Zulekha Karachiwalla

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Education

Carnegie Mellon University, Pittsburgh PA

Ph.D, Robotics   Expected Graduation: May 2027

University of Maryland Baltimore County (UMBC), Baltimore MD

Bachelor's of Science, Computer Engineering   Graduation: May 2022

Research Experience

Graduate Researcher — *Carnegie Mellon University (CMU) , Pittsburgh, PA*

Mentors: Prof. Zackory Erickson and Prof. Henny Admoni   August 2022 - Present

Project: Understanding nurse practices of wound care for the development of a robotic wound care system

- Organizing and mentoring a team of undergraduate researchers for an observational study to shadow wound care nurses at the University of Pittsburgh Medical Center
- Designing a note taking template to document the wound care process and training a team of researchers on documenting their observations during shadowing
- Working to extract design recommendations for a robotic wound care system

Research Fellow — *Johns Hopkins University, Baltimore, MD*

Mentor: Prof. Jeremy Brown   June 2021 - August 2022

Project: Dual modality haptic feedback device for minimally invasive robotic surgery

- Designed wrist-squeezing and vibrotactile haptic feedback device to test the impact of single versus dual modality feedback for surgical robots
- Created a ROS based interface to map force and acceleration of surgical tools on the da Vinci surgical robot to the haptic devices
- Organized and ran subject trials on the da Vinci surgical robot with the newly developed dual modality haptic feedback device

Research Fellow — *Stanford University, Virtual*

Mentor: Dr. Mark Cutkosky   June 2020 - December 2020

Project (1): A multi-axis FBG-based tactile sensor for gripping in space

- Designed an FBG tactile sensor using Onshape and optimized it through MATLAB simulation and finite element analysis (FEA) in Solidworks. This sensor is currently used on robots at the International Space Station

Project (2): A patient-specific mitral annuloplasty ring with selective stiffness segments

- Developed an annuloplasty ring for mitral valves affected by mitral regurgitation
- Designed and 3D printed an apparatus to test the durability of the ring using OnShape and used FEA to run a static and fatigue test on the ring design.

Research Assistant — *UMBC, Baltimore MD*

Mentor: Dr. Foad Hamidi   January 2020 - August 2022

Project: Understanding health accessibility barriers for refugees with disabilities in the US and Identifying barriers that can be addressed through technology solutions

- Researched cognitive disabilities and mental health concerns within the Maryland refugee population and obstacles that prohibit them from accessing proper medical care and assistance

- Conducted interviews with community leaders to understand challenges refugees face in the healthcare sector

Research Student — *Stanford University, Virtual*

Mentor: Dr. Monroe Kennedy   August 2019 - May 2020

Project: Autonomous powered walker using LiDar data and gmapping

- Created an autonomous wheelchair that also functions as a powered walker and used a LiDar sensor for obstacle avoidance
- Designed an android application to send travel paths to the autonomous system

Research Assistant — *UMBC, Baltimore MD*

Mentor: Dr. Mercedes Burns   June 2018 - January 2020

Project: Three-dimensional Visualization of Harvestman Spermathecae using Confocal Microscopy

- Planned and executed a research project using a confocal microscope to image harvestman (daddy-long legs) reproductive organs
- Created the first three-dimensional models of harvestman organs using Imaris software

Publications

Journals:

- S. Frishman*., A. Knight*., I. Pirozzi*., S. Maddineni., A. Imbrie-Moore., **Z. Karachiwalla**., M. J. Paulsen., A. D. Kaiser., Y. J. Woo., and M. R. Cutkosky. (2022). *DynaRing: A Patient-Specific Mitral Annuloplasty Ring With Selective Stiffness Segments. ASME. J. Med. Devices.*
- F. Hamidi., and **Z. Karachiwalla**. (2022). Structural accessibility barriers and service gaps facing refugees with disabilities in the United States", *Journal of Enabling Technologies*
- S. Frishman*., J.Di*., **Z. Karachiwalla**., B. Richard., K. Moslehi., T. Smith., B. Coltin., B. Moslehi., and M. R. Cutkosky. (2021). A Multi-Axis FBG-Based Tactile Sensor for Gripping in Space. *2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*
- **Z. Karachiwalla**., T. Decarvalho., and M. Burns,. (2020). Spermathecal Variation By Mating System in Temperate Harvestmen. *In Journal of Integrative and Comparative Biology.*
- **Z. Karachiwalla**., T. Decarvalho., and M. Burns,. (2020). Three-dimensional Visualization of Harvestman Spermathecae using Confocal Microscopy. *In Journal of Integrative and Comparative Biology.*

