Vaughn Chambers

Mechanical Engineering PhD Student
University of Delaware

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CONTACT

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BIOGRAPHY

Self-motivated and honest hard worker with backgrounds in mechanical and biomedical engineering. Enjoys leading teams, being a team member and pursuing solo work. Has experience in a traditional research setting as well as in all stages of the device design process. Will be graduating with a PhD in October 2023.

PUBLICATIONS

[1] V. Chambers and P. Artemiadis, "A Model-based Analysis of Supraspinal Mechanisms of Inter-leg Coordination in Human Gait: Toward Model-informed Robot-assisted Rehabilitation," *IEEE Trans. Neural Syst. Rehabil. Eng.*, vol. 29, pp. 1–1, 2021.

[2] V. Chambers and P. Artemiadis, "Repeated Robot-assisted Unilateral Stiffness Perturbations Result in Significant Aftereffects Relevant to Post-Stroke Gait Rehabilitation," in *IEEE International Conference on Robotics and Automation (ICRA),* 2022.

[3] V. Chambers and P. Artemiadis, "A Model-Based Analysis of The Effect of Repeated Unilateral Low Stiffness Perturbations on Human Gait: Toward Robot-Assisted Rehabilitation," in *IEEE International Conference on Robotics and Automation (ICRA),* 2023.

[4] V. Chambers and P. Artemiadis, "Using Robot-Assisted Stiffness Perturbations to Evoke Aftereffects Useful to Post-Stroke Gait Rehabilitation," *Frontiers in Robotics and AI,* 2022.

[5] Chambers, Vaughn, et al. "The Variable Stiffness Treadmill (VST) 2.0: Development and Validation of a Unique Tool to Investigate Locomotion on Compliant Terrains." *IEEE/ASME Transactions on Mechatronics* (2023) [In Review]

EDUCATION

PhD | Mechanical Engineering
🗓 2019 - Present

University of Delaware, Newark, DE

Human-Oriented Robotics and Control (HORC) Lab
GPA: 4.0/4.0 | Helwig Fellowship Recipient

B.S. | Engineering
🗓 2015 - 2019

Messiah University, Mechanicsburg, PA

Concentrations: Mechanical & Biomedical
GPA: 4.0/4.0 | President's Scholarship | Honors Program

RESEARCH EXPERIENCE

Modeling Human Gait
🗓 2019 - Present

HORC Lab | University of Delaware

Modeling the immediate and long-term human response to unilateral, low stiffness perturbations. This has been accomplished with MATLAB Simulink primarily using control theory and CMA-ES optimization (see publication [1],[3]).

Analysis of Human Gait
🗓 2020 - Present

HORC Lab | University of Delaware

Understanding the aftereffects induced by repeated unilateral, low stiffness perturbations. This involves running experiments and collecting data with human subjects on our unique Variable Stiffness Treadmill (VST), as well as analyzing, synthesizing, and clearly communicating results (see publication [2],[4],[5]).

Design of Robotic Treadmill
🗓 2022 - Present

HORC Lab | University of Delaware

Designing and constructing the Variable Stiffness Treadmill (VST) 2.0. This unique robotic, split-belt treadmill allows for the vertical stiffness of both belts to be reduced, resulting in vertical deflection. The VST 2.0 has major improvements when compared to the original VST and will soon be used to enable a deeper understanding of human gait in compliant environments (see publication [5]).

Prosthetic Design
🗓 2016 -2019

Messiah University | Collaboratory | Prosthetic Knee Project

Design and development of a low-cost prosthetic knee and prosthetic attachments that would be manufactured and used at a hospital in Mahadaga, Burkina Faso. Design had to include locally sourced materials and able to be built with limited machinery. Lead a 3 week trip to Mahadaga to teach locals how to manufacture our designs.

RESEARCH EXPERIENCE (CONT.)

Bio Sensor Design 📅 2018
Messiah University | ENGR431

Designed and constructed wearable biotech headband which measures and logs brain activity using EEG, Arduino Flora & BLE.

Theoretical Device Design 📅 2019
Messiah University | ENGR410

Semester project to design a theoretical medical device. This project included a literature/vendor review, conceptual product design, a mock proposal for seeking FDA approval, developing strategies for avoiding patent infringement, and writing a short-form and long-form proposal (see LinkedIn for brochure).

