

Michael Sobrepera

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Summary

PhD student and full stack roboticist with background in medical device design and manufacturing. Working to apply social robots to upper extremity rehabilitation.

Education

Doctor of Philosophy in Mechanical Engineering Aug 2016 – Expected Apr 2021
University of Pennsylvania Philadelphia, PA
PhD student in Mechanical Engineering and Applied Mechanics (MEAM). Adviser: Dr. Michelle Johnson, The Rehabilitation Robotics Laboratory. Affiliated with the General Robotics, Automation, Sensing, & Perception Laboratory (GRASP lab).

Bachelor of Science in Biomedical Engineering Aug 2012 – Dec 2015
Georgia Institute of Technology Atlanta, GA
Minor in Computer Science

Research Experience

Socially Assistive Robot for Upper Extremity Telerehab Aug 2016 – present
University of Pennsylvania, Rehabilitation Robotics Laboratory Philadelphia, PA
Developing an affordable socially assistive robot to aid in telepresence based assessment and treatment of patients with upper extremity motor impairments as a tool to expand the reach of clinicians while improving the objectivity of diagnostic tools. The project involves two primary foci 1) understanding how patients react to telepresence robots which incorporate social robots and how that affects remote assessment and 2) developing a framework for identifying motor function from video of a patient doing various robot guided activities.

Edge-Based Tracking for Flexible Manufacturing Aug 2015 – June 2016
Georgia Institute of Technology, IRIM Technology Transition Laboratory Atlanta, GA
Worked as an Undergraduate Researcher (Aug 2015 – Dec 2015) and Research Technician II (Dec 2015 – June 2016) under Dr. Henrik Christensen and Dr. Larry Sweet to advance technologies in the visual servoing space, explicitly focused on potential industry applications. Refined an existing video based real-time textureless tracker from a research code base to a well documented robust system capable of running at 30+ fps at 1920×1080 pixels, to enable manipulation on non-fixed, non-located car parts at a client automotive facility, resulting in successful demonstrations to management. Utilized heavy industrial robots while developing perception, calibration, and control systems in C++ and Python.

Publications

Journal Papers

- [1] Michelle J Johnson, Michael J Sobrepera, Enri Kina, and Rochelle Mendonca. “Design of an Affordable Socially Assistive Robot for Remote Health and Function Monitoring and Prognostication”. In: *International Journal of Prognostics and Health Management (IJPHM)* 10. Special Issue PHM for Human Health and Performance (2019).

Conference Papers

- [1] Michael J Sobrepera, Enri Kina, and Michelle J Johnson. “Designing and Evaluating the Face of Lil’Flo: An Affordable Social Rehabilitation Robot”. In: *IEEE International Conference on Rehabilitation Robotics*. Toronto, Ontario, Canada, 2019.

Conference Abstracts with Poster Presentations

- [1] Michael J Sobrepera and Michelle J Johnson. “Designing Arms for Lil’Flo, a Socially Assistive Rehabilitation Robot”. In: *Biomedical Engineering Society Annual Meeting 2019*. Biomedical Engineering Society Annual Meeting. Philadelphia, PA: Biomedical Engineering Society, Oct. 2019.
- [2] Michael J Sobrepera and Michelle J Johnson. “The Design of Lil’Flo, an Affordable Socially Assistive Robot for Telepresence Rehabilitation”. In: *Proceedings of the 2018 Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Conference*. RESNA, 2018.
- [3] Enri Kina, Michael J Sobrepera, Carla Diana, and Michelle J Johnson. “Creating An Emotive Robotic Face To Inspire Trust In Telepresence And Autonomous Rehabilitation Activities”. In: *Proceedings of the 2018 Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Conference*. RESNA, 2018.

Teaching

Teaching Assistantships

MEAM 147: Intro to Mechanics Lab

University of Pennsylvania

Aug 2018 – Dec 2018

Philadelphia, PA

Organized and ran the mechanics lab class for first semester undergraduate students in Mechanical Engineering and related fields, managing a teaching team of 6. The class consisted of 41 students across 3 sections.

