

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.

Education

Doctor of Philosophy in Mechanical Engineering

Aug 2016 – April 2022

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, TypeScript, SQL

Robotics

ROS, HRI, Kinematics, State Estimation, System Integration, Mechatronics

Mechanical Design

MCAD, Technical Drawing, RTV Molding, 3D Printing, Classical Machining

Software Infrastructure

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

Dec 2015 – Jun 2016

Undergraduate Research Assistant

Aug 2015 – Dec 2015

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] **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: *Journal of Rehabilitation and Assistive Technologies Engineering* 8 (Apr. 19, 2021), pp. 1–26. ISSN: 2055-6683. DOI: [10/gjrpj8](https://doi.org/10/gjrpj8).
- [2] **Michael J Sobrepera**, Vera G Lee, Suveer Garg, Rochelle Mendonca, and Michelle J Johnson. "Perceived Usefulness of a Social Robot Augmented Telehealth Platform by Therapists in the United States". In: *IEEE Robotics and Automation Letters* 6.2 (2021), pp. 2946–2953. ISSN: 2377-3766. DOI: [10/gb6hkk](https://doi.org/10/gb6hkk).
- [3] 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](https://doi.org/10/ggdd87).

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.

Pre-Prints Under Review

- [1] **Michael Sobrepera**, Vera Lee, and Michelle Johnson. "Therapists' Opinions on Telehealth, Robotics, and Socially Assistive Robot-Augmented Telepresence Systems for Rehabilitation". In: (Feb. 11, 2022). DOI: [10/gpfmwd](https://doi.org/10/gpfmwd).

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 – Feb 2021
<i>Co-Founder & President</i>	
Novel Orthoses for Pediatric Cerebral Palsy	
<ul style="list-style-type: none"> ▪ 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
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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

Social Robotics in Rehabilitation	Nov 2021
Course: Bioengineering 514: Rehab Engineering and Design	
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

Lehigh University AIRLab General Meeting	Feb 2022
Social Robot Augmented Telepresence For Remote Rehabilitation of Patients With Upper Extremity Impairment	
GRASP SFI	Feb 2021
Using Social Robots and Computer Vision to Augment Telerehabilitation https://youtu.be/2b8YyKZ1DsM	
Global Perspectives on Medicine, Rehabilitation, and Robotics Webinar Series	Nov 2020
Using Social Robots for Remote Assessment of Children With Disability https://youtu.be/FF0dKiB1qGM?t=2030	

Penn MEAM Department Seminar

Jul 2020

The Design of Lil'Flo, a Socially Assistive Robot for Upper Extremity Motor Assessment and Rehabilitation Via Telepresence

<https://youtu.be/DDZe1RhcpWY>**Service****Community Service**

UPenn Bioengineering BETA Day Volunteer	Mar 2021
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 <i>Growing out of the Stereotypes</i> 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 (JRATE)	2020
International Conference on Robotics and Automation (ICRA)	2017, 2020, 2021
International Conference on Intelligent Robots and Systems (IROS)	2018, 2020, 2021
International Conference on Human-Robot Interaction (HRI)	2020–2021
International Symposium on Robot and Human Interactive Communication (RO-MAN)	2021
Disability and Rehabilitation: Assistive Technology	2022

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 https://link.medium.com/34ti0GvN83	Apr 2020
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

Mentees

Ajay Anand Penn Robotics Master's	May 2021 – Present
Julie Elfishawy Penn Cognitive Science and Healthcare Management Bachelor's	Jun 2021 – Present

Jiayu Li Penn Bioengineering Master's	Oct 2021 – Present
Suveer Garg Penn Systems Engineering Master's	Feb 2020 – May 2021
Vera Lee Penn BioE Undergrad, Robotics Master's	Sept 2019 – Apr 2021
Ralph Tamakloe Penn BioE Undergrad	Jun 2019 – Aug 2019
Dhruv Karthik Penn CIS Undergrad	Jan 2018 – May 2019
Enri Kina Penn MEAM Undergrad	May 2017 – May 2019
Danielle Chen Penn Integrated Product Design Master's	Jun 2018 – Sept 2018
Andrew Levine Penn MEAM Undergrad	Jun 2018 – Aug 2018
Jagtar Singh Penn MEAM Master's	May 2018 – Aug 2018
Shyon Small Penn BioE Undergrad	May 2018 – Jul 2018
Weiyu Du Penn CIS Undergrad	May 2018 – Jul 2018
Sabrina Smith Imperial College London Biomedical Engineering Undergrad	July 2017 – Sept 2017
Tim Kulesza BSE, Mechanical Engineering & Materials Science	Jun 2017 – Aug 2017
Leora Korn Penn MEAM Undergrad	May 2017 – July 2017