

# Lorena I. Velásquez, Ph.D.

Doctoral Graduate Research Assistant at Johns Hopkins University

[lvelasq3@jhu.edu](mailto:lvelasq3@jhu.edu)

[lorenav.me](http://lorenav.me)

## EDUCATION

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Ph.D. Mechanical Engineering | The Johns Hopkins University | Baltimore, MD    Defense Passed: April 20<sup>th</sup>, 2026  
M.S Robotics | The Johns Hopkins University | Baltimore, MD    July 2025  
B.S. Mechanical Engineering | New Mexico Institute of Mining and Technology | Socorro, NM    May 2021

## RESEARCH EXPERIENCE & EMPLOYMENT (\* indicates currently held positions)

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**Haptics and Medical Robotics Laboratory, LCSR, ME, Johns Hopkins University**    June 2021\*  
Graduate Research assistant leading the Prosthetics team, focusing on the design and evaluation of agonist/antagonist tendon actuated upper limb prostheses with integrated sensory feedback.

**Computational Sensing and Medical Robotics Laboratory, Johns Hopkins University**    April-Aug. 2020  
Undergraduate Research Assistant, Mosquito Dissection Team

**Advanced Computational Metallurgy Laboratory, New Mexico Tech**    March-Aug. 2020  
Undergraduate Research Assistant, Solid State Rocket Motor Team

**Shock and Gas Dynamics Laboratory, New Mexico Tech**    Dec. 2019-May 2021  
Undergraduate Research Assistant, Automated Explosive Detection.

**Structural Mechanics Laboratory, New Mexico Tech**    Aug. 2018 – May 2021  
August 2018-May 2021 Undergraduate Research Assistant, general project aide.

**Los Alamos National Laboratory: Los Alamos Neutron Science Center (LANSCE)**    Dec. 2017 – May 2021  
Undergraduate Engineering Intern, Pulse Power, Magnet Power Supply, Injection, teams.

## SELECTED HONORS

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**Creel Family Teaching Assistant Award**    April 2026  
Recognized by Mechanical Engineering faculty for exceptional teaching effectiveness, mentorship, and contributions to student learning beyond standard TA responsibilities. (500 dollars)

**Best Abstract and Poster Presentation, Workshop, ICRA**    May 2025  
Recognized at the IEEE ICRA 2025 workshop “Multi-Modal Sensing and Shared Control: The Future of Wearable Robotics?”, for delivering the top-rated abstract and oral presentation on advances in multimodal sensing and shared control for wearable robotics. (200 dollars)

**Link Foundation Modeling, Simulation, and Control Fellowship**    June 2025  
Awarded to support innovative doctoral research in modeling, simulation, and control with demonstrated potential for broad societal impact and technical advancement. (35,000 dollars)

**Percy Pierre Fellowship, Whiting School of Engineering, Johns Hopkins University**    Aug. 2021  
Fellow of the inaugural cohort of outstanding future innovators aiming to enhance the excellence of the Whiting School of Engineering (full 2-year stipend, plus salary and professional development)

**Northrop Grumman Corporation Scholarship**    Aug. 2020  
Recipient, 15,000 in scholarship funds

**Naval Sea Systems Command (NAVSEA) and Strategic Systems Programs**    Oct 2017 & 2018  
Two-time recipient, 10,000 dollars in scholarship funds

**2021 ASEE Gulf-Southwest Conference Best Student Paper Award**    March. 2021  
Best Undergraduate student paper focusing on hybrid curriculum adaptations to the COVID 19 Pandemic (200 dollars)

## TEACHING EXPERIENCE

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Teaching Assistant for Haptic Interface Design, Mechanical Engineering, Johns Hopkins    Fall 2025  
Teaching Assistant for Mechatronics, Mechanical Engineering, Johns Hopkins    Spring 2022  
Teaching Assistant for Haptic Interface Design, Mechanical Engineering, Johns Hopkins    Fall 2022  
Teaching Assistant for Compressible Flow, New Mexico Tech    Spring 2020  
Teaching Assistant for Intro to Mechanical Engineering, New Mexico Tech    Fall 2019, 2020, 2021

