# Soha Niroumandijahromi

University of Southern California
Viterbi School of Engineering

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Google Scholar

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## EDUCATION

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|---|---|
| 2021 – Present | **University of Southern California**, Los Angeles, CA<br>Ph.D. Mechanical and Medical Engineering |
| 2023 – 2025 | **University of Southern California**, Los Angeles, CA<br>M.Sc. Computer Science |
| 2021 – 2023 | **University of Southern California**, Los Angeles, CA<br>M.Sc. Mechanical Engineering |
| 2016 – 2019 | **University of Tehran**, Tehran, Iran<br>M.Sc. Aerospace and Mechanical Engineering |
| 2011 – 2016 | **Yazd University**, Yazd, Iran<br>B.S. Mechanical Engineering |

## RESEARCH INTERESTS

Smartphone-Based Physiological Signal Acquisition · Non-Invasive Cardiovascular and Cerebrovascular Diagnostics · Signal Processing for Health Applications · Time-Frequency Analysis · Machine Learning · Deep Learning · Wearable Diagnostics · Data Science in Healthcare · Physics-Informed Machine Learning · Computational Mechanics · Biofluid Mechanics · Rheology of Complex Fluids

## ACADEMIC AND PROFESSIONAL EXPERIENCE

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| 2023 – 2025 | AHA Research Fellow<br>Department of Mechanical Engineering,<br>University of Southern California, Los Angeles, CA |
| 2021 – 2023 | Research Assistant<br>Department of Mechanical Engineering,<br>University of Southern California, Los Angeles, CA |

## AWARDS AND ACHIEVEMENTS

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| 2025 | **MIT Mechanical Engineering Rising Star** |
| 2025 | **Phi Kappa Phi Student Recognition Award** |
| 2024 | **American Heart Association Predoctoral Fellowship Award** |
| 2023 | **American Heart Association Travel Grant Award (Basic Cardiovascular Sciences Council)** |

## JOURNAL PUBLICATIONS

**10. Niroumandi S**, Wei H, Amlani F, Gorji MH, Alavi R, Chirinos JA, Pahlevan NM. Time-Frequency Machine Learning Transfer Function for Central Pressure Waveforms. European Heart Journal Open. 2025 Jun 23:oeaf082.

**9. Niroumandi S**, Alavi R, Wolfson AM, Vaidya AS, Pahlevan NM. Assessment of aortic characteristic impedance and arterial compliance from non-invasive carotid pressure waveform in the Framingham heart study. *The American Journal of Cardiology*. 2023 Oct 1;204:195-9.

**8.** Alavi R, Aghilinejad A, Wei H, **Niroumandi S**, Wieman S, Pahlevan NM. A coupled atrioventricular-aortic setup for in-vitro hemodynamic study of the systemic circulation: Design, fabrication, and physiological relevancy. *PLOS ONE*. 2022 Nov 4;17(11):e0267765.

**7.** Shojaeifard M, **Niroumandi S**, Baghani M. Swelling of pH-sensitive hydrogel pressure vessel under altered-pH coupled with inflation, extension, and torsion. *Meccanica*. 2022 Jun;57(6):1391-411.

**6.** Shojaeifard M, **Niroumandi S**, Baghani M. Programmable self-folding of trilayer and bilayer-hinge structures by time-dependent swelling of tough hydrogels. *Journal of Intelligent Material Systems and Structures*. 2022 Sep;33(16):2106-20.

**5.** Shojaeifard M, **Niroumandi S**, Baghani M. pH-Responsive Hydrogel Bilayer with Reversible, Bidirectional Bending Behavior. *Frontiers in Materials*. 2022 May 26;9:865652.

**4. Niroumandi S**, Shojaeifard M, Baghani M. On single and multiple pH-sensitive hydrogel micro-valves: a 3D transient fully coupled fluid–solid interaction study. *Transport in Porous Media*. 2022 Mar;142(1-2):295-316.

**3. Niroumandi S**, Shojaeifard M, Baghani M. PH-sensitive hydrogel-based valves: A transient fully-coupled fluid-solid interaction study. *Journal of Intelligent Material Systems and Structures*. 2022 Jan;33(1):196-209.

**2.** Shojaeifard M, **Niroumandi S**, Baghani M. Programming shape-shifting of flat bilayers composed of tough hydrogels under transient swelling. *Acta Mechanica*. 2022 Jan;233(1):213-32.

**1. Niroumandi S**, Shojaeifard M, Baghani M. Finite deformation of swollen pH-sensitive hydrogel cylinder under extension and torsion and its Poynting effect: analytical solution and numerical verification. *International Journal of Applied Mechanics*. 2021 Jul 20;13(06):2150071.

## PEER-REVIEWED CONFERENCE PROCEEDING PUBLICATIONS

**7.** Vaidya A, **Niroumandi S**, Mazandarani SP, Wolfson A, Pahlevan NM. Single Pressure Waveform Calculation of Total Arterial Compliance Predict Heart Failure Events in Framingham Heart Study. *Journal of the American College of Cardiology*. 2024 Apr 2;83(13):712-.

