Antonio Alvarez Valdivia

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PROFESSIONAL SUMMARY AND RESEARCH INTERESTS

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

Purdue University – West Lafayette, Indiana — Graduation Date: May 2025
- Ph.D. in Mechanical Engineering | *Advisor: Laura H. Blumenschein* — 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

Des Moines Area Community College – Ankeny, Iowa — Graduation Date: May 2018
- Pre-Engineering (Transfer Program) — GPA: 4.00/4.00

TECHNICAL SKILLS

- **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, CoppeliaSim/V-REP, motion tracking systems, basic Linux, ROS2, basic Unity development (AR & VR) for Microsoft HoloLens.
- **Research:** Report writing, data collection, statistical analysis, human factors research and psychophysics, IRB protocols, planning, and scheduling.

RESEARCH EXPERIENCE

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.
  - Evaluated 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.

  - Developed AR Unity application for rendering robot motion waypoints to convey robot learning.
  - 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 (308% extension).
  - Designed experimental protocols for the characterization of the device.
  - Constructed a preliminary demonstration of a pin array to demonstrate the feasibility of the display concept.
- Signal Complexity Effects on the Task-based Utility of Haptic Information (Aug 2022 – Present)
  - 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 evaluated 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.
- Evaluated and experimentally characterized sensors.

PUBLICATIONS

1. Habibian, Soheil, **Alvarez Valdivia, A.**, Shailly, Blumenschein, L.H. and Losey, D.P. (2023) *A Review of Communicating Robot Learning during Human-Robot Interaction*. (Under Review)
2. **Alvarez Valdivia, A.**, Rezqalla, Mohammad A., Swann, Sarah E., and Blumenschein, L.H. (2023) *Soft Growing Pin for High-Extension Shape-Changing Displays*. (Under Review)
3. **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
4. **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
5. **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.

6. 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
7. 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

Oral Presentations

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. "Portable Imaging Viscometry for Quantitative Complex Fluid Measurements." In 2020 14th ISU Symposium on Undergraduate Research and Creative Expression. Iowa State University. Ames, IA.
3. "Portable Imaging Viscometry for Quantitative Complex Fluid Measurements." in 2020 22nd Texas National McNair Research Conference. University of North Texas. Denton, TX.
4. "Flexible Capacitive Force Sensors for use in Robotic Grippers," in Summer 2019 REU Symposium. University of Pennsylvania. Philadelphia, PA.

Poster Presentations

1. "Wrapping Haptic Displays Around Robot Arms to Communicate Learning," in 2023 IEEE International Conference in Robotics and Automation (ICRA). London, UK.
2. "Wrapping Haptic Displays Around Robot Arms to Communicate Learning," in 2023 Inaugural ICON Student Research Conference. Purdue University. West Lafayette, IN.
3. "Wrapped haptic display for communicating physical robot learning," in 2022 IEEE 5th International Conference on Soft Robotics (RoboSoft). Edinburgh, Scotland.
4. "555-timer Flexible Circuit," in 2019 McNair Program Research Symposium. Iowa State University. Ames, IA.
5. "Portable Imaging Viscometry for Quantitative Complex Fluid Measurements," in Summer 2018 REU Symposium. Iowa State University. Ames, IA.

TEACHING, LEADERSHIP & SERVICE

Graduate Student Mentor | RAAD Lab, Purdue University ME Aug 2021 – Present

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

Diversity Officer | 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 Oct 2023 – Present

- Student-run conference at Purdue's Institute for Control, Optimization and Networks (ICON).
- Logistics Co-chair. Assisting with initial planning of conference dates, program, and arrangements.

Volunteer | Purdue Women in Engineering Program Nov 2021 – Present

- Assisted in engineering workshops and short courses directed by Prof. Blumenschein (RAAD Lab) in programs hosted by Purdue's Women in Engineering (WiE).

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

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

International Student Orientation Leader | Iowa State University June 2019 - Aug 2019

- Led orientation for groups of international students for the International Students and Scholars Office (ISSO) at ISU.
- Assisted with registration, English placement, and immigration processes.
- Exemplified respectful practices and communication with multicultural, international students.
- Organized group activities and discussions facilitation
- Welcomed students at Des Moines Airport.

Peer Mentor | Iowa State University Sep 2018 – May 2021

- Engineering Admissions Partnership Program for Engineering Student Services.
- Communicate with prospective transfer students.
- Network with industry partners and student organizations to feature articles in monthly newsletters.

Summer School Teacher | Ames Community School District June 2017 – July 2017

- Created *Engineering 101* course curriculum.
- Taught 6-week summer school course for 1st - 6th grade students.

HONORS AND AWARDS

- 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
- Ronald E. McNair Outstanding First Year Scholar, May 2019