## **INVITED TALKS**

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<b>National Science Foundation M3X conference   Alexandria, Virginia</b>	May 2026
Featured Podium talk: “Dexterous Prosthesis Manipulation through Context-Driven Amputee Prosthesis Co-Adaptation”	
<b>Seminar: Neuroscience   Department of Neuroscience   JHU</b>	May 2026
Lab Talk: “Multimodal Evaluation of Cognitive Load During Prosthetic Device Use in Activities of Daily Living”, section on anthropomorphic prosthetic research	
<b>Guest Lecture: Haptic Interface Design for Human-Robot Interaction   JHU</b>	Dec. 2025
“What Could Possibly Go Wrong? (A Lot): Experimental Design for Human–Robot Interaction”	
<b>New Mexico Institute of Mining and Technology   Dept. of Mech. Eng.   Socorro, New Mexico</b>	Nov. 2025
Mechanical Engineering Seminar talk, “Form, Function, and Control, Biologically Informed Approaches to Prosthetic Design and Evaluation”	
<b>George Mason University   Dept. of Biomedical Engineering   Fairfax, Virginia</b>	April 2025
Medical Engineering Conference Guided talks, “On the Design and Evaluation of Tendon Actuated Prostheses with Integrated Haptic Feedback”	
<b>Reagan High School   Engineering CTE   El Paso, Texas</b>	April 2025
Class talk, “The Design, Manufacturing, and Evaluation of Upper Limb Prosthetic Devices”	
<b>Max Plank Institute for Intelligent Systems   Haptic Intelligence Department   Stuttgart, Germany</b>	Sep. 2024
Featured talk, “Towards Tendon Actuated Prostheses with Integrated Haptic Feedback”	

## **ACTIVITIES & SERVICES (\* indicates currently held positions)**

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<b>Showcase Exhibitor, Maryland Science Center</b>	May 2025*
Lead in development of a three-part child friendly exhibit at the Maryland Science Center detailing the evolution of tendon actuation prostheses and the impact of haptic integration.	
<b>CAMP BMORE Volunteer, Kenedy Kreiger Institute, Johns Hopkins Medicine</b>	June 2025
Developed and presented hands on demonstrations of various superhero themed prosthetic devices for children recovering from cancer treatment, and their siblings.	
<b>PROPEL Program, Mentor, Johns Hopkins University</b>	May 2024-May 2026
Mentor in the PROPEL: Promoting Research Opportunities in Engineering Labs program providing summer research experience, mentorship, graduate school preparation, professional development, and collaborative work experience to undergraduates from under resourced backgrounds.	
<b>WISE Program, Johns Hopkins University</b>	Feb. 2024-May 2026
Mentor in the WISE program, a paid research opportunity for Baltimore City high school students who are mentored by Johns Hopkins University (JHU) researchers. WISE aims to increase the diversity of students pursuing science and engineering in college by developing their knowledge of a specific STEM field and fostering connections with STEM professionals	
<b>Vivien Thomas Scholars Initiative, Fellow, Johns Hopkins University</b>	May 2022-August 2025
Mentor in the program establish and strengthen pathways for students from Historically Black Colleges and Universities (HBCUs) and Minority Serving Institutions (MSIs) to pursue and receive PhDs in STEM fields.	
<b>Chair of Diversity, Equity and Inclusion, MECHE Grad Student Association (MEGA)</b>	July 2022- 2023
Served as a link between the MECHE department DEI committee and the graduate student body, actively led community events and social gatherings aiming to support underrepresented groups, with an emphasis on cultural celebrations.	
<b>Outreach Coordinator, HAMR Lab, Johns Hopkins University</b>	Jan. 2022*
Coordinating and leading relations between the HAMR lab and the greater Baltimore community, including providing interactive lab tours for freshman undergraduate students, Boy Scout troops, visiting faculty members, and even individuals with recent limb loss.	
<b>Graduate Student Representative, MECHE Department DEI Committee</b>	Sep. 2021-May 2026
Committee members helping to inform departmental decisions on how to support students, recruit from diverse sources, and promote student well-being at the departmental level.	

