ELYSE D. Z. CHASE

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RESEARCH INTERESTS

I design multisensory interactive systems. Humans use their senses to explore, interact, learn, and make high-level judgments between objects – all while simultaneously building mental models of the world. I study how humans perceive and integrate multisensory information with implicit knowledge and priors, which is critical to how we perceive and understand the world.

EDUCATION

Stanford University, Ph.D. in Mechanical Engineering — Summer 2023
Thesis: In Touch with Causation: The Role of Haptics in Multisensory Phenomenal Causality
Advisor: Dr. Sean Follmer

Stanford University, M.S. in Mechanical Engineering — Spring 2020
Depth in Mechatronics

University of Pennsylvania, B.S.E. in Mechanical Engineering and Applied Mechanics — Spring 2017
Minors in Fine Arts and Anthropology | Summa Cum Laude

APPOINTMENTS

Mechatronics and Haptic Interfaces Lab, Rice University — 2023 - Current
Postdoctoral Fellow, Advisor: Dr. Marcia K. O' Malley
Studing how referred haptic feedback, such as vibration and squeeze at the wrist, can provide the user information about what is occurring at their fingertips. Exploring multisensory integration with referred haptic feedback and sensory illusions in virtual reality. Aiding projects on haptic feedback for surgical training, robotic rehabilitation, and haptic perception.

SHAPE Lab, Stanford University — 2017 - 2023
Graduate Research Assistant, Advisor: Dr. Sean Follmer
Conducted research on haptics and human perception to understand causality through experimental results and computational models. Also explored humans' affective interpretation of robot motion, haptic guidance for blind and visually impaired individuals, and reach redirection in virtual reality.

Haptics Group, Facebook Reality Labs Research — Sept 2020 - Jan 2021
Research Intern, Advisor: Dr. Ali Israr
Studied how the human wrist can transfer information via vibrotactile actuation with a wristband device.

Haptics Group, University of Pennsylvania — Spring 2015 - 2017
Undergraduate Research Assistant, Advisor: Dr. Katherine J. Kuchenbecker
Studied cutaneous haptic devices with the da Vinci surgical robot; built devices for robotic palpation.

Caracol Archaeological Project, Belize — Annually - 2014
Lab Assistant, Advisors: Drs. Arlen & Diane Chase
Worked for two months every year in the field to document and catalog remains (www.caracol.org).

SHORT-TERM EXPERIENCES

CHARM Lab, Stanford University — Winter 2018
Graduate Research Assistant, Advisor: Dr. Allison Okamura
Developed the system and conducted studies to test haptic perception on the forearm using a Phantom.

Haptic Intelligence, Max Planck Institute for Intelligent Systems in Stuttgart, Germany Summer 2017
Visiting Researcher, Advisor: Dr. Dr. Katherine J. Kuchenbecker
Designed a haptic feedback pen and created documentation for exercise for older adults with a Baxter.

Drones and Autonomous Systems Lab, University of Nevada, Las Vegas Summer 2016
Undergraduate Research Assistant, Advisor: Dr. Paul Oh
Aided a project to document and create open-source resources for making soft, pneumatic robots.

Research Experience for Undergraduates (REU), University of Central Florida Summer 2014
Hard & Soft Materials in Nanoscience Technology Driven Energy Applications, Advisor: Dr. Sudipta Seal
Worked with graduate students to detect proteins using magnetic nanoparticles and optics.

ACADEMIC HONORS AND ACHIEVEMENTS

Selected as a **Rising Star in Mechanical Engineering** 2024

Future Faculty Fellow (FFF) Rice's George R. Brown School of Engineering and Computing 2024

Intelligence Community Postdoctoral Fellowship 2023, 2024

Rice Academy of Fellows Postdoctoral Fellowship 2023, 2024

NSF Graduate Research Fellowship Program (GRFP) 3 years 2017

Stanford Graduate Fellowship (SGF) 3 years, *Stanford University* 2017

Ralph Teetor Award, *University of Pennsylvania* 2017
Awarded annually to the senior who in the opinion of the department's faculty, has demonstrated the qualities of ingenuity, creativity, scholarship, and service.