**6.** Vaidya A, **Niroumandi S**, Mazandarani SP, Wolfson A, Pahlevan NM. Left Ventricle Pulsatile Workload from A Single Pressure Waveform Using Physics-Based Machine Learning Approach and Cardiovascular Disease Events in The Framingham Heart Study. *Journal of the American College of Cardiology*. 2024 Apr 2;83(13):2451-.

**5.** Vaidya A, **Niroumandi S**, Mazandarani SP, Wolfson A, Pahlevan NM. Prognostic Value of Aortic Characteristic Impedance Calculated from A Single Carotid Waveform Using Hybrid Intrinsic Frequency-Machine Learning Approach. *Journal of the American College of Cardiology*. 2024 Apr 2;83(13):1988-.

**4.** Liu J, **Niroumandi S**, Petrasek D, Pahlevan NM. Non-Invasive Insulin Resistance Evaluation Using Carotid Pressure Waveforms in Framingham Heart Study. *Circulation*. 2023 Nov 6;148: A16533- A16533

**3. Niroumandi S**, Rinderknecht D, Bilgi C, Wolfson A, Vaidya A, King KS, Pahlevan NM. A Noninvasive Smartphone Assessment of Aortic Arch Pulse Wave Velocity and Total Arterial Compliance. *Circulation*. 2023 Nov 6;148:A18846-A18846.

**2. Niroumandi S**, Wolfson A, Vaidya A, Pahlevan NM. Abstract P367: Evaluation of Left Ventricular Pulsatile Workload in Heart Failure with Preserved Ejection Fraction Using a Single Pressure Waveform Form Framingham Heart Study. *Hypertension*. 2023 Sep;80: AP367- AP367.

**1. Niroumandijahromi S**, Vaidya A, Pahlevan NM. Hybrid Intrinsic Frequency Machine Learning Approach for Calculation of Total Arterial Compliance and Aortic Characteristic Impedance from A Single Carotid Waveform in Heart Failure With Preserved Ejection Fraction. *Hypertension*. 2022 Sep;79:A039-A039.

## PATENTS

**1.** Alavi R, Amlani F, Gorji H, **Niroumandijahromi S**, Heng Wei H, and Pahlevan NM. (2024). "Sequentially-Reduced Artificial Intelligence Based Systems And Methods For Cardiovascular Transfer Functions" (US-20230138773-A1).
**https://ppubs.uspto.gov/dirsearch-public/print/downloadPdf/20240138773**

## GRANTS

**1.** American Heart Association (AHA) predoctoral fellowship award
Period: 01/01/2024-12/31/2025
Amount: $67,388.00
Role: PI
Title: A Noninvasive Smartphone-based Approach for Assessment of Dementia Risk Predictors Using Arterial Pressure Waveform

## CLINICAL TRIALS AND STUDIES

**1. "**A Noninvasive, inexpensive intervention for heart failure patients to reduce morbidity, hospitalizations, and improve quality of life"
Location: University of Southern California,
Keck Medical School and Viterbi School of Engineering
Time Period: 2023-2027
Role: Co-Investigator
Principal Investigators: Ajay Vaidya, MD, Niema Pahlevan, PhD
Collaborating Investigator: Aaron Wolfson MD

## CONFERENCE PRESENTATIONS

**5. Niroumandi S, Bilgi C, King K, Pahlevan N,** White Matter Hyperintensity and Whole Brain Cerebrovascular Reactivity Can Be Estimated from Non-Invasive Carotid Pressure Waveforms. In NORTH AMERICAN ARTERY 2025 (Selected Oral Abstract Presentation).
**4. Niroumandi S**, Amlani F, Matthews R, Pahlevan N. The Influence of Left Ventricle and Aorta Interactions on the Coronary Blood Flow Using One-Dimensional Model of Hemodynamics and Wave Propagation in the Entire Circulatory System. Bulletin of the American Physical Society. 2023 Nov 19.
**3.** Alavi R, Aghilinejad A, Wei H, **Niroumandi S**, Wieman S, Pahlevan N. In-vitro coupled left atrioventricular-aortic hemodynamic simulator for systemic circulation. InAPS Division of Fluid Dynamics Meeting Abstracts 2021 (pp. E28-003).
**2. Niroumandi S**, Alavi R, Pahlevan N. A Machine Learning Methodology for estimation of vascular characteristics using a single carotid waveform. In APS Division of Fluid Dynamics Meeting Abstracts 2021 (pp. H14-003).
**1. Niroumandi S**, Jafari A, Vakilipour S. 3-D simulation of pulsatile blood flow using a haemorheological model. In AERC 2019 (Selected Oral Abstract Presentation).

## MENTORING

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| **University of Southern California K-12 STEM Center Outreach** | 12 High School Students from 2022-2024 |
| **NSF Summer Research Program** | 2 High School Students 2023 |

## ACADEMIC SERVICES

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| **NSF Outreach** | 4 visits for Gardena Highschool students starting 2023 |