A. Michael West Jr. – Massachusetts Institute of Technology, Mechanical Engineering, PhD Candidate

• e-mail: amwestjr@mit.edu • website: https://michaelwestjr.github.io/ • google scholar

RESEARCH INTERESTS

My research seeks to better control algorithms for robots involved in rehabilitation, and dexterous manipulation. I investigate human upper-limb motor control and human hand manipulation during tool-use and physical-interaction. By introducing new methods of analyzing human motor control and exploiting old methods on new experimental paradigms, my work leads to new insights on human motor control and perception.

EDUCATION

Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts

     Ph.D., Mechanical Engineering, Class of 2024, GPA: 5.0/5.0
- Dissertation Topic: The Role of Functional Kinematic Hand Synergies in Object Manipulation.
- Advisor: Neville Hogan
- Committee: Haruhiko Harry Asada, Alberto Rodriguez, and Madhusudhan Venkadesan

     M.S., Mechanical Engineering, May 2020, GPA: 4.5/5.0
- Dissertation Topic: Towards a non-invasive measurement of human motion, force, and impedance during a complex physical-interaction task: wire-harnessing
- Advisor: Neville Hogan

Yale University, New Haven, Connecticut

     B.S., Mechanical Engineering, May 2018, GPA: 3.5/4.0, Major GPA: 3.6/4.0

EXPERIENCE

Massachusetts Institute of Technology, Newman Laboratory for Biomechanics & Human Rehabilitation
Graduate Student   2018 – Present
My research uses analysis of kinematic data recorded during human behavioral studies to unveil latent aspects of human motor control for applications in rehabilitation and dexterous robots.
- Using kinematic analysis of pianists to predict the prevalence of injury.
- Exploring how kinematic analysis of the human hand can be used to estimate the complexity of a dexterous task.
- Collecting & analyzing data on human hand manipulation of complex objects & tools.
- Investigated how humans estimate hidden mechanical properties of another's limbs simply by observing their motions.
- Conducted human subject experiment to analyze how humans control force during motion.

Medtronic, North Haven
Robotic Design Intern   Summer 2018
- Designed & built the first prototype of an articulating endoscope to interface with a surgical robot, using Creo Parametric 3.0.
- Implemented the endoscopes controller model using Simuscape 2017.

Yale University, Biomechanics & Control Lab
Undergraduate Research Assistant   Fall 2017 – Spring 2018
- Designed & conducted an experiment to produce a geometric theory that models limb movement using joint surface features.

Yale University, Medical Device Design & Innovation
Design Engineering Student   Fall 2016 – Fall 2017
- Designed & built a 125-part saw guide to improve sternotomies & decrease complications stemming from sternal non-union.

Yale University, Yale Student Technology Collaborative (STC)
Computer Lab Technician   2017 – 2018
- Worked as an STC Operations staff member to repair hardware & software issues of on-campus lab computers.

Yale University, Center for Engineering Innovation & Design (CEID)
Design Aide   2017 – 2018
- Provided theoretical & technical expertise to students seeking help on design projects in the Yale CEID.

Yale University, Social Robotics Laboratory
Undergraduate Research Assistant   Summer 2016
- Designed & built the interior & exterior components of a social robot's articulating face to improve infant-robot interaction.

JOURNAL PAPERS

1. **West, A. M.** & Hogan, N. (In Progress). Reach-and-Grasp Synergies differ from Manipulation Synergies. *Journal of Neurophysiology*.
2. **West, A. M.,** Huber, M.E., & Hogan, N. (2022). Role of Path Information in Visual Perception of Joint Stiffness. *PLOS Computational Biology*.
3. **West, A. M.,** Hermus, J., Huber, M., Maurice, P., Sternad, D., & Hogan, N. (2022). Dynamic Primitives Limit Human Force Regulation during Motion. *IEEE Robotics and Automation Letters (RA-L)*.

CONFERENCE PAPERS

1. **West, A. M.**, Tessari, F. & Hogan, N. (Submitted) The Study of Dexterous Hand Manipulation: A Synergy-Based Complexity Index. *IEEE International Conference of Robotics and Automation (ICRA)*.
2. **West, A. M.**, Tessari, F. & Hogan, N. (2023). The Study of Complex Manipulation via Kinematic Hand Synergies: The Effects of Data Pre-Processing. *IEEE International Consortium for Rehabilitation Robotics (ICORR)*.