Goldwater Scholar 2016

Victor W. K. Ku Memorial Award, *University of Pennsylvania* 2016
Awarded annually to a student who, at the end of their junior year, best exemplifies the ideals of high scholarship, personal discipline, and service to others.

National Merit Finalist Scholarship 2013
Sponsored by the National Distiller's Distributors Foundation

RESEARCH AND DESIGN PRIZES

Best Work in Progress Paper at World Haptics Conference July 2021

1st Prize SEAS Senior Design, University of Pennsylvania 2017
Across the School of Engineering and Applied Science, for Backster: an accurate, affordable, and portable torso mapping system

Francis G. Tatnall Prize, University of Pennsylvania 2017
Awarded to the senior design project judged to be the most outstanding and which reflects the qualities of ingenuity, technical proficiency, and usefulness

Abraham Research Award, University of Pennsylvania 2015
Awarded annually to support an undergraduate student conducting summer research

PUBLICATIONS

Journal Publications

In Prep

[J7] Mahan E.E., King S.T., **Chase E.D.Z.**, Schearer E.M., O'Malley M.K. (2025) Upper Limb Movement Assistance through Model-Based Path Planning and Control of Hybrid FES-Exoskeleton Systems. IEEE Transactions on Neural Systems and Rehabilitation Engineering (TNSRE).

Under Review

[J6] **Chase E.D.Z.**, Smith K., Follmer S., Gerstenberg T. (2025) Seeing, Hearing, and Feeling Causality. Cognitive Psychology.

[J5] **Chase E.D.Z.**, Israr A., Schepmann M.S., O'Malley M.K., Hartcher-O'Brien J. (2025) Information Bandwidth of the Wrist: Signal Variations from Single to Multiple Tactors. ACM Transactions on Human-Robot Interaction (THRI).

Published

[J4] Mahan E.E., King S.T., **Chase E.D.Z.**, Schearer E.M., O'Malley M.K. (2025) Nonlinear Optimization for Personalized Path Planning for a Hybrid FES-Exoskeleton System. IEEE Robotics and Automation Letters (RA-L).

[J3] Mahan E.E.*, Oh J.*, **Chase E.D.Z.**, Dunkelberger N.B., King S.T., Sayenko D., O'Malley M.K. (2024) Assessing the Effect of Cervical Transcutaneous Spinal Stimulation with an Upper Limb Robotic Exoskeleton and Surface Electromyography. IEEE Transactions on Neural Systems and Rehabilitation Engineering.

[J2] Sullivan D.H., **Chase E.D.Z.**, O'Malley M.K. (2024) Comparing the Perceived Intensity of Vibrotactile Cues Scaled Based on Inherent Dynamic Range. IEEE Transactions on Haptics, 17(1): 45-51.

[J1] Murdock R.J., Putnam S.A., Das S., Gupta A., **Chase E.D.Z.**, Seal S. (2017) High-Throughput, Protein-Targeted Biomolecular Detection Using Frequency-Domain Faraday Rotation Spectroscopy. Small, 13 (12): 1613 - 682.

Conference Papers

[C8] **Chase E.D.Z.**, Sullivan D.H., O'Malley M.K. (2025) Hands-On or Hands-Off? Active Touch Influences Multisensory Perception of Referred Haptics. In IEEE World Haptics Conference, July 2025. (*Oral Presentation by* **Chase E.D.Z.**)

[C7] Stovicek K.C., King S.T., **Chase E.D.Z.**, Fleck J.J., Zandiyeh P., O'Malley M.K. (2025) Walking Does Not Diminish Localizability of Vibrotactile Feedback on the Waist. In IEEE World Haptics Conference, July 2025. (*Oral Presentation by Stovicek K.C.*)

[C6] **Chase E.D.Z.**, O'Malley M.K. (2024) The Interplay of Vision and Referred Haptic Feedback in VR Environments. In International Conference on Human Haptic Sensing and Touch Enabled Computer Applications, pp. 385-397. Cham: Springer International Publishing, 2024. (*Oral Presentation by* **Chase E.D.Z.**)

