

Gregory J. Reardon

Ph.D Candidate at the University of California, Santa Barbara

Media Arts and Technology Program

Phone: +1 (631) 704-4821 Email: reardon@ucsb.edu

Curriculum vitae last updated on July 21, 2023

EDUCATION

- Dec. 2023** **Ph.D in Media Arts and Technology⁺**
(⁺ expected) University of California, Santa Barbara, Santa Barbara, California, USA
Specialization: Haptics, Wave Mechanics
Advisor: Yon Visell, Ph.D
GPA: 4.00/4.00
- May 2018** **M.M. in Music Technology**
New York University, Steinhardt, New York, New York, USA
Specialization: Signal Processing, Spatial Audio, Psychophysics
Advisors: Juan Pablo Bello, Ph.D and Agnieszka Roginska, Ph.D
GPA: 4.00/4.00
- May 2016** **B.Sc in Applied Mathematics-Economics, *magna cum laude***
Brown University, Providence, Rhode Island, USA
Study Abroad: St. Edmund Hall, Oxford University, Oxford, England (2014-2015)
GPA: 3.85/4.00

PROFESSIONAL OVERVIEW

My research interests lie in the intersection between mechanics and sensory perception. I have contributed to research in academia relating to the auditory and haptic senses in order to inform the design of interactive media technologies. My research on audition includes contributions to the perceptual evaluation of spatial audio rendering methods and to acoustical analysis of mixed reality headsets to determine their effect on spatial hearing cues. With respect to haptics, my research contributions have ranged from aiding the construction of novel haptic devices, such as assistive devices for individuals who are deaf/blind and wearable interfaces for augmenting daily touch interactions without obstructing the hand, to proposing new paradigms for computational haptics via soft, flexible touchscreens with programmatically controllable vibration feedback, and to reporting on shear shock front formation on the surface of the skin which provide a fundamental constraint on the effectiveness of current rendering methods for air-coupled ultrasound haptics. Recently, I have been working on developing methods for controlling the propagation of mechanical waves in solid media in order to render new forms of vibration feedback on touch surfaces. I use the tools I have gained from my varied academic background to engineer novel haptic devices, develop algorithms for rendering touch feedback, and design perception studies for evaluating sensations.

SKILLS

General

Haptics, Wave Mechanics, Signal Processing, Spatial Audio, Probability and Statistics, Psychophysics, Virtual and Augmented Reality, Computational Simulation, Human-Computer Interaction, Data Analysis, Machine Learning

Software Development

Advanced: Python, MATLAB, C# .NET, Unity, PyTorch, JavaScript, HTML, CSS, Max/MSP/Jitter
Intermediate: COMSOL Multiphysics, C++, Java, R

AWARDS AND PROFESSIONAL SERVICE

- 2023 Best Transactions on Haptics Short Paper (Reardon, Goetz, Linnander, Visell)**
2023 IEEE World Haptics Conference
- 2023 Best Student Presentation Finalist (Reardon, Goetz, Linnander, Visell)**
2023 IEEE World Haptics Conference
- 2023 Best Presentation Award (Tummala, Reardon, Shao, Dandu, Saal, Visell)**
2023 Festival of Touch
- 2022 Best Application Paper Finalist (Kawazoe, Reardon, Woo, Di Luca, Visell)**
IEEE Transactions on Haptics
- 2022 Best Technical Paper Runner Up (Dinulescu, Tummala, Reardon, Dandu, Goetz, Topp, Visell)**
2022 IEEE Haptics Symposium
- 2022 Organizing Committee: Web Chair**
2022 IEEE Haptics Symposium
- 2021 Encouragement Award (Hachisu, Reardon, Shao, Suzuki, Visell)**
Workshop, Inst. of Electrical Eng. of Japan
- 2020 Best Technical Paper (Reardon, Kastor, Shao, Visell)**
2020 IEEE Haptics Symposium
- 2020 Best Presentation Hon. Mention (Reardon, Kastor, Shao, Visell)**
2020 IEEE Haptics Symposium
- 2020 Best Presentation Hon. Mention (Hachisu, Reardon, Shao, Suzuki, Visell)**
2020 IEEE Haptics Symposium
- 2020 Most Promising Work-In-Progress Hon. Mention (Dinulescu, Reardon, Topp, Visell)**
2020 IEEE Haptics Symposium
- 2018 Chancellor's Fellowship (full doctoral funding for 5 years)**
University of California, Santa Barbara
- 2017 Fleishman Scholarship**
New York University Steinhardt

RESEARCH AND TEACHING EXPERIENCE

Sept 2019 - Present: **RE Touch Lab, University of California, Santa Barbara**
Graduate Student Researcher

- Designed novel rendering methods for generating dynamic source motion and perceptually evocative spatially- and temporally-resolved haptic feedback on wave-mediated surface haptic displays.
- Drew on theory, numerical simulation, and time-resolved optical imaging to demonstrate that mid-air haptic displays generate viscoelastic shear shock fronts in the skin and that these artifacts impair perception.
- Used acoustic focusing methods to produce localized energy in soft media at centimeter-scale resolution for producing multi-point, localized vibrotactile feedback.