## **PUBLICATIONS & POSTERS**

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### **Papers**

- [7] Velásquez, L., Goytizolo, G., Brown, J.D., “Multi-modal Evaluation of Cognitive Load during Activities of Daily Living”, *Journal of NeuroEngineering and Rehabilitation*, *Under Review*, doi:10.21203/rs.3.rs-9888865/v1
- [6] Velásquez, L., Brown, J.D., “Human-Inspired Design of Tendon-Driven Prosthetic Hands: A User-Centered Comparative Study”, *IEEE Transactions on Neural Systems and Rehabilitative Engineering*, Special Issue on User-Centered Innovation in Upper Limb Prosthetics, May 2025, *Under Review*, doi: 10.64898/2026.04.06.26350199
- [5] Lahr, C., Velásquez, L., Brown, J.D., “A Tendon-Driven Anthropomorphic Prosthesis: Where Biology and Engineering Go Hand in Hand”, *Mechanical Engineering*, Johns Hopkins University, May 2024. (Masters thesis)
- [4] Velásquez, L., Brown, J.D., “Understanding the Utility of State-Based Haptic Feedback in Tendon-driven Anthropomorphic Prostheses”, *IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE)*, 2024, DOI: 10.1109/TNSRE.2025.3573871
- [3] Dunning, C., Velásquez, L., Cervantes, R., Western, A., Hassanalian, M. “Design and Manufacturing of a Bioinspired Spider Rolling Robot for Mars Exploration”, 2021 AIAA
- [2] Velásquez, L., O’Malley, C., (2020). “Delivering Hands-On Introductory Design Experiences in a Hybrid Curriculum” 2021 ASEE Annual Conference
- [1] Velásquez, L., Nunez, E., Harlow, R., Garcia, J., O’Malley, C., (2020). “The implementation of dynamic learning in a project-based introductory engineering course.” 2020 ASEE Conference

### **Posters**

- [15] Agbebi, O., Velásquez, L., Brown, J.D., “A Dual Approach to Enhancing Dexterity and Sensory Feedback in Prosthetic Hands”, *American Society for Microbiology Annual Biomedical Research Conference for Minority Students (ABRCMS)*, November 2025
- [14] Velásquez, L., Huang, H., Brown, J.D., “Toward Co-Adaptive Prosthetic Control: Hill-Type musculoskeletal Models Improve Prosthetic Utility and Performance”, *Robot Automation Society International Conference on Robotics and Automation (ICRA)*, May 2025
- [13] Velásquez, L., Brown, J.D., “HAMR Time: Customized Anthropomorphic End-Effectors, Where Biology and Engineering Go Hand in Hand” *Malone Center Symposium*, Johns Hopkins University
- [12] Velásquez, L., Brown, J.D., “HAMR Time: Customized Anthropomorphic End-Effectors, Where Biology and Engineering Go Hand in Hand”, *IEEE, International Conference on Biomedical Robotics and Biomechatronics (BioRob)*, September 2024
- [11] Policarpo, J., Kanashiro, Y., Velásquez, L., Brown, J.D., “Enhancing Prosthetic Hand Functionality with a Flexible Actuator Finger and high-density force sensor Integration”, *SACNAS 2024*
- [10] Ivey-Shinno, E., Velásquez, L., Brown, J.D., “Verification of a Custom Tendon-Actuated Anthropomorphic hand for a Trans-Radial Amputee”, *SACNAS 2024*
- [9] Velásquez, L., Brown, J.D., “Modular Design of Embedded Haptic Feedback in Anthropomorphically-Driven Prostheses”, *IEEE World Haptics 2023*
- [8] Polydefkis, E., Lahr, C., Velásquez, L., Brown, J.D., “Design and Verification of a 3D-printed Anthropomorphic Hand to Improve Surface Contact with Force Sensing Objects”, *LCSR*, Johns Hopkins University.
- [7] Bomhoff, K., Velásquez, L. “Design and Verification of an Anthropomorphic Bypass Socket”, *LCSR*, Johns Hopkins University, July 2022
- [6] Steinhoff Prosthetic Hand, , *Senior Design Symposium*, Poster Presentation and Lightning Talk, *New Mexico Institute of Mining and Technology*, March 2021
- [5] Velásquez, L., Goodridge, A., Iordachita, I., “Robotic System for Mosquito Dissection: Linear Jaw Assembly
- [4] Sandia Integrated Sensing Device, *Junior Design Symposium*, Poster Presentation and Lightning Talk Optimization”, *Computer Science NSF REU Summer Symposium*, Johns Hopkins University
- [3] Velásquez, L., “High Voltage Phet Board Optimization: Prolonging Life Through PCB Design”, *Summer Poster Symposium*, *Los Alamos Neutron Science Center*, *Los Alamos National Laboratory*
- [2] Velásquez, L., “Diode Installation on High Voltage Power Supplies”, *Summer Poster Symposium*, *Los Alamos Neutron Science Center*, *Los Alamos National Laboratory*
- [1] Dynamic Characterization of Resonance Frequency, *Freshman Design Day*, Poster Presentation, *New Mexico Institute of Mining and Technology*, Dec 2018