[C5] **Chase E.D.Z.**, Gerstenberg T., Follmer S. (2023) Realism of Visual, Auditory, and Haptic Cues in Phenomenal Causality. In IEEE World Haptics Conference, pages 306-312, July 2023. (*Oral Presentation by* **Chase E.D.Z.**)

[C4] Gonzalez E.J., **Chase E.D.Z.**, Kotipalli P., Follmer S. (2022) A Model Predictive Control Approach for Reach Redirection in Virtual Reality. In ACM CHI, pages 1-15, April 2022. (*Oral Presentation by Gonzalez E.J.*)

[C3] **Chase E.D.Z.**, Israr A., Preechayasomboon P., Sykes S., Gupta A., Hartcher-O'Brien J. (2021) Learning Vibes: Communication Bandwidth of a Single Wrist-Worn Vibrotactile Actuator. In IEEE World Haptics Conference, pages 421-426, July 2021. (*Oral Presentation by* **Chase E.D.Z.**)

[C2] **Chase E.D.Z.**, Follmer S. (2019) Differences in Haptic and Visual Perception of Expressive 1DoF Motion. In ACM Symposium on Applied Perception, pages 1-9, Barcelona, Spain, September 2019. (*Oral Presentation by* **Chase E.D.Z.**)

[C1] Brown J.D., Ibrahim M., **Chase E.D.Z.**, Pacchierotti C., Kuchenbecker K.J. (2016) Data-Driven Comparison of Four Cutaneous Displays for Pinching Palpation in Robotic Surgery. In Proc. IEEE Haptics Symposium, pages 147-154, Philadelphia, PA, USA, April 2016. (*Oral Presentation by Brown J.D.*)

Book Chapters

[B2] Chase A.S.Z., **Chase E.D.Z.**, Chase D.Z., Chase A.F. (2024) Population History for Caracol, Belize: Numbers, Complexity, and Urbanism. A.S.Z. Chase, A.F. Chase, & D.Z. Chase Eds. In Ancient Mesoamerican Population History: Demography, Social Complexity, and Change, University of Arizona Press, Tucson. pp. 67-88.

[B1] Siu A.F., **Chase E.D.Z.**, Kim G.S-H., Boadi-Agyemang A., Gonzalez E.J., Follmer S. (2021) Haptic Guidance to Support Design Education and Collaboration for Blind and Visually Impaired People. In C. Meinel and L. Leifer, Eds. Design Thinking Research: Translating, Prototyping, and Measurement, pp. 167 - 180, Springer Nature Switzerland AG.

Posters, Demonstrations, Work In Progress Papers, Late-Breaking Works, & Extended Abstracts

[L12] **Chase E.D.Z.**, O'Malley M.K. (2025) Modeling Physical Perception in Virtual Interactions. In IEEE RO-MAN, Eindhoven, Netherlands, August 2025. (*Presented by* **Chase E.D.Z.**)

[W11] Tomassetti O., **Chase E.D.Z.**, Follmer S. (2025) Understanding the Role of Explicit Error-based Feedback Through a Sensorimotor Modeling Approach. In IEEE World Haptics Conferences, Suwon, South Korea, July 2025. (*Presented by Tomassetti O.*)

[W9, D10] Chen X., Hlibok B., Morriss N., Nik-Ahd A., Tan W., Zhou D., **Chase E.D.Z.**, O'Malley M.K. (2025) WRIST: A Wearable Radial Interface for Sensory hapTic feedback. In IEEE World Haptics Conferences, Suwon, South Korea, July 2025. (*Presented by Chen X., Hlibok B., Morriss N., & Nik-Ahd A.*)

[P8] Schepmann M.S., **Chase E.D.Z.**, O'Malley M.K. (2025) Good Vibes: The Influence of Intensity on Vibrotactile Haptic Feedback Perception. Undergraduate Research Poster Symposium. (*Presented by Schepmann M.S.*)