MEAM 211: Undergraduate Dynamics

University of Pennsylvania

Jan 2018 – May 2018

Philadelphia, PA

Designed and ran problem based recitation sections, held office hours, covered 2 general lectures, developed a problem set, graded exams, and managed 5 graders. The class consisted of 56 students

MEAM 147: Intro to Mechanics Lab

University of Pennsylvania

Aug 2017 – Dec 2017

Philadelphia, PA

Assisted in the management of the mechanics lab class for first semester undergraduate students in Mechanical Engineering and related fields. The class consisted of 36 students across 3 sections

Guest Lectures

Robots in Pediatric Rehabilitation

Nov 2018

Lecture on Robotics in Pediatric Rehabilitation given to the *Bioengineering 514: Rehab Engineering and Design* class at the University of Pennsylvania, including demos of systems, and a final group activity.

Robots in Pediatric Rehabilitation

Apr 2018

Lecture on Robotics in Pediatric Rehabilitation given to the Teaching Institute of Philadelphia *Robots in HealthCare: From Science Fiction to Reality* class.

Robot Inspiration: Artificial Intelligence/Brain and Programming

Mar 2018

Lecture on the basics of artificial intelligence and machine learning given to the Teaching Institute of Philadelphia *Robots in HealthCare: From Science Fiction to Reality* class.

Mentees

Vera Lee

Sept 2019 – Present

Penn BioE Undergrad

Working to drive forward the Flo project, by working on mechanical design and supporting subject testing.

Ralph Tamakloe

Jun 2019 – Aug 2019

Penn BioE Undergrad

Worked to understand how desktop social robots can be used for low cost, portable, objective assessments.

Dhruv Karthik

Jan 2018 – May 2019

Penn CIS Undergrad

Worked to build automatically generated syntactic maps of hospitals to lower the barriers to entry of mobile robots in hospitals.

Enri Kina

May 2017 – May 2019

Penn MEAM Undergrad

Worked heavily on designing the head for a social robot and understanding how to test the designs. Work was done as part of the Penn Rachleff Scholars Program.

Danielle Chen

Jun 2018 – Sept 2018

Penn Integrated Product Design Masters

Worked on the form and design of a social assistive robot.

Andrew Levine

Jun 2018 – Aug 2018

Penn MEAM Undergrad

Worked to program a Nao robot to perform neuromotor therapy exercises with patients.

Jagtar Singh

May 2018 – Aug 2018

Penn MEAM Masters

Worked towards a framework to extract biometric markers, such as pulse rate from a video of an active person.

Shyon Small

May 2018 – Jul 2018

Penn BioE Undergrad

Explored the use of social robots to perform cognitive testing on pediatric patients with motor disorders such as Cerebral Palsy. Completed work as part of the National Science Foundation and Philadelphia Region Louis Stokes Alliance for Minority Participation (NSF/LSAMP) Undergraduate Research Program.

Weiyu Du

May 2018 – Jul 2018

Penn CIS Undergrad

Developed an understanding of challenges and opportunities presented by hospital environments for low cost autonomous navigation. Worked as part of the Penn Undergraduate Research Mentoring Program (PURM).

Sabrina Smith

July 2017 – Sept 2017

Imperial College London Biomedical Engineering Undergrad

Worked on algorithms to convert outputs from human motion tracking systems to features which provide diagnostic information on upper extremity impairment.

Tim Kulesza

Jun 2017 – Aug 2017

BSE, Mechanical Engineering & Materials Science

Developed a set of needs for a mobile robotic base to carry a hospital based semi autonomous social robot. Translated the needs to a series of design requirements and developed specifications for such a system.

Leora Korn

May 2017 – July 2017

Penn MEAM Undergrad

Worked on designing the upper extremities of a social assistive robot for upper extremity rehab so they could adequately perform tasks necessary to engage patients in rehab activities.

Service

UPenn Bioengineering BETA Day Volunteer

Jan 2020

Tech Girlz Circuit Workshop Volunteer

Jan 2020

Girls Advancing in STEM (GAINS) Lab Tour Lead

Nov 2019

Philadelphia Robotics Expo Volunteer

Oct 2019

Philadelphia Maker Faire Volunteer

Oct 2019

Upward Bound *Growing out of the Stereotypes* Workshop Lead

Dec 2018

Developed and ran a workshop introducing high school students to programming robots using Sphero robots and custom-designed wooden mazes. Workshop was a part of an event by the Singh Center for Nanotechnology for the LULAC National Educational Service Centers (LNESEC) Upward Bound Program.