CONFERENCE ABSTRACTS

1. **West, A. M.**, Tessari, F. & Hogan, N. (2023, September). The Study of Complex Manipulation via Kinematic Hand Synergies: The Effects of Data Pre-Processing. PowerPoint and poster presented at *Rehab Week*, Singapore. **12th place (out of 300+ submissions) best poster award**
2. **West, A. M.,** & Hogan, N. (2023, April). Kinematic Hand Synergies Differ during Tool-Use and Object Manipulation. Poster presented at the 2023 *Society for Neural Control of Movement (NCM) Conference*, Victoria, BC, Canada.
3. **West, A. M.,** Hermus, J., Huber, M., Maurice, P., Sternad, D., & Hogan, N. (2022, May). Dynamic Primitives Limit Human Force Regulation during Motion. PowerPoint and poster presented at the 2022 *International Conference of Robotics and Automation (ICRA)*, Philadelphia, PA, USA.
4. **West, A. M.,** Hermus, J., Huber, M., Maurice, P., Sternad, D., & Hogan, N. (2022, March). Dynamic Primitives Limit Human Force Regulation during Motion. Poster presented at the 2022 *MIT Sports Summit*, Cambridge, MA, USA.
5. **West, A. M.,** Huber, M.E., Hermus, J., Maurice, P., Sternad, D., & Hogan, N. (2021, April). Humans Do Not Directly Control Force During Physical Interaction. Poster presented at the 2021 *Society for the Neural Control of Movement Conference (NCM)*, Virtual.
6. **West, A. M.,** Huber, M.E., & Hogan, N. (2020, October). Role of Path Information in Visual Perception of Joint Stiffness. PowerPoint presented at the 2020 *Neuromatch Conference*, Virtual.
7. **West, A. M.,** Huber, M.E., Hermus, J. & Hogan, N. (2020, October). Humans Do Not Directly Control Force During Physical Interaction. PowerPoint presented at the 2020 *Conference of Ford Fellows*, Virtual.

8. **West, A. M.,** & Hogan, N. (2020, May). An Analysis of Kinematic Hand Synergies During Wire-Harness Installation. PowerPoint presented at the 2020 *International Conference of Robotics and Automation (ICRA)*, Virtual.
9. Huber, M.E., **West, A. M.,** Folinus, C., & Hogan, N. (2019, October). Visual Perception of Joint Stiffness from Multi-Joint Limb Motion. Poster presented at the 2019 *Annual Conference of the Society for Neuroscience (SfN)*, Chicago, IL, USA.
10. **West, A. M.,** Mandl, H., McCann, C., & Gunawardena, N. (2017, April). A Novel Sternotomy Saw Guide Incorporating Integrated Rigid Fixation. Poster presented at the 2017 *Design of Medical Devices Conference*, Minneapolis, MN, USA.

HONORS & AWARDS

12th Place (out of 300+ Submissions) Best Poster Competition, Rehab Week	2023
Accenture Fellowship **($98,349)**, MIT	2023
MechE Research Exhibition (MERE), Honorable Mention Best Overall Performance **($125)**, MIT	2023
BAMIT Research SLAM, 2nd Place **($500)**, Black Alumni of MIT (BAMIT)	2023
Takeda Fellowship **($94,789)**, MIT	2022
Ben Gold Fellowship **($90,932.76)**, MIT	2021
Ford Foundation Fellowship **($81,000)**, Ford Foundation	2020
Teaching Practice Certificate, MIT Teaching + Learning Lab	2020
Subject Design Certificate, MIT Teaching + Learning Lab	2020
GEM University Associate Fellowship, MIT	2018 & 2020
Ford Foundation Fellowship Honorable Mention, Ford Foundation	2018
UCEM SLOAN Scholar **($40,000)**, MIT	2018
Office of Graduate Education (OGE) Diversity Fellowship **($80,872)**, MIT	2018
Student Design Showcase, 3rd Place, Design of Medical Devices Conference	2017

INVITED TALKS

1. **"Exploring Human Performance: The Importance of Studying our Limitations"** Collaborative Haptics and Robotics in Medicine Lab, Stanford University, May 10, 2023
2. **"Exploring Human Performance: The Importance of Studying our Limitations"** Neuromuscular Biomechanics Lab, Stanford University, May 10, 2023
3. **"Understanding Human Neuromotor Control: All Models are Wrong, Simple Models are Useful"** Neurobionics Engineering Club, Camplus College, May 4, 2023
4. **"Mechanical Impedance: A Necessity in Both Human Motor Action and Human Motor Perception"** Control Conclave, Indian Institute of Technology Delhi, January 6, 2023
5. **"Mechanical Impedance: A Key Component in Both Human Motor Action and Motor Perception"** Future Leaders in Mechanical and Aerospace Engineering: Celebrating Diversity and Innovation, March 10, 2021

TEACHING EXPERIENCE

Massachusetts Institute of Technology, 2.183J/4 Biomechanics and Neural Control of Movement
Teaching Assistant to Professor Neville Hogan   Spring 2021

- Assisted students in understanding homework and lecture material via weekly office hours.
- Helped organize the course and develop lessons based on the courses teaching topics.
- The course was designed for upper-level undergraduates / graduate students. It was comprised of 7 undergraduate and 15 graduate students.
- The class presented students with a quantitative description of how biomechanical and neural factors interact in human sensory-motor behavior. Topics included a review of relevant neural, muscular and skeletal physiology, neural feedback and "equilibrium-point" theories, co-contraction strategies, impedance control, kinematic redundancy, optimization, intermittency, contact tasks and tool-use.

Massachusetts Institute of Technology, 2.151 Advanced System Dynamics and Control
Teaching Assistant to Professor Neville Hogan   Fall 2020
- Independently led students in weekly problem-solving based lectures.
- Helped organize the course and develop lessons based on the courses teaching topics.
- The course was designed for graduate students. It was comprised of 30 graduate students.
- Topics included analytical descriptions of state-determined dynamic physical systems, time and frequency domain representations, system characteristics, and modification of system characteristics using feedback.

