Hoang “Charlie” Vuong

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RESEARCH FOCUS

Building sensing systems and visualization tools for understanding fluid and soft materials, supporting materials literacy for creative practice and interaction design. Connecting material characterization with digital fabrication through pressure-based sensing and rheological embedding maps. Extending this research across hydrogel characterization, embedded systems, and biomedical sensing.

EDUCATION

PhD in Computer Engineering, *University of Texas at Arlington, Arlington, TX* **Expected May 2028**

Advisor: Dr. Cesar Torres (CSE)

MSc in Electrical Engineering, *California State University-Fullerton, Fullerton, CA* May 2022

Advisor: Mostafa Shiva (ECE)

Bachelor of Electrical Engineering with Minor in Computer Science

University of Minnesota-Twin Cities, Minneapolis, MN December 2019

PUBLICATIONS

HCI

- ***(Honorable Mention - Top 5%)*** **Vuong, H**; Torres, C. RheoMaps: Mapping Inks, Gels, Pastes, and Slurries in the Rheological Embedding Space using Retraction-Extrusion Pressure Sensor Vectors. In *Proceedings of the 2025 ACM Conference on Human Factors in Computing Systems* (Yokohama, Japan, 2025), CHI ’25.
- Liao, L; **Vuong, H**; Torres, C; et al. TacitCaptions: Externalizing Tacit Skills within Neon Glass Bending Practices through Video Synchronized Sensory Augmentation Cues. Glass Art Society Conference 2025, Texas.

Bio-medical

- Boyher, C. M.; **Vuong, H.**; Dang, Q.-V.; Cao, H. Parametric Characterization of a Low-Cost Wearable Speckle Plethysmography Sensor for Continuous Cardiovascular Monitoring. Submitted to the 2026 IEEE SENSORS Conference; (under review).
- Sarafan, S; Cao, H; **Vuong, H**; et al. "A Novel ECG Denoising Scheme Using the Ensemble Kalman Filter," 2022 44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC), Glasgow, Scotland, United Kingdom, 2022, pp. 2005-2008, doi: 10.1109/EMBC48229.2022.9871884.
- Wang, J.-P.; Wu, K.; **Vuong, H**.; et al. Magnetic Particle Spectroscopy-Based Handheld Device for Wash-Free, Easy-to-Use, and Solution-Phase Immunoassay Applications. DMD2020-9054, V001T10A011; 6 Apr. 2020.

Abstract and Poster

- **Vuong, H**; Torres, C. RheoMap: Mapping Inks, Gels, Pastes, and Slurries within a Rheological Embedding Space using Retraction-Extrusion Pressure Sensor Vectors. *Student Computing Research Festival (SCRF), UTA's College of Engineering*, *2025* - ***Honorable Mention Lightning Talk Award.***
- **Vuong, H**; Torres, C. FrostSense: A Vacuum Retraction Viscosity Sensing Method for Soft Material Human-in-the-Loop Fabrication. *Innovation Day, CSE UTA*, *2023*. ***Honorable Mention Award.***

RESEARCH EXPERIENCE

Ph.D. Researcher at UTA, Advisor: Dr. Cesar Torres (CSE) - *Fluid Material-Device Interfaces and Sensing*

The Hybrid Atelier, University of Texas at Arlington, TX Aug 2022 – Present

Research program: *RheoVerse — Fluid Material Sensing and Interactive Systems*

Develop sensing methods and interactive tools that make fluid material behavior measurable during material exploration and fabrication. RheoMap addresses rheological characterization; RheoCast applies material sensing to ceramic slip casting.

- Created *RheoMap*, a retraction-extrusion pressure sensing method that maps inks, gels, pastes, and slurries into a rheological embedding space. Published at ACM CHI 2025 with an **Honorable Mention**.
- Evaluated pressure-based sensing across 26 fluid materials using cycle testing and Random Forest classification, achieving a weighted F1-score of 0.943 with five-fold cross-validation.
- Evaluated biofilament recipe variations through manual extrusion tests, demonstrating that rheological embedding maps distinguished extrudable from non-extrudable formulations to support material exploration for digital fabrication.
- Developed *RheoCast*, a fluctuation-enhanced sensing approach for ceramic slip casting, including an acquisition rig and spectral/autocorrelation features for investigating gelation, thickness, and defects.
- Built integrated research systems spanning embedded hardware, wireless data acquisition, signal processing, machine learning, and mobile/desktop interfaces for live material feedback.
- Developed pressure-signal features and computational representations for characterizing fluids, with applications in bioadhesive formulation and device-material integration.

Research supported since June 2026 by Dr. Cesar Torres's NSF CAREER project, *Towards Interactive Sensor-Driven Tools for Exploring, Replicating, and Sharing Material Recipes* (Award No. 2543683).

Summer Visiting Graduate Researcher at UCI, Advisor: Dr. Hung Cao - *Wearable Bioelectronics*

Hero Lab, University of California, Irvine, CA Jun 2025 – Aug 2025

- Designed a wearable speckle plethysmography system for arm/wrist cardiovascular monitoring, integrating optical sensing, embedded electronics, and multisensor data collection.
- Redesigned a wearable fetal ECG system and collected clinical data at UCI Medical Center.
- Contributed to low-noise analog electronics and firmware for biopotential recording. Associated SPG manuscript under review at IEEE SENSORS 2026.

Related research: *Hydrogel Sensing and Characterization* | Advisor: **Dr. Kytai Nguyen**

Nanomedicine and Tissue Engineering Laboratory, University of Texas at Arlington, TX Sep 2024 – May 2025

- Investigated portable sensing methods for characterizing hydrogel composition and curing behavior in adhesive nanocomposites.
- Evaluated chitosan-containing formulations and cross-linkers, using signal processing and classification to investigate hydrogel curing time.

