Phillip Tran

2900 Pharr Ct South NW, Apt 1411,
Atlanta, GA 30305, USA

Email : ptran49@gatech.edu
Phone : +1-240-731-8063
Website : phillipytran.github.io

Education

Georgia Institute of Technology, Atlanta, GA — Expected December 2022
Ph.D. in Bioengineering, Home School: Eletrical and Computer Engineering — **GPA: 4.00/4.00**
Coursework & Research: Robotics, Mechatronics, Linear Control Systems, Physiology/Pathophysiology, Human Motor Control, Microelectromechanical Systems, Dynamics, SolidWorks, Kotlin, C, Fluid Mechanics.

University of Maryland, College Park, MD — 05/2017
B.S. in Bioengineering — **GPA: 3.88/4.00**
Coursework: Biomechanics, Statics, Physiology, Organic Chemistry, Biochemistry, Genetics, Fluid Dynamics

Experience

Medical Robotics and Automation (RoboMed) Laboratory — 08/2017 - present
Graduate Research Assistant

- Developing a **voice-controlled, tendon-actuated soft robotic hand exoskeleton** (PATENT PENDING) for assistive/rehabilitative purposes for individuals with hand dysfunction.
- Conducting **case studies with individuals with spinal cord injury** to evaluate performance and efficacy of various iterations of the exoskeleton system.
- Designed and integrated **compact 3D-printed self-sealing suction cups** with the exoskeleton system to investigate alternative grasping modalities for everyday tasks.
- **Accessibility, Rehabilitation, and Movement Science** scholar for two years receiving a $2000 travel grant.

BMED 4739/6739: Medical Robotics — 08/2020 - 12/2020
Graduate Teaching Assistant

- Conducted a teaching practicum for a class of around 20 undergraduate and graduate students.
- Planned and taught three lectures covering various topics in robotics (forward kinematics, dynamics).
- Coordinated several review sessions for the students to help prepare them for exams.

ECE4781: Biomedical Instrumentation and ECE4782: Biosystems Analysis — 08/2017 - 05/2018
Graduate Teaching Assistant

- Graded homework assignments and exams and held review sessions for classes of approximately 40 undergraduate students.
- **School of Electrical and Computer Engineering** assistantship offer for one year of teaching assistant positions.

University of Maryland Gemstone Undergraduate Research Program — 08/2013 - 05/2017
Undergraduate Researcher

- Investigated the fabrication and efficacy of silk-based vascular grafts to replace current synthetic vascular grafts.
- Built an electrospinner system for the construction of silk-based vascular grafts.
- Worked on a multidisciplinary team of 13 undergraduate students over the course of four years to finish an independent research project.

Mote Marine Laboratory and Aquarium — 05/2016 - 08/2016
Research Intern

- Optimized the internal mechanisms of an autonomous oceanographic platform (OPD) capable of detecting and mapping harmful phytoplankton blooms.
- Overhauled Python scripts and created new Matlab programs to analyze the data collected from deployed OPD units.
- Devised and validated a new calibration method for OPD units before deployment.

National Institute of Neurological Disorders and Stroke — 05/2015 - 08/2015
Research Intern

- Worked on a team of three to design a crowd-sourced machine-learning neural network project for mapping neurons in brain tissue slices.
- Designed and programmed interactive website tutorials to instruct website users how to train the neural network to search for and identify neurons.

National Institute of Mental Health 06/2014 - 08/2014

Research Intern

- Developed programs with Python to analyze and display visual representations of functional magnetic resonance imaging data.
- Programmed several Matlab scripts for training rhesus monkeys for functional magnetic resonance imaging tests.

Relevant Experience & Awards

- **Gordon Research Seminar (GRS) 2022 on Robotics Program Committee Member** 2021
- **Two-year Accessibility, Rehabilitation, and Movement Science Scholar: $2000 travel award** 2018-19
- **2019 International Symposium on Medical Robotics Best Symposium Paper Award** 2019
- **2019 International Symposium on Medical Robotics Speaker** 2019
- **Aleksander & Halina Szlam Scholarship** 2017-2018

Relevant Skills

- **General:** CAD, Modeling, Controls
- **Coding:** Kotlin, MATLAB, Simulink, C
- **Software:** Solidworks, Android Studio, Eagle
- **Machining/Fabrication:** 3D-printing, Laser-cutting, Lathe and Milling machine proficiency
- **Languages:** Chinese (conversational)