[W7] [***Best Workshop Presentation***] Mahan E.E., King S.T., **Chase E.D.Z.**, O'Malley M.K. (2024) Nonlinear Trajectory Optimization to Improve Performance of a Hybrid FES and Exoskeleton System. BioRob Workshop. (*Presented by E.E. Mahan*)

[P6] **Chase E.D.Z.**, O'Malley M.K. (2024) From Integration to Illusion: Advancing Multisensory Perception with Haptic Feedback. In Interface Rice. Houston, TX, USA, April 2024. (*Presented by* **Chase E.D.Z.**)

[W5] Johnson L.R., **Chase E.D.Z.**, Byrne M.D., O'Malley M.K. (2024) Real-Time Vibrotactile Haptic Feedback Based on Tool Movement Smoothness for Endovascular Surgical Skill Training. In Haptics Symposium. Long Beach, CA, USA, April 2024. (*Presented by L.R. Johnson*)

[E4] **Chase E.D.Z.**, Wolff P., Gerstenberg T., Follmer S. (2021) In Touch with Causation: Understanding the Impact of Kinesthetic Haptics on Causality. In Proc. Annual Meeting of the Cognitive Science Society, 43(43). Virtual, July 2021. (*Presented by* **Chase E.D.Z.**)

[W3] [***Best Work in Progress Paper***] **Chase E.D.Z.**, Wolff P., Gerstenberg T., Follmer S. (2021) A Causal Feeling: How Kinesthetic Haptics Affects Causal Perception. In IEEE World Haptics Conferences, pages 421-426, Virtual, July 2021. (*Presented by* **Chase E.D.Z.**)

[W2] **Chase E.D.Z.***, Siu A.F.*, Boadi-Agyemang A., Kim G.S-H., Gonzalez E., Follmer S. (2020) PantoGuide: A Haptic and Audio Guidance System To Support Tactile Graphics Exploration. In ACM SIGACCESS, pages 1-4, Virtual, October, 2020. (*Presented by* **Chase E.D.Z.**)

[D1] Ibrahim M., **Chase E.D.Z.**, Brown J.D., Pacchierotti C., Kuchenbecker K.J. (2016) One sensor, three displays: A comparison of tactile rendering from a BioTac sensor. In IEEE Haptics Symposium, Philadelphia, PA, USA, April 2016. (*Hands-on demonstration presented by* **Chase E.D.Z.** *and Ibrahim M.*)

INVITED TALKS

Tactile Intelligence: Active Perception, Wrist Bandwidth, and Adaptive Modeling. Invited Speaker for the Intelligence Community Tech Week. MacLean, VA (Remote). September 24, 2025.

Beyond the Fingertips: Wrist-Worn Haptics for Immersive Interaction. Invited Speaker for Workshop on Emerging Challenges in Wearable Haptics, World Haptics Conference. Suwon, S. Korea. July 8, 2025.

Multisensory Integration in Extended Reality: Design & Implementation. Invited Speaker for UMass Amherst Mechanical & Industrial Engineering Department. Amherst, MA. February 26, 2025.

Human Augmentation Through Referred Haptic Feedback. Invited Speaker for the Intelligence Community Tech Week. MacLean, VA. September 12, 2024.

Referred Haptics in Virtual Environments and Multisensory Integration. Spotlight Speaker for Texas Regional Robotics Symposium (TEROS). College Station, TX. April 30, 2024.

GRANT AND PROPOSAL WRITING EXPERIENCE

Technical Committee on Haptics: Innovation in Haptics Research Proposal Oct 2024
Dr. E.D.Z. Chase, "Inertial Rendering: Referring Haptic Feedback from the Fingertips to the Wrist"
$2,100: *Research Stipend, Travel Budget*

Intelligence Community Postdoctoral Fellowship Sept 2023 - 2025
Dr. E.D.Z. Chase & Dr. M.K. O'Malley, "Enabling Components of Human Augmentation"
$181,500: *Postdoc Salary, Research Stipend, Travel Budget*

Rice Academy Postdoctoral Fellowship Aug 2023 - 2025
Dr. E.D.Z. Chase & Dr. M.K. O'Malley, "Understanding Multisensory Perception within Sensory Illusions"
$70,000: *Postdoc Salary, Research Stipend*