Paper Airplane Aerodynamics 📅 2018
Messiah University | ENGR213

Semester project on the flight behavior of paper airplanes. Project included procedure design, data collection, data analysis, and website design: https://cr1312.wixsite.com/paperairplane

CONFERENCES

IEEE International Conference on Robotics and Automation 📅 2022
Philadelphia, PA

Presentation and Poster: Repeated Robot-assisted Unilateral Stiffness Perturbations Result in Significant Aftereffects Relevant to Post-Stroke Gait Rehabilitation (see publication [2]).

IEEE/RSJ International Conference on Intelligent Robots and Systems 📅 2023
London, UK

Presentation and Poster: Robot-Assisted Targeted Gait Training (see publication [5]).

SKILLS

Engineering/Coding
Proficiency: MATLAB, Simulink, Solidworks (Certified Associate), Latex, Excel, HTML, CSS,
Working Knowledge: Python, R, C++ (in progress)

Technical
Proficiency: Wood and metal working
Working Knowledge: MIG & TIG welding

Graphic Design
Proficiency: Adobe Illustrator & Photoshop, DaVinci Resolve
Working Knowledge: Adobe After Effects

Hobbies
Wood working, website design and coding, and logo design (https://dribbble.com/VaughnChambers)

WORK EXPERIENCE

Teaching/Lecturing 📅 2020 - 2021
University of Delaware & Messiah University

Guest lectured in the following courses: Introduction to Robotics and Biomedical Instrumentation.

Welder Repair Technician 📅 2018
Systematics Inc. | West Chester, PA

Repaired & tested customers' broken/malfunctioning MIG welders, TIG welders and plasma cutters. Most repairs involved circuit board testing and replacement.

Prosthetics & Orthotics Intern 📅 2017
Ability Prosthetics and Orthotics | Exton, PA

Interned under a Resident Prosthetist Orthotist. I fitted patients for leg braces and cranial remolding helmets as well as made adjustments to patients' prosthetics & orthotics. Gained experience in communicating effectively with patients.

Poster Design 📅 2018 - 2019
Messiah University | Mechanicsburg, PA

Designed weekly eye-catching, informational posters advertising guest speakers at engineering seminars using Adobe Illustrator (see posters on LinkedIn)

Deck Construction 📅 2016 - 2018
Self-Employed

One full deck design and construction (30 ft. x 15 ft), and 2 decks re-boarded using a combination of wood and composite materials.

AWARDS & POSITIONS

Helwig Fellowship Recipient 📅 2019 - Present
University of Delaware
Ambitious, creative, innovative ME graduate students

James T. Scroggin Award 📅 2019
Messiah University
Engineering Excellence, Leadership & Service (1 student/year)

Student Project Manager 📅 2017 - 2019
Prosthetic Knee Team | Messiah University

2nd Place Poster Presentation 📅 2018
Mid-Atlantic Biomedical Engineering Graduate Fair

Club President 📅 2018 - 2019
Messiah University Engineering Honor Society

Board Member 📅 2018 - 2019
Messiah University Engineering Advisory Board

Club President 📅 2022 - Present
InterGrad Christian Fellowship | University of Delaware

PAPER REVIEWS

Nature	2020 - Present
Wearable Technologies	2020 - Present
Transactions on Neural Systems and Rehabilitation Engineering	2021 - Present
International Conference on Robotics and Automation	2021 - Present
International Conference on Rehabilitation Robotics	2023 - Present

VOLUNTEER EXPERIENCE

Goodworks Inc.
2011 - Present

Coatesville, PA

One full work day per month repairing homes of low-income home owners. Gained experience in flooring, HVAC, window installation and flashing, roofing, bathroom installation and plumbing, ceiling installation, other miscellaneous tasks.

Redeemer Fellowship
2020 - Present

Newark, DE

Leads the welcome team (25 people), which works towards creating a friendly and welcoming environment for guests and members. Leads the Bridge team (12 people), which runs a 10-week introductory course twice a year.

COURSEWORK

Relevant Graduate Level Classes

Biomechatronics	Linear Systems
Intermediate Dynamics	Digital Control
Robotics	Applied Nonlinear Control

Relevant Undergraduate Classes

Engineering Graphics	Mechanical Design
Materials Engineering	Manufacturing Processes
Mechanics of Materials	Biomedical Instrumentation
Mechanical Instrumentation	Design of Medical Devices