Conferences:

- F. Hamidi., and **Z. Karachiwalla**. (2022). "I'm ok because I'm alive": understanding socio-cultural accessibility barriers for refugees with disabilities in the US. *In Proceedings of the 19th International Web for All Conference (W4A '22). Association for Computing Machinery*
- S. Machaca, **Z. Karachiwalla**, N. D. Riaziat and J. D. Brown. (2022) . Towards a ROS-based Modular Multi-Modality Haptic Feedback System for Robotic Minimally Invasive Surgery Training Assessments. *2022 International Symposium on Medical Robotics (ISMR)*
- F. Hamidi., and **Z. Karachiwalla**. (2022). "Fear is Grounded in Reality": The Impact of COVID-19 Pandemic on Refugees' Access to Health and Accessibility Resources in the United States. *In ACM SIGCAS/SIGCHI Conference on Computing and Sustainable Societies (COMPASS '22). Association for Computing Machinery.*

Awards and Fellowships

- Carnegie Mellon Center for Machine Learning and Health Fellowship   2023
- Honorable Mention Johns Hopkins Computational Sensing and Robotics REU presentation   2021
- UMBC Undergraduate Research Award   2020 & 2021
- Barry Goldwater Scholarship Finalist   2020
- Stanford University Summer Undergraduate Research Fellowship   2020
- Society of Women in Engineering Northrop Grumman Scholarship   2019-2020
- Maryland Senatorial Scholarships   2019-2022
- Howard Community College (HCC) Basketball Athletic Scholarship   2019
- HCC Rouse Scholars Capstone Research Award   2018
- HCC Marinich Honors Research Conference Award   2018
- Summer Undergraduate Research Program (UMBC)   2018
- Howard Community Honors Scholarship   2016-2018
- BGE Engineering Scholarship   2017
- BGE Spring Engineering Project Award   2017
- Maryland Delegate Scholarship   2016

Conferences and Presentations

- Computing and Sustainable Societies Conference | Seattle, Washington   2022
- UMBC Undergraduate Research and Creative Achievement presentations   2019 & 2021 & 2022
  Baltimore, Maryland
- Johns Hopkins Computational Sensing and Robotics Summer REU presentations | Virtual   2021
- Stanford Undergraduate Research Symposium | Virtual   2020
- Society of Integrative and Comparative Biology (SICB) Conference | Austin, Texas   2020
- UMBC Undergraduate Chemical and Biological 2019 Sciences Symposium | Baltimore, Maryland 2019
- Conference for Undergraduate Women in Physics | Newport News, Virginia   2019
- Howard Community College Research Honors Conference | Columbia, Maryland   2018
- STEM BUILD UMBC Research Symposium | Baltimore, Maryland   2018

Professional Experience

Software Engineer Intern — *KBR, Virtual*   April 2021 - August 2021

- Developed a personal identification information program (PII) using both classical machine learning and Artificial Neural Networks approaches to identify PII within resumes submitted to the Air Force Research Lab

Computer Science (CS) Instructor — *Google CS Summer Program, Columbia MD*   June 2017 - August 2017

- Managed a team of computer science counselors, taught them course curriculum and project plans.
- Mentored young girls on the importance of education and females in the STEM field.

Mentoring and Outreach

Mentor — *CMU School of Computer Science Mentorship Program, Pittsburgh PA*   August 2022 - Present
- Mentoring a group of young women in the CMU Computer Science Program
- Organizing monthly meetings to discuss each member's current interests in computer science, answering questions and providing advice about research and professional goals

Coding Instructor — *Girls Who Code, Columbia MD*   August 2017 - May 2019
- Taught high school and middle school girls computer science languages (C++ and Python)
- Created an environment for young girls to feel supported while learning CS and engineering

Technical Project

Senior Engineering Capstone — *UMBC, MD*   August 2021 - May 2022
- Designing a robotic walker with a haptic feedback device and braking system to aid in fall prevention for elderly populations, especially patients with gait disorders

Gesture Controlled Robotic Car — *HCC, Columbia MD*   January 2018 - May 2018
- Led engineering club to design a robotic car, using an Arduino to transmit and receive code

Syrian Refugee Crisis Website — *HCC, Columbia MD*   August 2017 - December 2018
- Designed an informative webpage about the Syrian refugee crisis and its impact on Syrian females
- Website: https://syrainrefugewomenshealth.weebly.com