Michael Sobrepera

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Summary

I am a doctoral student and full stack roboticist. I have an array of hard skills across design, hardware, software, and algorithms, complemented by strong data analysis, experimental design, and communication skills, allowing me to enter new project spaces, rapidly gain domain knowledge, and go deep into problems to generate answers and solutions. I am passionate about learning, working on meaningful problems, pushing the boundaries of technology, and mentoring the next generation.

My PhD work has focused on understanding the use of social robotics for upper extremity rehabilitation and computer vision for objective assessment in upper extremity rehabilitation. I have prior experience in computer vision for industrial automation and medical device design and manufacturing.

I am currently searching for a team working on exciting problems to join for a summer 2021 internship in Seattle.

Education

Doctor of Philosophy in Mechanical Engineering — Aug 2016 – Expected Dec 2021
University of Pennsylvania
Advisor: Dr. Michelle Johnson.
Affiliated with the General Robotics, Automation, Sensing, & Perception Laboratory (GRASP Lab).

Master of Science in Robotics — Aug 2016 – Aug 2019
University of Pennsylvania

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

Skills

Programming Languages	Python, R, MATLAB, TypeScript, SQL, C++
Robotics	ROS, HRI, Kinematics, State Estimation, System Integration, Mechatronics
Mechanical Design	MCAD, Technical Drawing, RTV Molding, 3D Printing, Classical Machining
Software Infrastructure	PyTorch, Docker, Git, NGINX, NodeJS, Redis, PostgreSQL, React

Funding

NIH F31 Predoctoral Fellowship (F31HD102165) — Apr 2020 – Present
University of Pennsylvania Fontaine Fellowship — Sept 2016 – Apr 2020

Experience

PhD Student — Aug 2016 – present
University of Pennsylvania, Rehabilitation Robotics Laboratory
Socially Assistive Robot for Upper Extremity Telerehabilitation

- Led hardware design and software integration for the development of an affordable socially assistive robot (Lil'Flo) to aid in telepresence based assessment and treatment of patients with upper extremity motor impairments (https://youtu.be/DDZe1RhcpWY).
- Developed and now implementing experiments to determine how patients react to telepresence robots which incorporate social robots and how that affects remote assessment.
- Developing a framework for identifying motor function from video of a patient doing various robot guided activities using both classical computer vision and machine learning techniques.
- Mentored and managed over a dozen students doing research within the project.
- Presented work in papers, posters, and talks.

Research Technician II Aug 2015 – Jun 2016

Georgia Institute of Technology, IRIM Technology Transition Laboratory

Edge-Based Tracking for Flexible Manufacturing

- Refined a C++ 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 partner automotive facility.
- Supported industrial partner in successful technical demonstrations to management.
- Developed tools for calibrating multiple robot arms to cameras.
- Integrated perception and motion control to track moving targets with a collaborative robot.

Automation Intern May 2015 – Aug 2015

Eli Lilly and Company

Offline Plant Simulations for Automation Development and Testing

- Rapidly learned automation systems being used (Emerson DeltaV and Rockwell).
- Evaluated options for offline software/hardware/operator in the loop plant simulations for process validation, control code development, pre-factory acceptance testing control system checkout, operator training, and process improvement.
- Reported on findings in both a technical paper and oral presentation.

Machine Shop Supervisor Aug 2014 – May 2015

Georgia Institute of Technology, TEP Machine Shop

- Guided Master's in Biomedical Innovation and Development students in design and prototyping of medical devices.
- Supported the Cardiovascular Fluid Mechanics Lab and the Tissue Mechanics Lab in development and fabrication of experimental equipment.

Product Development Engineering Co-Op Jan 2014 – Jul 2014

Unilife Corporation

Product Development and Manufacturing for Injectable Drug Delivery Devices

- Tested prototypes for both usability and engineering constraints and iterated on design.
- Developed and prototyped new product concepts based on customer needs.
- Designed, procured, assembled, and programmed automation equipment for syringe component gluing, assembly, and finish operations.
- Worked with vendor to design and procure sterilizable packaging for 1MM annual units of product.

Publications

Peer-reviewed Journal Publications

[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).

Peer-reviewed Conference Publications

[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. DOI: 10/ggdd87.

Preprints

[1] **Michael J Sobrepera**, Vera G Lee, and Michelle J Johnson. "The Design of Lil'Flo, a Socially Assistive Robot for Upper Extremity Motor Assessment and Rehabilitation in the Community Via Telepresence". In: *medRxiv* (2020). DOI: 10.1101/2020.04.07.20047696.

Extended Conference Abstracts with Poster Presentations

[1] **Michael J Sobrepera** and Michelle J Johnson. "The design of Lil'Flo, a socially assistive robot for upper extremity motor assessment and rehabilitation via telepresence". In: Rehabilitation Research 2020: Envisioning a Functional Future. Digital: National Institutes of Health, Oct. 2020.