**MENTORSHIP (\* indicates current mentorship roles)**

[22] Aaliyah Thompson-Mazzeo   Ph.D.	Summer 2025*
[21] Rana Atwain   WISE	Summer 2025
[20] Oluwafolahan Agbebi   NSF REU	Summer 2025
[19] Itzel Vargas   Stone Ridge School of the Sacred Heart	May 2025 – Aug. 2026*
[18] Naomi Mason   WISE	Spring 2025
[17] MaKhaila Benti   Ph.D.   VTSI	Jan. 2025 – May 2026
[16] Jared Magdiel Jaroszewski   Ph.D.   VTSI	Dec. 2024 – May 2026
[15] Gabriella Goytizolo   BS MECHE	Aug. 2024*
[14] Delphine Tan   MS MECHE	Aug. 2024 – July 2025
[13] Hannah Qu   MS MECHE	Aug. 2024 – July 2025
[12] Luis Flores   Ph.D.   VTSI	Aug. 2024 - May 2026
[11] Kayla Wilkins   WISE	Summer 2024
[10] Jose Policarpo   PROPEL REU	Summer 2024
[9] Emmaleigh Ivey Shinno   NSF REU	Summer 2024
[8] Yensabro Kanashiro   MS MECHE Student   Ph.D.   VTSI	Dec. 2023 - Aug. 2025
[7] D.J. Gordon   Ph.D.   VTSI	Aug. 2023 - May 2025
[6] Noah Drakes   Ph.D.   VTSI	Aug. 2023 - May 2026
[5] Caelyn Rivas -Sobie   Ph.D.   VTSI	Aug. 2023 - July 2025
[4] Elizabeth Polydefkis   NSF REU	Summer 2023
[3] Chase Lahr   MS. MECHE	Aug 2023-May 2024
[2] Rasheedat Ekiyoyo   NSF REU	Summer 2022
[1] Katie Bomhoff   NSF REU & BS MECHE	May 2022-2023

**RESEARCH (\* indicates current projects)**

<b>GRADUATE</b>	
<b><i>Musculoskeletal Characterization of Impedance Modulation During Prosthesis Use</i></b>	July 2025*
Used Musculoskeletal informed control to develop contraction profiles analyzing the use of co-contraction methods for impedance modulation during prosthesis use.	
<b><i>Pneumafingers: A Dual Approach to Enhancing Dexterity and Sensory Feedback in Prosthetic Hands</i></b>	July 2025
Integrated hollow bladders into flexible prosthetic hands to passively monitor force at the fingertip, and characterized these hands to detect the stiffness of objects.	
<b><i>Design and implementation of a Haptic Cello</i></b>	June 2025*
In conjunction with a high school cellist in the Peabody Conservatory, developed a 3D printed electric cello with imbedded haptic feedback to guide novices through new pieces of music.	
<b><i>Design of Marvel Themed Tendon Actuated Prostheses for Children</i></b>	May 2025 – July 2025
Developed and showcased two tendon actuated pediatric prostheses for demonstration at an event for children recovering from cancer treatment, and their siblings.	
<b><i>Development of an Imbedded Systems Platform for Prosthetic Demonstration</i></b>	May 2025*
Developed a stand-alone interactive mobile testbed system for the display of a variety of prosthetic designs and haptic augmentations for the Maryland Science Center.	
<b><i>Multimodal Evaluation of Cognitive Load During Activities of Daily Living</i></b>	April 2025*
Combined eye tracking, FNIRS, and subjective metrics to perform multileveled assessment and characterization of cognitive burden during prosthesis use.	
<b><i>3D Printed Customized Flexible Socket Platform for Transradial Amputees</i></b>	January 2025
Customized end to end prosthetic socket for transradial amputees employing HAMR Process user-centered design principles.	
<b><i>Haptic training for improved MSK model EMG control</i></b>	January 2025*
Incorporating haptic training paradigms to inform optimized muscle-driven models in control of the prosthesis.	
<b><i>Musculoskeletal Model (MSK) Informed Control</i></b>	Nov. 2024*