Massachusetts Institute of Technology Teaching + Learning Lab
Teaching Practice Certificate Program   Summer 2020
- Discovered several evidence-based teaching strategies that help students stay cognitively active and enable them to practice the material and immediately test their knowledge.
- Practiced giving a lecture that incorporated active learning techniques on a topic involving computer programming.

Massachusetts Institute of Technology Teaching + Learning Lab
Subject Design Certificate Program   Summer 2020
- Learned how to define a lecture's scope, goals, and objectives, and how to effectively assess student progress and give useful feedback.
- Learned how to cultivate a classroom that values a diverse set of thoughts, perspectives, and experiences by acknowledging my own experiences and biases.

SUPERVISION OF UNDERGRADUATE MENTEES

Nicole Attram, Mechanical Engineering, University of Maryland, Baltimore County   Summer 2023 – Present
Jose Ramos, Mechanical Engineering, MIT   Spring 2021
Shreya Gupta, Mechanical Engineering, MIT   Summer 2020 – Fall 2020

SUPERVISION OF GRADUATE MENTEES

Margaret Wang, M. Eng., Electrical Engineering and Computer Science, MIT   Fall 2022 – Spring 2023
- Wang, M. X. (2023). *Non-invasive vision-based measurement of hand kinematics and interaction* (M. Eng, MIT).
- West, A. M., Tessari, F., **Wang. M,** & Hogan, N. (Submitted) The Study of Dexterous Hand Manipulation: A Synergy-Based Complexity Index. *IEEE International Conference of Robotics and Automation*

COMMUNITY SERVICE & OUTREACH

Massachusetts Institute of Technology, New Vassar Dormitory
Graduate Resident Advisor   Fall 2020 – Present
- Fosters a supportive, safe, & positive living environment for students through events built upon shared community standards.

Massachusetts Institute of Technology, Black Graduate Student Association (BGSA)
Treasurer   Spring 2021 – Spring 2022
- Allocated & managed funds to hold community service & social events for MIT's Black graduate students.

Massachusetts Institute of Technology, Academy of Courageous Minority Engineers (ACME)
Treasurer   Spring 2019 – Spring 2022
- Allocated & managed funds for a group of minority engineers who met weekly to discuss career goals & hold each other accountable in achieving those goals.

Massachusetts Institute of Technology, MIT Summer Research Program (MSRP)
Pod Leader Summer 2019 & Summer 2021
- Organized meetings & events to foster a positive climate for undergraduate minority students conducting research at MIT.
- **13 of the 20 students I mentored have enrolled in top STEM graduate programs including MIT, Stanford, UC Berkeley, Georgia Tech, and Purdue.**

Yale University Admissions Office
STEM Outreach Ambassador Spring 2017 – Spring 2018
- Mentored high school students, who had expressed interest in pursuing STEM fields, in making an informed college decision.

National Society of Black Engineers (NSBE) Yale University Chapter
Vice President Spring 2016 – Spring 2017
- Founded a tutoring service at New Haven Academy Elementary School.
- Facilitated chapter meetings & increased comradery through encouraging Black students to continue pursuing STEM fields.
- Assisted in managing organization finances in efforts to sponsor members to attend the national conferences.

Yale University Zeta Psi Fraternity Chapter
Vice President Spring 2016 – Spring 2017
- Served as board member, with the primary role of increasing recruitment, fostering brotherhood, & improving philanthropy.

Yale University Football
Defensive End & Linebacker Fall 2014 – Summer 2016
- Responsibilities included 30+ hours a week of film study, practice, strength & conditioning, & encouraging teammates.

PROFESSIONAL DEVELOPMENT

The Institute on Teaching and Mentoring, Tampa, FL	October 2023
Trail Blazers in Engineering, Purdue University	July 2023
Postdoctoral Recruitment Initiative in Sciences and Medicine (PRISM), Stanford University	May 2023
Focus Fellows Program, Georgia Institute of Technology	January 2023
The Institute on Teaching and Mentoring, Atlanta, GA	October 2022
NextProf Future Faculty Workshop, University of California, Berkeley	September 2022
The Institute on Teaching and Mentoring, Atlanta, GA	October 2019
National Society of Black Engineers (NSBE) Annual Convention, Pittsburgh, PA	March 2018
National Society of Black Engineers (NSBE) Annual Convention, Kansas City, MO	March 2017
National Society of Black Engineers (NSBE) Annual Convention, Boston, MA	March 2016

IN THE NEWS

[A. Michael West: Advancing human-robot interactions in health care](#), MIT News	September 2023

TECHNICAL SKILLS

- Hardware: rapid prototyping using 3D printers, laser cutters, & machine shop tools (mill & lathe).
- Software: CAD (Solidworks, Creo Parametric), Programming (C, C++, Matlab, Python, Arduino, Machine Learning), MuJoCo, Drake, Visual Studio, Microsoft Office.