EL Education Future of Work Conference Interviewee

Nov 2018

Participated in RET: Leveraging Our Collective Impact Conference

Oct 2018

Philadelphia Robotics Expo Presenter

Oct 2018

Mechanical Engineering Graduate Association Vice President

Sept 2017 – Sept 2018

University of Pennsylvania

Philadelphia, PA

Represented masters and PhD students in the department and organized events to foster academic cooperation and departmental unity. Started a PhD mentoring program to ease the transition into the PhD by giving new students access to more experienced PhD students outside of their labs. Also started a one hour lab showcase event to introduce the research done across the department to incoming students through a series of 12 fast-paced talks.

GRASP RET Program

Jun 2018 – Aug 2018

University of Pennsylvania

Philadelphia, PA

Mentored two School District of Philadelphia middle school teachers, one math and one science, through a six week research experience. Guided teachers through the process of establishing the state of the art in an area, identifying a knowledge gap, developing a hypothesis to narrow the gap, developing a methodology to test their hypothesis, testing their hypothesis, and presenting their work in written and oral form.

The program includes a total of six visits to middle school classrooms throughout the 2018 – 2019 school year to demonstrate work being done today in research and help teach lessons.

Delivered an introduction to circuits class and an introduction to computer aided design class to the cohort of teachers in the program.

Work funded by NSF Grant #: 1542301

Be a Pennovator Workshop Lead

Apr 2018

Developed and ran a workshop introducing middle school students to programming robots using Sphero robots and custom-designed wooden mazes.

GRASP RET Program

Jun 2017 – Aug 2017

University of Pennsylvania

Philadelphia, PA

Mentored a School District of Philadelphia middle school science teacher through a six week research experience. Guided her through the process of establishing the state of the art in an area, identifying a knowledge gap, developing a hypothesis to narrow the gap, developing a methodology to test her hypothesis, testing her hypothesis, and presenting her work in written and oral form.

Visited her classroom three times throughout the 2017-2018 school year to demonstrate work being done today in research, help teach a circuits lesson, and to lead a coding lesson using Spheros.

Developed and delivered an introduction to circuits class and an introduction to computer aided design class to the cohort of teachers in the program.

Work funded by NSF Grant #: 1542301

Penn Science Olympiad Volunteer

Feb 2017

Penn First Lego League Judge

Feb 2017

Penn-Alexander School Science Fair Judge

Dec 2016

Awards

Rothberg Catalyzer First Place

Nov 2019

University of Pennsylvania Fontaine Fellowship	2016 – Present
Hispanic Scholarship Fund (HSF) Scholar	Dec 2016
Georgia Institute of Technology OMED Tower Award	2015
Georgia Institute of Technology Dean's List	2012 – 2014
Auburn University Dean's List	2011 – 2012

Work Experience

Automation Intern Eli Lilly and Company Evaluated options for offline software/hardware/operator in the loop plant simulations for the purposes of process validation, control code development, pre-Factory Acceptance Testing control system checkout, operator training, and process improvement, with a specific focus on Emerson DeltaV and Rockwell interoperability. Reported on findings in both a technical paper and oral presentation.	May 2015 – Aug 2015 Indianapolis, IN
Machine Shop Supervisor Georgia Institute of Technology, TEP Machine Shop Maintained equipment, trained shop users, guided Masters in Biomedical Innovation and Development (MBID) students in design and prototyping of medical devices, supported the Cardiovascular Fluid Mechanics (CFM) Lab and the Tissue Mechanics Lab.	Aug 2014 – May 2015 Atlanta, GA
Product Development Engineering CO-OP Unilife Corporation Worked throughout the product development pipeline on injectable drug delivery devices. Took products from customer needs through ideation, iterative prototyping, and pilot production. Worked on molding and assembly line design, procurement, assembly, and qualification. Developed test fixtures to ensure product quality.	Jan 2014 – Jul 2014 York/King of Prussia, PA

Press

Students' Innovative Orthotic Device Wins Rothberg Catalyzer https://link.medium.com/34ti0GvN83	Oct 2019
Teachers Become Students to Become Better Teachers at GRASP Lab's RET Program https://link.medium.com/zIHvqZH25S	Sept 2018