Undergraduate Research Electrical Engineer May 2019 – Dec 2019

Team MagiCoil, University of Minnesota, Twin Cities

Advisor: Dr. Kai Wu

- Developed portable magnetic particle spectroscopy hardware for biofluid sensing and detection.
- Designed lock-in amplification, bandpass filtering, and control/acquisition electronics for measuring magnetic nanoparticle responses.

Undergraduate Research Engineer Intern Sep 2019 – Dec 2019

Neuromodulation Research Center, University of Minnesota, Twin Cities

- Designed the mechanical and electrical setup for deep brain stimulation using an ultrasound catheter.
- Integrated a Basler area-scan camera with 16-channel EEG measurements for in vivo studies.

INDUSTRY EXPERIENCE

Research Electrical Engineer Intern Sep 2021 – Dec 2021

Sensoriis and HERO Lab, Calit2, University of California, Irvine

- Developed BLE firmware and analog front-end electronics for biopotential acquisition; analyzed local field potentials in rodents using signal processing and classification.
- Evaluated extended and ensemble Kalman filtering methods for denoising zebrafish ECG signals.

R&D Engineer Intern May 2019 – Sep 2019

ACIST Medical Systems, Eden Prairie, MN

- Built an X-ray simulation and hardware-interface system using Arduino firmware and a LabVIEW graphical interface.
- Performed test-protocol validation and mechanical performance testing on imaging catheters.

HONORS

Awards

- **ACM CHI 2025 Honorable Mention Award** — *RheoMap*. Recognized among the top 5% of papers.
- **Student Computing Research Festival Honorable Mention**, 2025 — RheoMap lightning talk, UTA College of Engineering.
- **Innovation Day Honorable Mention**, 2023 — FrostSense, UTA Computer Science and Engineering.

Travel Support

- **CHI 2025:** Travel support from UTA CSE Department and the Dean's Office for ACM CHI in Yokohama, Japan.
- **DIS 2023:** Travel support through the NSF CRII project *Sustaining Cognitive Flow in Physical Making*.

INVITED TALKS

University of Science VNU-HMC | Host by Prof. Duy Khanh Le

"RheoMap: Mapping Inks, Gels, Pastes, and Slurries within a Rheological Embedding Space"

International University VNU-HMC | Host by Prof. Chi Thanh Vi

"RheoMap: Mapping Inks, Gels, Pastes, and Slurries within a Rheological Embedding Space"

TEACHING

Graduate Teaching Assistant

Department of Computer Science, University of Texas at Arlington

- **CSE 1320, Intermediate Programming** — Fall 2023; more than 20 students.
- **CSE 5360, Artificial Intelligence I** — Fall 2022 and Spring 2023; more than 60 students.
- **CSE 1325, Object-Oriented Programming** — 2024–2025; more than 50 students.

MENTORING

Graduate Research Mentor

NSF REU Site: Hybrid Design and Fabrication — Summers 2023 and 2024, The Hybrid Atelier, UTA.

Undergraduate Research Mentoring

UTA Undergraduate Research Students program — Spring 2023.

SERVICE

Program Committee

ACM Intelligent User Interfaces (IUI) — 2026 and 2027.

Peer Reviewing

49 reviews for ACM and IEEE conferences and journals.

- **HCI and design:** CHI (2023, 2025, 2026); DIS (2025); TEI (2024–2026); MobileHCI (2023–2025); Creativity & Cognition (2025).
- **Ubiquitous and collaborative computing:** IMWUT/UbiComp (2023–2024); CSCW (2025).
- **VR and spatial interaction:** VRST (2024, 2026); SUI (2025); IEEE VR (2026).
- **Haptics and robotics:** IEEE Haptics Symposium (2026); ACM/IEEE HRI (2026).

Special Recognition for Outstanding Reviews

CHI (1), DIS (1), MobileHCI (4), and Creativity & Cognition (1).

TECHNICAL SKILLS

Languages: Python, C/C++, MATLAB, Verilog

Data Processing: LabVIEW, Jupyter Notebook, Google Colab

Cloud & Web: MongoDB, WebSocket, React, Node.js, GitHub

Embedded Programming: C/C++ (Arduino, ESP32, STM32, PIC32, ARM Cortex-M4F), MPLAB X, Segger

Wireless Communication: WiFi, Bluetooth, BLE nRF52

Power & Circuit Design: Power Management, Analog/Digital I/O, Schematic Capture

PCB Design Tools: Altium Designer, KiCad, Eagle, FluxAI.

EE Simulation: PSpice, LTSpice, OrCAD.

Biomedical Application: EEG, ECG/EKG, EMG, PPG, fNIR and SPG.

Platforms/Devices: Biopac, OpenBCI, ADS1299, Neuroelectrics.

Sensing and Analysis: Pressure sensing, pulse segmentation, baseline correction, feature extraction, classification, PCA, t-SNE, LDA, and UMAP.

DESIGN SKILLS

Digital Fabrication: 3D Printing, Laser Cutting, CNC Milling, Vacuum Forming, Soldering, SMT Assembly, PCB Fabrication (Bantam and Voltera), Polymer Fabrication (silicone and hydrogel)

Craft & Material Work: Ceramics (molding and slip casting), Papermaking

Design Tools: Figma, Adobe CC (Illustrator, Premiere Pro, Express), Fusion 360, openSCAD, Miro

Design Methods: Wireframing, Storyboarding, Design Thinking

Research Methods: Semi-structured Interviews, Workshops, Questionnaire Design, Statistical Analysis.