[2] **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.

[3] Ralph Tamakloe, **Michael J Sobrepera**, and Michelle J Johnson. "Designing a Game for Upper Extremity Motor Function Assessment Using Anki Cozmo, a Desktop Social Robot". In: *Biomedical Engineering Society Annual Meeting 2019*. Biomedical Engineering Society Annual Meeting. Philadelphia, PA: Biomedical Engineering Society, Oct. 2019.

[4] **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.

[5] 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.

Awards & Honors

Penn Wharton Entrepreneurship Startup Challenge Innovation Award — May 2020
Rothberg Catalyzer First Place — Nov 2019
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
The Auburn National Scholars Presidential Scholarship — 2011

Ventures

MAR Orthotics — Oct 2019 – Present
Co-Founder & President
Novel Orthoses for Pediatric Cerebral Palsy

- Public face of company, successfully pitched through multiple innovation and business competitions to win competitive awards.
- Performing customer discovery and validation to refine product market fit.
- Working on technical design.

Professional Development

Neuromatch Academy — Summer 2020

Teaching Experience

Teaching Assistantships

Lead Teaching Assistant for MEAM 147: Intro to Mechanics Lab — Fall 2018
Teaching Assistant for MEAM 211: Undergraduate Dynamics — Spring 2018
Teaching Assistant for MEAM 147: Intro to Mechanics Lab — Fall 2017

Guest Lectures

Robots in Pediatric Rehabilitation — Nov 2018, 2020
Course: Bioengineering 514: Rehab Engineering and Design

Robots in Pediatric Rehabilitation — Apr 2018
Course: Robots in HealthCare: From Science Fiction to Reality

Robot Inspiration: Artificial Intelligence, the Brain, and Programming — Mar 2018
Course: Robots in HealthCare: From Science Fiction to Reality

Talks

Global Perspectives on Medicine, Rehabilitation, and Robotics Webinar Series — Nov 2020
Using Social Robots for Remote Assessment of Children With Disability

Penn MEAM Department Seminar — Jul 2020
The Design of Lil'Flo, a Socially Assistive Robot for Upper Extremity Motor Assessment and Rehabilitation Via Telepresence

Service

Community 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

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
GRASP NSF Research Experience for Teachers Program Summer 2017 & Summer 2018
Mentored three middle school teachers through a six week research experience covering the entire scientific process. Visited their classrooms a total of six times to demonstrate state of the art research and teach lessons.
Be a Pennovator Workshop Lead Apr 2018
Penn Science Olympiad Volunteer Feb 2017
Penn First Lego League Judge Feb 2017
Penn-Alexander School Science Fair Judge Dec 2016

University Service

Penn Doctoral Diversity and Inclusion Board Member Jun 2020 – Present
GRASP Student Advisory Committee Member Jan 2020 – Present
Mechanical Engineering Graduate Association Vice President Sept 2017 – Sept 2018

Reviewer

Journal of Rehabilitation and Assistive Technologies Engineering 2020
International Conference on Robotics and Automation 2017, 2020
International Conference on Intelligent Robots and Systems 2018, 2020
HRI Conference 2020–2021

Conference Volunteer

Northeast Robotics Colloquium 2019
Biomedical Engineering Society Conference 2019
Rehabilitation Engineering and Assistive Technology Society of North America Conference 2018

Selected Press

2020 Startup Challenge Special Part 3: MAR Designs Apr 2020
https://link.medium.com/34ti0GvN83

Students' Innovative Orthotic Device Wins Rothberg Catalyzer Oct 2019
https://link.medium.com/34ti0GvN83

Teachers Become Students to Become Better Teachers at GRASP Lab's RET Program Sept 2018
https://link.medium.com/zIHvqZH25S

Mentees

Vera Lee Sept 2019 – Present
Penn BioE Undergrad, Robotics Master's

Suveer Garg Feb 2020 – Present
Penn Systems Engineering Master's

Ralph Tamakloe Jun 2019 – Aug 2019
Penn BioE Undergrad

Dhruv Karthik Jan 2018 – May 2019
Penn CIS Undergrad

Enri Kina May 2017 – May 2019
Penn MEAM Undergrad

Danielle Chen Jun 2018 – Sept 2018
Penn Integrated Product Design Master's

Andrew Levine Jun 2018 – Aug 2018
Penn MEAM Undergrad

Jagtar Singh May 2018 – Aug 2018
Penn MEAM Master's

Shyon Small May 2018 – Jul 2018
Penn BioE Undergrad

Weiyu Du May 2018 – Jul 2018
Penn CIS Undergrad

Sabrina Smith July 2017 – Sept 2017
Imperial College London Biomedical Engineering Undergrad

Tim Kulesza Jun 2017 – Aug 2017
BSE, Mechanical Engineering & Materials Science

Leora Korn May 2017 – July 2017
Penn MEAM Undergrad