conference on Rehabilitation Technology. Presented at the RESNA, Arlington, Virginia: RESNA. (**Honorable mention in student scientific paper competition**)
 15. Kamaraj, D. C., Dicianno, B., Youk, A., **Mahajan, H. P.**, & Cooper, R. (2015). Perceived Workload Between Experienced and Novice Power Wheelchair Users While Using a Wheelchair Driving Simulator. Archives of Physical Medicine and Rehabilitation, 96(10), e60–e61.
 14. Wang, J., **Mahajan, H. P.**, Toto, P. E., McKeon, A., McCue, M. P., & Ding, D. (2014). Comparison of Two Prompting Methods in Guiding People with Traumatic Brain Injury in Cooking Tasks. In ICOST 2014 - 12th International Conference on Smart Homes, Assistive Technology and Health Telematics: Advances in Cognitive Technologies. Denver, Colorado: Springer.
 13. **Mahajan, H. P.**, & Ding, D. (2014). Cueing Kitchen: A smart cooking assistant. In Bioengineering Conference (NEBEC), 2014 40th Annual Northeast. Boston, Massachusetts: IEEE.
 12. **Mahajan, H. P.** (2013). Article 3 (NIDRR) Development and Evaluation of a Smart Cueing Kitchen for Individuals with Cognitive Impairments. Archives of Physical Medicine and Rehabilitation, 94(10), e1–e2.
 11. **Mahajan, H. P.**, Ding, D., Wang, J., Ni, S. X., & Telson, J. (2013). Towards Developing A “Cueing Kitchen” For People With Traumatic Brain Injury. In Proceedings of the 36th Annual Conference on Rehabilitation Technology. Presented at the RESNA, Seattle, Washington: RESNA.
 10. Wang, J., Ding, D., **Mahajan, H. P.**, Filippone, A. B., Toto, P. E., & McCue, M. P. (2013). Evaluating Different Types of Prompts in Guiding Kitchen Tasks for People with Traumatic Brain Injury: A Pilot Study. In Proceedings of the 36th Annual Conference on Rehabilitation Technology. Presented at the RESNA, Seattle, Washington: RESNA.
 9. Guirand, A. S., Dicianno, B. E., **Mahajan, H. P.**, & Cooper, R. (2010). Tuning Algorithms for Control Interfaces for Users with Upper Limb Impairments (Vol. 89, pp. S1–2 (**Medical Student Category Award Winner**)). Presented at the Annual Meeting of the Association of Academic Physiatrists, Bonita Springs, FL.
 8. **Mahajan, H. P.**, Wasser, R., Dicianno, B. E., & Cooper, R. A. (2009). Isometric Joystick Performance and Error Correction During Computer Access Tasks. Presented at the RESNA, New Orleans, LA: RESNA.
 7. Spaeth, D. M., & **Mahajan, H. P.** (2009). Software to Enhance Computer Access. Presented at the RESNA, New Orleans, LA: RESNA.
 6. **Mahajan, H. P.**, Dicianno, B. E., Gordon, A. T., Cooper, R. A., Wang, H., & Sibenaller, S. (2008). A Control Algorithm to Improve Target Tracking in Individuals with and without Cerebral Palsy. Presented at the RESNA, Arlington VA: RESNA.

5. Dicianno, B. E., Winful, C., Cooper, R. A., Spaeth, D. M., & **Mahajan, H. P.** (2008). Isometric Joystick Control Interfaces for Individuals with Spastic Cerebral Palsy (Vol. 87, p. S2 (**Best Faculty Research Paper**)). Presented at the Annual Meeting of the Association of Academic Physiatrists, Anaheim, CA.
4. **Mahajan, H. P.**, Spaeth, D., & Cooper, R. A. (2007). Preliminary Analysis Of Wheelchair Driving Performance In A 2D Virtual Environment. Presented at the RESNA, Phoenix, AZ: RESNA.
3. Winful, C., Dicianno, B. E., Cooper, R. A., Spaeth, D., & **Mahajan, H. P.** (2007). Joystick Use for Virtual Electric Power Wheelchair Driving in Individuals with Spastic Cerebral Palsy. Presented at the RESNA, Phoenix, AZ.
2. **Mahajan, H. P.**, Spaeth, D., Bevly, A. J. I., Ding, D., & Cooper, R. A. (2006). A Wheelchair Driving Simulation For People With Low Visual Attention Span. Presented at the RESNA, Atlanta, GA: RESNA.
1. Brown, K. W., & **Mahajan, H. P.** (2006). Modeling an Electric Powered Wheelchair for a Virtual Driving Simulator. Presented at the Institute of Rehabilitation and Research (IRR) research day, Pittsburgh, Pennsylvania, United States: University of Pittsburgh.