Stanford HAI (Human-Centered Artificial Intelligence) Seed Grant 2021
PI Dr. Sean Follmer, Co-PIs Dr. Jeannette Bohg & Dr. Tobias Gerstenberg, "In Touch With Causation"
Contribution: Helped to plan projects, provide preliminary data, and write those sections of the proposal.
$75,000: *PI Salary, Graduate Student Salary, Research Funds*

TEACHING EXPERIENCE

Guest Lecturer, **Haptic Interface Design for Human Robot Interaction** (EN.530.691) Fall 2024
Johns Hopkins University, Dr. Jeremy Brown – Graduate Level
Topic: Haptics in Multisensory Integration

Guest Lecturer, **Translational Neuroengineering** (MECH 599) Spring 2024
Rice University, Dr. Marcia O'Malley – Graduate Level (12 students)
Topic: IRB and Experimental Design

Course Assistant, **Design and Control of Haptic Systems** (ME 327) Spring 2022
Stanford University, Dr. Allison Okamura – Graduate Level (79 students), Review 4.55/5

Course Assistant, **Advanced Dynamics & Computation** (ME 331A) Winter 2022
Stanford University, Dr. Paul Mitiguy – Graduate Level (29 students)

Course Assistant, **Human-Computer Interaction Seminar** (CS 547) Fall 2021
Stanford University, Dr. Sean Follmer – Graduate & Undergraduate Levels

PROFESSIONAL SERVICE AND MEMBERSHIPS

Honor Society Memberships & Affiliations

Tau Beta Pi, Sigma Xi, SWE, ASME, ACM, IEEE

Editorial Boards

Associate Editor for Haptics Symposium, Haptic-Technology Subtrack (2026)
Work in Progress at Haptics Symposium (2024)

Workshops

Centering the Person in Haptics Research WHC 2025
Organizers: Daziyah H. Sullivan, Elyse D. Z. Chase, & Marcia K. O'Malley
Topics: participatory design, human-centered design, and user-experience design

Reviewer

Journals
IEEE RA-L Robotics and Automation Letters (2025)
IEEE TNSRE Transactions on Neural Systems and Rehabilitation Engineering (2025)
IEEE TOH Transactions on Haptics (2024, 2025)
Nature Reviews Electrical Engineering (2024)
ACM THRI Transactions on Human-Robot Interaction (2024)

Conferences
WHC World Haptics Conference (2021, 2025)
EuroHaptics (2022, 2024)
ACM CHI Human Factors in Computing Systems (2023, 2024)
IEEE HS Haptics Symposium (2024)
IEEE ICRA International Conference on Robotics and Automation (2025)
IEEE RAS International Conference on Soft Robotics – RoboSoft (2025)

MENTORING

Rice University

Kyra Stovicek, *ME PhD Student* [C7] Fall 2024 - current
Amelia Pillar, *ME Undergraduate Student* Fall 2024 - current
Mina Schepmann, *ME Undergraduate Student* [J5, P8] Summer 2024 - current
Buckley-Sartwelle Scholarship Spring 2025
Awarded to an outstanding junior in mechanical engineering
Daziyah Sullivan, *ME PhD Student* [J2, C8] Fall 2023 - current
Rodrigo Gallardo, *Architecture Masters Student* Summer 2025 - current
Joseph Engelking, *ME Undergraduate Student* Summer 2025 - current
Shawn-Michael Ferguson, *ME Undergraduate Student* Summer 2025
Erin Mahan, *ME PhD Student* [J7, J4, J3, W7] Fall 2023 - Spring 2025
Noah Kim, *ME PhD Student* Fall 2023 - Summer 2024
Anas Yousaf, *ME Undergraduate Student* Fall 2023 - Spring 2024

Undergraduate Senior Capstone Teams
WRIST: A Wearable Radial Interface for Sensory hapTic feedback [W9, D10] Fall 2024 - Summer 2025
Ali Nik-Ahd (*ME*), Brendan Hlibok (*ME*), Didi Zhou (*ECE*),
Nathan Morriss (*ME*), Wendy Tan (*ECE*), and Xinghe (Mark) Chen (*ECE*)
OEDK Staff Favorite Award April 2025

Special recognition given to a student project based on a staff member's favorite

IEEE CASS Student Design Competition World Winner (1st Place) May 2025

A worldwide competition where undergraduate students will suggest and execute projects on electrical engineering and related areas. The focus should be on finding a solution to a real-life problem based on circuits and systems.