Fall 2019, Fall 2021: **UCSB Department of Media Arts and Technology**
Graduate Teaching Assistant: Wave Mechanics

- Tutored on analytical and numerical solutions to wave equations, building up from simple harmonic motion and oscillations on a string to 3D wave equations.

- Wrote code and led workshops to aid students' in simulating and understanding wave phenomena (e.g. Huygens' principle, evanescent waves, etc.).

Jan 2016 - Aug 2018: **Music and Audio Research Laboratory, New York University**
Graduate Student Researcher

- Designed and conducted a 70-participant psychophysical study on the perception and psychophysics of different spatial audio rendering methods to determine which percepts are most predictive of perceived quality.
- Analyzed head-related transfer functions (HRTFs) gathered using dummy-head microphones affixed with various mixed and virtual reality headsets to determine whether these headsets impair natural hearing.
- Led an interest group on spatial audio, created virtual reality demos that showcased 360° audio-video recordings captured by the group, and ran workshops on integrating and scripting spatial audio in Unity.

PUBLICATIONS

Journal Articles

Reardon, G., Goetz, D., Linnander, M., Visell, Y. (2023) Rendering Dynamic Source Motion in Surface Haptics via Wave Focusing. *IEEE Transactions on Haptics*.

Best Transactions on Haptics Short Paper
Best Student Presentation Finalist

Reardon, G., Dandu, B., Shao, Y., Visell, Y. (2023) Shear Shock Waves Mediate Haptic Holography via Focused Ultrasound. *Science Advances*.

Kastor, N., Dandu, B., Bessari, V., **Reardon, G.**, Visell, Y. (2023) Ferrofluid Electromagnetic Actuators for High-Fidelity Haptic Feedback. *Sensors and Actuators*.

Kawazoe, A., **Reardon, G.**, Woo, E., Di Luca, M., Visell, Y. (2021) Tactile Echoes: Multisensory Augmented Reality for the Hand. *IEEE Transactions on Haptics*.

Best Application Paper Finalist

Peer-Reviewed Conference Papers

Reardon, G.*, Goetz, D.*, Linnander, M., Visell, Y. (2023) Dynamic Feedback in Wave-Mediated Surface Haptics: A Modular Platform. *2023 IEEE World Haptics Conference*.

Dinulescu, S., Tummala, N., **Reardon, G.**, Dandu, B., Goetz, D., Topp, S., Visell, Y. (2022) A Smart Bracelet Supporting Tactile Communication and Interaction. *2022 IEEE Haptics Symposium*.

Best Technical Paper Runner Up
Most Promising Work-In-Progress Honorable Mention

Reardon, G., Kastor, N., Shao, Y., Visell, Y. (2020) Elastowave: Localized Tactile Feedback in a Soft Haptic Interface via Focused Elastic Waves. *2020 IEEE Haptics Symposium*.

Best Technical Paper
Best Presentation Honorable Mention

*Contributed equally

Hachisu, T., **Reardon, G.**, Shao, Y., Suzuki, K., Visell, Y. (2020) Interpersonal Vibrotactile Feedback Via Waves Transmitted through the Skin: Mechanics and Perception. *2020 IEEE Haptics Symposium*.
Encouragement Award
Best Presentation Honorable Mention

Reardon, G., Shao, Y., Dandu, B., Frier, W., Long, B., Georgiou, O., Visell, Y. (2019) Cutaneous Wave Propagation Shapes Tactile Motion: Evidence from Air-Coupled Ultrasound. *2019 IEEE World Haptics Conference*.

Genovese, A., Zalles, G., **Reardon, G.**, Roginska, A. (2018) Acoustic Perturbations in HRTFs Measured on Mixed Reality Headsets. *2018 Audio Engineering Society International Conference on Audio for Virtual and Augmented Reality*.

Reardon, G., Genovese, A., Zalles, G., Flanagan, P., Roginska, A. (2018) Evaluation Of Binaural Renderers: Multidimensional Sound Quality Assessment. *2018 Audio Engineering Society International Conference on Audio for Virtual and Augmented Reality*.

Reardon, G., Genovese, A., Zalles, G., Flanagan, P., Roginska, A. (2018) Evaluation Of Binaural Renderers: Localization. *Audio Engineering Society Convention 144*.

Reardon, G., Zalles, G., Genovese, A., Flanagan, P., Roginska, A. (2018) Evaluation Of Binaural Renderers: Externalization, Front/Back and Up/Down Confusions. *Audio Engineering Society Convention 144*.

Reardon, G., Calle, J.S., Genovese, A., Zalles, G., Olko, M., Jerez, C., Flanagan, P., Roginska, A. (2017) Evaluation Of Binaural Renderers: A Methodology. *Audio Engineering Society Convention 143*.

PEER REVIEW ACTIVITY

2023 IEEE World Haptics (Conference) - 1 publication

2022 IEEE Computer Graphics and Applications (Journal) - 1 publication

2020 IEEE Haptics Symposium (Conference) - 1 publication