TEACHING EXPERIENCE

1. Fall 2018: Design Studio, Industrial Design
 - Role: Guest Lecturer
 - Class size: 30 Undergraduate students
2. Spring 2014: Rehabilitation Engineering and Assistive Technology Practices
 - Role: Guest Lecturer
 - Class size: 25 graduate students
3. Fall 2006: Fundamentals of Rehabilitation Engineering and Technologies I
 - Role: Teaching assistant, grading assistant, laboratory coordinator
 - Class size: 45 Undergraduate and 25 graduate students
4. Spring 2007: Research Methodology
 - Role: Teaching assistant, grading assistant
 - Class size: 25 graduate students

EDITORIAL AND REVIEW WORK

1. Applied Sciences (2019, 2020)
2. Robotics (2019, 2020)
3. BMC Geriatrics (2019)
4. PLOS ONE: Manuscript Reviewer (2017, 2019)
5. Assistive Technology: Manuscript Reviewer (2014, 2017, 2020)
6. NIDILRR Field Initiated Projects: Grant Application Reviewer (2017, 2019, 2020)
7. Paralyzed Veterans of America: Grant Application Reviewer (2015- 2019)
8. Annual meeting of American Congress of Rehabilitation Medicine: Reviewer (2014-2020)
9. Rehabilitation Engineering Society of North America Annual Conference: Reviewer (2008-2020)
10. Displays: Manuscript Reviewer (2016)
11. Journal of Rehabilitation Research and Development: Manuscript Reviewer (2015)
12. Biomedical Research International: Manuscript Reviewer (2014)
13. IEEE Transactions Neural Systems & Rehabilitation Engineering: Manuscript Reviewer (2012, 2014)
14. IEEE Engineering in Medicine and Biology Magazine: Manuscript Reviewer (2006)
15. IEEE/RSJ International Conference on Intelligent Robots and Systems: Manuscript Reviewer (2006).

PROFESSIONAL ASSOCIATIONS AND SERVICE

1. American Congress of Rehabilitation Medicine: Member
 - International conference Program Committee
 - Technology Networking Group
2. Rehabilitation Engineering Society of North America: Member

AWARDS

1. Advanced Rehabilitation Research Training Post-Doctoral fellowship 2012, 2013.
2. NIDRR ARRT Fellow award, Young Investigators Symposium, American Congress of Rehabilitation Medicine meeting, Progress in Rehabilitation Research, 2013.

SELECTED INVITED TALKS

1. “The Cueing Kitchen” 36th Annual Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Conference, Seattle, Washington, 2013.
2. “Development and Evaluation of a Smart “Cueing Kitchen” for Individuals with Cognitive Impairments”, American Congress of Rehabilitation Medicine meeting, Progress in Rehabilitation Research, Orlando, FL, 2013. (**Post-doctoral fellow award winner**)
3. “Research Update of Home and Community Health and Wellness: Cueing Kitchen”, Quality of Life Technologies Summit, Carnegie Mellon University, Pittsburgh, PA, 2013.
4. “Wheelchair Assessment: Virtual Reality for Power Wheelchair Driving Assessment and Training”, Institute for Continuing Education, 1199SEIU Funds Training and Employment, New York, NY, 2013.
5. “The Cueing Kitchen”, Tech It Out Event, Woman in Cable and Telecommunications (WICT) Greater Philadelphia, Philadelphia, PA, 2013.
6. “Virtual Reality for Power Wheelchair Driving Assessment and Training”, State of Science Symposium: Virtual Reality and its role in Wounded Warrior and Veteran Care, The Walter Reed National Military Medical Center and The Center for Rehabilitation Science Research, Bethesda, MD, 2012.
7. “Design and validation of a Power Wheelchair Driving Simulator (PoWDS)” Quality of Life Technology Engineering Research Center, Pittsburgh, PA, 2009.
8. “Preliminary Analysis Of Wheelchair Driving Performance In A 2D Virtual Environment” 30th Annual Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Conference, Phoenix, Arizona, 2007.

LEADERSHIP, MENTORING & SERVICE

1. **Mentored clinical research internships** of 13 undergraduate students, 3 medical school students, 3 graduate students, and 1 high school student
2. National Veteran Wheelchair Games, Volunteer and Researcher Coordinator (2008, 2012)
3. Pittsburgh Internal Revenue Service’s Volunteer Income Tax Assistance program: Volunteer (2008-09)
4. Student Leadership Council, Quality of Life Technology ERC: Outreach Coordinator (2008-09)
5. Association for India’s Development, Pittsburgh: President(2009-12), Overall Project Coordinator (2008), Secretary (2005-07)
6. Indian Graduate Student Association: Cross Cultural Coordinator (2008-09)
7. Engineering in Medicine & Biology Society, IEEE student chapter: Chairperson (2003) & Secretary (2002)
8. Volunteered at a therapy clinic, Mumbai, India (2002-04).