

# Antonio Alvarez Valdivia

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## PROFESSIONAL SUMMARY AND RESEARCH INTERESTS

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More than 5 years of research experience in soft robotics, haptics, human-robot interaction, human factors, and microfluidics. Current research endeavors include *soft haptic interfaces for HRI* and robot learning, and development of *shape-changing interfaces* (inflatable soft pin arrays) for *human-machine interaction*. General research interests include haptics, HRI, soft sensors and actuators, and human factors in engineering.

## EDUCATION

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Purdue University – West Lafayette, Indiana	Graduation Date: May 2025
- Doctor of Philosophy in Mechanical Engineering   Advisor: <i>Laura H. Blumenschein</i>	GPA: 3.75/4.00
Iowa State University – Ames, Iowa	Graduation Date: May 2021
- Bachelor of Science in Mechanical Engineering	GPA: 3.86/4.00

## TECHNICAL SKILLS

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- **Fabrication and Testing:** Mechanical design and assembly, 3D printing, GD&T, hand tools, laser cutting, soldering, electronic circuit design and evaluation, force gage testing, silicon elastomer fabrication and basic wet lab procedures.
- **Computer:** MATLAB, Python, Arduino, SolidWorks, AutoCAD, IBM SPSS Statistics, Multisim, Proteus, CoppeliaSim/V-REP, Microsoft Office, PhaseSpace Motion Tracking, basic Linux, ROS2 and Gazebo.
- **Research:** Report writing, data collection, statistical analysis, human factors research and psychophysics, IRB protocols, planning and scheduling.

## RESEARCH EXPERIENCE

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**Graduate Student Researcher** Aug 2021 – Present

*Purdue University, Mechanical Engineering* Advisor: *Laura H. Blumenschein*

*Thesis Title: Ubiquitous, Pneumatically-Actuated Haptic Interfaces for Human-Machine Interaction*

- Wrapped Haptic Display to Communicate Robot Learning (Aug 2022 – Present)
  - Designed and manufactured pneumatically actuated soft haptic interfaces.
  - Tested a variety of soft and compliant materials such as LDPE, TPU, fabrics, flexible resins, and elastomers.
  - Designed experimental protocols for human subject and user studies.
  - Collected psychophysiological data related to haptic perception and performed statistical analysis.
- Inflatable Soft Growing Pin for Dynamic Shape-Changing Displays (May 2023 – Present)
  - Developed a compact, pneumatically actuated soft growing pin capable of growing 18.5cm (364% extension).
  - Designed experimental protocols for the characterization of the device.
  - Constructed a preliminary demonstration of a 3x3 pin array to demonstrate the feasibility of the display concept.
- Perception of and Response to a Haptic Device as a Function of Signal Complexity (Aug 2022 – Feb 2023)
  - Designed an experiment to measure the differences between perception and use as it relates to signal complexity.
  - Created a holdable soft haptic device to provide navigation directions with varied complexity.
  - Interfaced a motion capture system to investigate tradeoffs between complexity and usability of navigation feedback.

**Undergraduate Research Assistant** Jun 2018 – Dec 2020

*Iowa State University, Mechanical Engineering* Advisor: *Jaime J. Juarez*

- Constructed and tested portable microscopy devices for microrheology measurements.
- Designed prototypes and testing hardware for colloidal science experiments.
- Collected video data using microscopes and analyzed/processed it on MATLAB.

## Summer Undergraduate Research Assistant

May 2019 – Aug 2019

University of Pennsylvania, Mechanical Engineering and Applied Mechanics

Advisor: Kevin T. Turner

- Fabricated capacitive, force sensing cells with copper films and PDMS and Ecoflex substrates.
- Designed digital electronic circuit to measure small changes in capacitance.
- Tested and experimentally characterized sensors.

## PUBLICATIONS

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1. **Alvarez Valdivia, A.** and Blumenschein, L.H. (2023) *Perception of and Response to a Haptic Device as a Function of Signal Complexity*. 2023 IEEE World Haptics Conference (WHC). DOI: 10.1109/WHC56415.2023.10224490
2. **Alvarez Valdivia, A.**, Habibian, S., Mendenhall, C.A., Fuentes, F., Shailly, R., Losey, D.P. and Blumenschein, L.H. (2023) *Wrapping Haptic Displays Around Robot Arms to Communicate Learning*. IEEE Transactions on Haptics. DOI: 10.1109/TOH.2023.3240400
3. **Alvarez Valdivia, A.**, Shailly, R., Seth, N., Fuentes, F., Losey, D.P. and Blumenschein, L.H. (2022) *Wrapped haptic display for communicating physical robot learning*. 2022 IEEE 5th International Conference on Soft Robotics (RoboSoft). DOI: 10.1109/RoboSoft54090.2022.9762210.
4. Shabaniverki, S., **Alvarez Valdivia, A.** and Juárez, J.J. (2021) *3D printed self-propelled composite floaters*. Smart Materials and Structures. DOI: 10.1088/1361-665X/ac01a9
5. Shabaniverki, S., **Alvarez Valdivia, A.** and Juárez, J.J. (2019) *Portable imaging viscometry for quantitative complex fluid measurements*. Experimental Thermal and Fluid Science. DOI: 10.1016/j.expthermflusci.2019.05.009.

## PRESENTATIONS (3 out of 9)

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1. “Perception of and Response to a Haptic Device as a Function of Signal Complexity,” Oral Presentation in 2023 IEEE World Haptics Conference (WHC). Delft, Netherlands.
2. “Wrapping Haptic Displays Around Robot Arms to Communicate Learning,” Poster Presentation in 2023 IEEE International Conference in Robotics and Automation (ICRA). London, UK.
3. “Wrapped haptic display for communicating physical robot learning,” Poster Presentation in 2022 IEEE 5th International Conference on Soft Robotics (RoboSoft). Edinburgh, Scotland.

## TEACHING, LEADERSHIP & SERVICE

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**Graduate Student Mentor** | RAAD Lab, Purdue University Mechanical Engineering Aug 2021 – Present

- Mentored 8 undergraduate students in semester-long soft robotics and haptics research projects.

**Diversity Officer** | Purdue ME OMEGA (Official Mechanical Engineering Graduate Association) Jan 2022 – Present

- Organized major social and networking events for ME graduate students, faculty, and staff.
- Represented Purdue ME department in graduate school diversity recruitment programs.

**Organizing Committee** | 2nd ICON Student Research Conference, Purdue University Oct 2023 – Present

- Assisting with initial planning of conference dates, program, and arrangements.

**Undergraduate Teaching Assistant** | Iowa State University Aug 2020 – Dec 2020

- Grading duties for assignments, exams, and final projects for ME 325: Mechanical Component Design.

## AWARDS

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- NSF Graduate Research Fellowship, 2022
- Purdue Frederick N. Andrews Fellowship, 2021
- Purdue Graduate Bridge Program Fellow, 2021
- Iowa State University MSA Academic Excellence Award, 2020
- Ronald E. McNair Scholar, 2018
- Tau Beta Pi Engineering Honor Society, February 2020