Publications

Journal Articles

1. **P. Tran**, S. Jeong (co-first author), F. Lyu, K.R. Herrin, S. Bhatia, D. Elliott, and J.P. Desai, "FLEXotendon Glove-III: Voice-Controlled Soft Robotic Hand Exoskeleton with Novel Fabrication Method and Admittance Grasping Control," in *IEEE Transactions on Mechatronics*, doi: 10.1109/TMECH.2022.3148032.
2. **P. Tran**, S. Jeong (co-first author), K.R. Herrin, and J.P. Desai, "A Review: Hand Exoskeleton Systems, Clinical Rehabilitation Practices, and Future Prospects," in *IEEE Transactions on Medical Robotics and Bionics*, doi: 10.1109/TMRB.2021.3100625.
3. **P. Tran**, S. Jeong (co-first author), S.L. Wolf, and J.P. Desai, "Patient-Specific, Voice-Controlled, Robotic FLEXotendon Glove-III System for Spinal Cord Injury," in *IEEE Robotics and Automation Letters.* doi: 10.1109/LRA.2020.2965900
4. S. Jeong, **P. Tran (co-first author)** and J. P. Desai, "Integration of Self-Sealing Suction Cups on the FLEXotendon Glove-II Robotic Exoskeleton System," in *IEEE Robotics and Automation Letters.* doi: 10.1109/LRA.2020.2965895

Conference Proceedings

1. **P. Tran**, S. Jeong, K.R. Herrin, S. Bhatia, S. Kozin, and J. P. Desai, "FLEXotendon Glove-III: Soft Robotic Hand Rehabilitation Exoskeleton for Spinal Cord Injury," in *2021 IEEE International Conference on Robotics and Automation (ICRA)*, Xian, China, 2021.
2. **P. Tran**, S. Jeong, and J. P. Desai, "Voice-Controlled Flexible Exotendon (FLEXotendon) Glove for Hand Rehabilitation," in *2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Macau, China, 2019, pp. 4834-4839.
3. K. Park, **P. Tran**, N. Deaton, and J. P. Desai, "Multi-walled Carbon Nanotube (MWCNT)/PDMS-based Flexible Sensor for Medical Applications," *2019 International Symposium on Medical Robotics (ISMR), IEEE*, Atlanta, GA, USA, 2019, pp. 1-8.
4. X. Wang, **P. Tran**, S.M. Callahan, S.L. Wolf, and J. P. Desai, "Towards the Development of a Voice-Controlled Exoskeleton System for Restoring Hand Function," *2019 International Symposium on Medical Robotics (ISMR), IEEE*, Atlanta, GA, USA, 2019, pp. 1-7.

Patent Applications

- J. P. Desai, **P. Tran**, S. Jeong, X. Wang, "Voice-Activated Robotic Exoskeleton for Rehabilitation and Assistance," **Provisional patent, PCT/US20/20954** , 2020

References

Reference 1*: Dr. Jaydev P. Desai, PhD

Ph.D. Advisor

- Professor, Wallace H. Coulter Department of Biomedical Engineering, Georgia Institute of Technology
- Director, Georgia Center for Medical Robotics
- Associate Director, Institute for Robotics and Intelligent Machines
- Tel: (Office) +1-404-385-5381
- Email: jaydev@gatech.edu

Reference 2: Dr. Scott Kozin, MD

Clinician Collaborator

- Chief of Staff, Shriners Hospitals for Children, Philadelphia
- Orthopaedic Surgeon, Shriners Hospitals for Children, Philadelphia
- Tel: (Office) +1-215-430-4000
- Email: skozin@shrinenet.org

Reference 3: Ms. Kinsey Herrin, MSPO, C/LPO, FAAOP

Research Scientist Collaborator

- Research Scientist, Woodruff School of Mechanical Engineering, Georgia Institute of Technology
- Tel: (Office) +1-404-894-6269
- Email: kinsey.herrin@me.gatech.edu

Reference 4: Dr. Steven L. Wolf, PhD, PT, FAPTA

Research Collaborator

- Professor, Department of Rehabilitation, Emory University School of Medicine
- Director of Program in Restorative Neurology, Emory University School of Medicine
- Tel: (Office) +1-404-712-4801
- Email: swolf@emory.edu

Assistive/Rehabilitative Hand Exoskeleton

Publications: ISMR 2019, IROS 2019, IEEE RAL 2020, ICRA 2021 (One US patent), T. Mech. 2022