Evaluating the efficacy of optimized muscle-driven models in control of the prosthesis. Currently incorporating real time MSK parameter optimization toward a co-adaptive control framework.	
<b>Customization of Anthropomorphic End-Effectors: Partial Hand Amputees</b>	Summer 2024
Expanded the HAMR process to form fittings for a partial hand amputee.	
<b>Haptic Integration in Tendon Actuated Anthropomorphic Prostheses</b>	Jan. 2023
Evaluating single and multimodal haptic implementations in the prosthesis. Current integration focusses on multi-modal soft haptic interfaces.	
<b>Creation of Anthropomorphic Tendon Actuated End Effectors</b>	
Creation of the Human-inspired Actuator Modeling and Reconstruction (HAMR) process for molding end effectors and prosthetic devices to the morphology of the residual limb.	
<b>Impedance Control of a Tendon-Actuated Prosthesis</b>	May 2022*
Integrating and improving sEMG-based impedance control in the prosthesis. Current work focusses on creating compact in line tension sensors.	
<b>Design and Manufacturing of 3D-printed Bypass Sockets</b>	May 2022*
Using FDM to create accessible, customizable, and comfortable prosthetic devices out of a variety of materials. Currently being expanded to fully flexible transradial prostheses.	
<b>Tendon Actuated Anthropomorphic Prosthesis</b>	June 2021*
Lead of a project on the design, manufacturing, control, haptic integration, and testing of an anthropomorphic tendon-actuated prosthesis. Overall project associated with other sub-projects listed here.	
UNDERGRADUATE	
<b>Prosthetic Hand for Eddie Steinhof</b>	Aug. 2020-May 2021
Lead of the control subgroup fabricating daily use prosthetic limb for a partial hand amputee, Eddie Steinhoff.	
<b>Bio-Inspired Mars Rover</b>	Nov. 2020-May 2021
Member of a team designing a bio-inspired Mars rover based on evasive strategies of golden rolling spiders.	
<b>Robotic System for Mosquito Dissection</b>	Summer 2020
Research Assistant working on a robotic system for mosquito dissection to aid in malaria vaccine production.	
<b>Additive Manufacturing of Rocket Motors</b>	Summer 2020
Member of a team funded by the Defense Advanced Research Program manufacturing solid-state rocket motor systems using 3D printer technology.	
<b>Automated Explosive Detection</b>	Fall 2020
Lead of the Department of Homeland Security project focused on automating explosives sampling.	
<b>Multi-Faceted Sensing Device Aug.</b>	Aug. 2019-May 2020
Team lead of a design group tasked with the fabrication of an integrated sensing device to monitor and transmit environmental conditions of sensitive material during transit for Sandia National Laboratory.	
<b>High Altitude Weather Balloon</b>	Fall 2018
Leader of the logistics group that programmed, designed, and launched a weather balloon that collected data in the Socorro atmosphere reaching a height of 60,000 ft.	
<b>Explosive Deflection Shields</b>	Fall 2018
Leader of a group in competition to develop a shield to survive a 5 lb c4 pipe bomb explosion. Successfully completed the task with zero penetration through the shield.	