Stanford University

Olivia Tomassetti, *ME PhD Student* [W11]	January 2025 - Current
Yuyu Lin, *CS Masters Student*	Fall 2021
Amy Zhou, *PD Undergraduate Student*	Summer 2021 - Fall 2022
Cherie Frances, *ME Undergraduate Student*	Summer 2021
Abena Boadi-Agyemang, *ME Undergraduate Student* [W2]	Summer 2019
Julea Chin, *ME Undergraduate Student*	Summer 2018

ACTIVITIES AND OUTREACH

Teacher, **Stories in 2D: Sketching & Design Thinking** Spring 2021
Stanford University, Stanford Rainstorm
Co-designed and co-taught a 1.5-hour design thinking workshop in which we covered some design thinking elements and allowed students to draw and discuss their new objects with peers. We hosted 20 students during an online weekend program for middle and high school students.

Demonstrator, **Exploratorium After Dark: Tactile** Jan 2020
Exploratorium, San Francisco, CA
Helped to run public demo booths at the SF Exploratorium with other members of the Shape Lab.

Teacher, **Stories in Motion: Mechanical Automata and Rapid Prototyping** 2019
Stanford University, Stanford Splash (November 2019) and SeeME (April 2019)
Co-designed and co-taught a 2-hour class that focused on prototyping techniques through the creation of automata. We prepped laser cut materials, including different cams for the automata, so that students could quickly test out motion for their devices. We hosted 20 high school and middle school students on campus each weekend.

Women's Community Center STEM Mentor	2021 - 2023
Shape Lab Website Admin	2019 - 2023
Shape Lab Outreach Coordinator	2018 - 2023

Creation of programming for outreach activities centered around prototyping and design for middle and high school students – both in-person hands-on projects and completely online courses, organization of lab tours

Stanford HCI (Human Computer Interaction) Website Admin	2020 - 2021
PennApps Volunteer, Rapid Prototyping Staff	2014 - 2017
Stouffer College House Steering President	Fall 2016
SWE Mentor for Incoming Freshman	2014
AWE (Advancing Women in Engineering) Pre-Orientation Mentor	August 2014
Engineering Student Activities Council (ESAC), University of Pennsylvania	2014 - 2016
President	2016
Corporate Sponsorship Chair	2015

MEDIA COVERAGE

Mechanical Engineer researches haptics to improve medical procedure simulators and flight training
Oak Ridge Institute for Science and Education: Success Stories [Link] June 13, 2024

Elyse Chase, 2013 National Merit National Distillers Distributors Foundation Scholarship
National Merit Scholarship Corporation News [Link] February 2, 2018

Three University of Pennsylvania Students Win Goldwater Scholarships
Penn Today [Link] April 15, 2016

SKILLS

Programming Experience: MATLAB, C, C++, C# (Unity), R, Python, Javascript, Arduino, Processing, Embedded Hardware

Design and Fabrication: SolidWorks, laser cutting, 3D printing, soldering, mechatronic design, precision machining, CNC machining, silicone molding, photoshop, illustrator

Printmaking: I apprenticed at Flying Horse Press, University of Central Florida, with Professor Ke Francis, learning different printmaking techniques on my pieces and printing pages for books created by Ke Francis (Summer 2013). Later, I studied under Professor Marc Blumthal at the University of Pennsylvania with silk-screen, etching, letterpress, woodcut, linocut, and monotype projects (2016 - 2017).

Fine Arts: watercolor, acrylic, oil, pencil, charcoal, pastels, mixed media, photography, fiber arts