

Soha Niroumandijahromi

University of Southern California
Viterbi School of Engineering

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EDUCATION

- 2021 – Present **University of Southern California**, Los Angeles, CA
Ph.D. Student, Department of Mechanical Engineering
Advisor: Prof. Niema Pahlevan
- 2021 – 2023 **University of Southern California**, Los Angeles, CA
M.S., Department of Mechanical Engineering
- 2016 – 2019 **University of Tehran**, Tehran, Iran
M.S., Department of Aerospace and Mechanical Engineering
- 2011 – 2016 **Yazd University**, Yazd, Iran
B.S., Department of Mechanical Engineering

RESEARCH INTERESTS

Biofluid Mechanics, Data Science in Healthcare, Physics-informed Machine Learning, Non-invasive Methods in Cardiovascular Disease, Cardiovascular Biomechanics, Rheology, Soft matter, Spectral Numerical Methods, Scientific Computing

ACADEMIC AND PROFESSIONAL EXPERIENCE

- 2021 – Present PhD student
Department of Mechanical Engineering,
University of Southern California, Los Angeles, CA

AWARDS AND ACHIEVEMENTS

- 2024 **American Heart Association Predoctoral Fellowship Award**
- 2023 **American Heart Association Travel Grant Award (Basic Cardiovascular Sciences Council)**

JOURNAL PUBLICATIONS

- 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.** Shojaefard 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.** Shojaefard 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**, Petrusek 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

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

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. InAPS 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.

MENTORING

Christopher Lopez	Summer Highschool Intensive in Next-Generation Engineering 2022, "Using Machine Learning to Predict Arterial Compliance".
Jayden Solis	Summer Highschool Intensive in Next-Generation Engineering 2022, "Artificial Organ Fabrication and Experiments".
Vedika Kothari	Summer Highschool Intensive in Next-Generation Engineering 2022, "Non-Invasive Prediction of Aortic Stiffness".
Justine Ludden	Summer Highschool Intensive in Next-Generation Engineering 2022, "Classification of CVD Patients using Machine Learning".
Abigail Gugsu	Summer Highschool Intensive in Next-Generation Engineering 2023, "Predicting Pulse Wave Velocity in Cardiovascular Disease Patients".
Melodie Ebrahimi	Summer Highschool Intensive in Next-Generation Engineering 2023, "Correlations Between Heart Failure, Age, Arterial Compliance, and Other Biomarkers: Found Using Machine Learning Algorithms".
Nico Marazzi	Summer Highschool Intensive in Next-Generation Engineering 2023, "Artificial Cardiovascular Organ Production".
Hyunwoo Lee	Summer Highschool Intensive in Next-Generation Engineering 2023, "Using Machine Learning to Predict Cardiovascular Age".
Jessica Ferrie	Summer Highschool Intensive in Next-Generation Engineering 2024, "Exploring the Circulatory System and Predicting Aortic Stiffness through Machine Learning Techniques".
Sophia Choi	Summer Highschool Intensive in Next-Generation Engineering 2024, "Investigation of the Circulatory System and Prediction of Cardiovascular Biomarkers Using Machine Learning".
Dylan Thai	Summer Highschool Intensive in Next-Generation Engineering 2024, "Investigation of Cardiovascular System Using A Mock Circulatory System".
Janelle Hurtado	Summer Highschool Intensive in Next-Generation Engineering 2024, "Predicting Arterial Stiffness through Circulatory System Analysis Using Machine Learning".

ACADEMIC SERVICES

NSF outreach Program Organizer

coordinating 4 visits for Gardena Highschool
students starting 2023