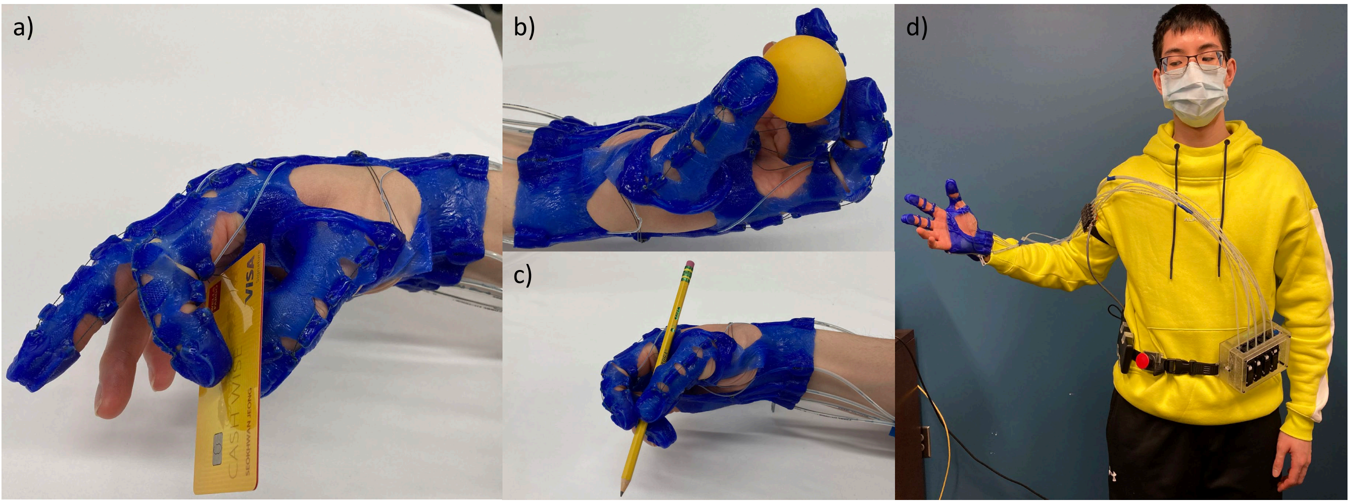

Figure 1: (a) FLEXotendon Glove-III gripping credit card; (b) FLEXotendon Glove-III holding ping pong ball; (c) FLEXotendon Glove-III grasping pencil; (d) FLEXotendon Glove-III system on user.

FLEXotendon Glove Series: In this project, we have developed several iterations of **assistive/rehabilitative hand exoskeletons** for individuals with hand dysfunction. The exoskeleton system has progressed from primarily rigid 3D-printed components to a silicone-based soft robotic exoskeleton. The low-level control strategy has evolved from feed-forward position control to admittance control for adaptable exoskeleton operation. Voice control has remained as the high-level control strategy, though the user interface has advanced from a desktop computer-bound experience to full implementation of exoskeleton operation within a smartphone application for a truly portable exoskeleton system. Several versions of the FLEXotendon Glove exoskeleton system have been evaluated in human subject case studies with individuals with spinal cord injury and have demonstrated the ability to complete standardized hand function tests.

Hand Exoskeleton with Integrated Suction Cups

Publications: IEEE RAL 2020

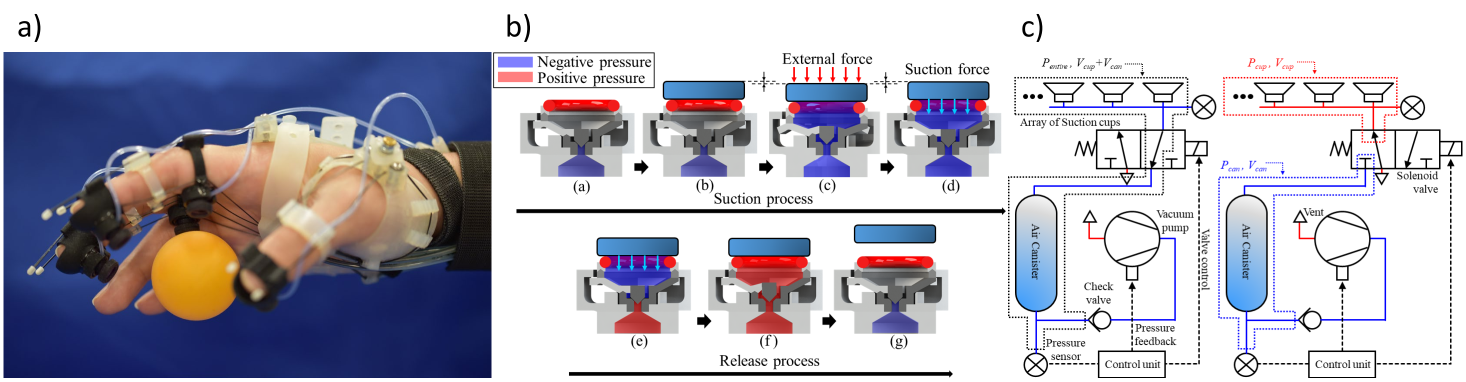

Figure 2: (a) FLEXotendon Glove-II with integrated suction cups; (b) Self-sealing suction cup mechanism; (c) Pneumatic diagram for suction cup operation.

Self-sealing suction cups for alternative grasping modalities: This project is an offshoot of the FLEXotendon Glove exoskeletons, in which we developed **3D-printed self-sealing suction cups**, which were then integrated into the FLEXotendon Glove exoskeleton system to observe the effect on object grasping and manipulation. The self-sealing behavior of the suction cups was achieved through the use of polyjet 3D-printing, which allowed us to combine flexible and rigid components within a single print such that the suction cups can be printed without the need for further construction. The suction cups have a diameter of 14 mm, a height of 12 mm, weigh 0.9 g, and a single suction cup can lift up to 0.4 kg. The suction cups also incorporate a gimbal mechanism that allows for accommodate contact angles between -20 degrees to 20 degrees.