

Mehran Mirramezani

GENERAL

Immigration Status: Permanent Resident of the US (Green Card Holder)
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RESEARCH INTERESTS

- Computational mechanics
- Machine learning for engineering
- Health planning
- Data-driven techniques
- Bio-inspired design
- Soft robotics

EDUCATION

University of California, Berkeley, Berkeley, CA August 2015 - December 2020
Ph.D., Mechanical Engineering, GPA: 3.98 / 4.00
- Dissertation: Reduced-order modeling of blood flow
- Advisor: Prof. Shawn C. Shadden
- Committee: Prof. Mohammad Mofrad, Prof. Per-Olof Persson, Prof. Tarek Zohdi
University of California, Berkeley, Berkeley, CA January 2018 - December 2020
M.A., Mathematics, GPA: 4.0 / 4.0
- Areas of Study: Machine/deep learning, numerical methods, optimization
- Courses: Optimization models in engineering, convex optimization and approximation, statistical learning theory, introduction to machine learning, designing and understanding deep neural networks, numerical solution of differential equations ODE/PDE (I,II), metric differential geometry
Isfahan University of Technology, Isfahan, Iran September 2011 - September 2013
M.Sc., Mechanical Engineering, GPA: 4.0 / 4.0
- Dissertation: Fluid-structure interaction modeling for nano scale problem
- Advisor: Dr. Hamid Reza Mirdamadi
Isfahan University of Technology, Isfahan, Iran September 2007 - July 2011
B.Sc., Mechanical Engineering, GPA: 4.0 / 4.0

PROFESSIONAL EXPERIENCE

- **NSF Computing Innovation Postdoctoral Researcher** September 2021 - Present
Advisor: Prof. Ryan P. Adams
Department of Computer Science
Princeton University, Princeton
- **Postdoctoral Researcher** December 2020 - August 2021
Advisor: Prof. Shawn C. Shadden
Department of Mechanical Engineering
University of California, Berkeley
- **Graduate Research Assistant** August 2015 - December 2020
Advisor: Prof. Shawn C. Shadden
Department of Mechanical Engineering
University of California, Berkeley
- **Finite Element Research Intern** May 2020 - August 2020
Apple
Cupertino, California, United States
- **Graduate Research Assistant** September 2011 - May 2015
Advisor: Prof. Hamid Reza Mirdamadi
Department of Mechanical Engineering
Isfahan University of Technology
- **Undergraduate Research Assistant** September 2010 - April 2011
Advisor: Dr. Hamid Reza Mirdamadi
Department of Mechanical Engineering
Isfahan University of Technology

RESEARCH FUNDING

A Learning-Based Approach for Functional Engineering Design of Mechanical Systems

- Project Start/End Dates: 09/01/2021 - 09/01/2024
- Sponsors: NSF & CRA & CCC - Role: PI - Total Funding: \$425,000
- Summary: Dr. Mirramezani is developing a novel computational modeling paradigm integrating computational solid mechanics, machine learning architectures, and optimization techniques to explore innovative learning-based design of compliant structures with complex functionalities. This approach automates an important emerging engineering paradigm at the interface between mechanical engineering, computer science, and robotics, which will not only make the design loop tighter; it will unlock new kinds of multifunctional compliant systems.

HONORS AND AWARDS

- Selected for the NextProf Nexus Workshop 2022
- Awarded NSF Computing Innovation Postdoctoral Fellowship 2021-2024
- Selected for Rising Stars in Mechanical Engineering, UC Berkeley Rising Stars Workshop 2020
- JBME Editors' Choice Paper for 2019, Journal of Biomechanical Engineering 2020
- ASME-BED Student Paper Competition Finalist, World Congress of Biomechanics 2018
- JTH Editors' Highlight and Cover Photo, Journal of Thrombosis and Haemostasis 2018
- William S. Floyd Jr. Graduate Student Fellowship, UC Berkeley 2020
- Bakar Innovation Fellowship, UC Berkeley 2019
- Graduate Division Block Grant Award, UC Berkeley 2016 and 2020
- Best Prelim Performer, UC Berkeley 2016
- Annual Best Master of Science Thesis Award, Isfahan University of Technology 2014
- Outstanding Graduate Student, Isfahan University of Technology 2013
- Ph.D. program merit-based Admission Offer, Sharif/Isfahan University of Technology 2013

JOURNAL PUBLICATION

12. **Mirramezani, M.**, Oktay, D., Adamas, R.P., "A rapid and automated computational approach to the design of multistable soft actuators", *Computer Physics Communications*. 298:109090, 2024. [\[Link\]](#)
11. Oktay, D., **Mirramezani, M.**, Medina, E., Adamas, R.P., "Neuromechanical Autoencoders: Learning to couple elastic and neural network nonlinearity", *International Conference on Learning Representations (ICLR)*, 2023. [\[Link\]](#)
 - **ICLR Spotlight Paper (Notable, Top 25%)**
 - **Princeton Press Article** [\[Link\]](#)
10. **Mirramezani, M.**, Shadden, S.C., "Distributed lumped parameter modeling of blood flow in compliant vessels", *Journal of Biomechanics*. 140:111161, 2022. [\[Link\]](#)
9. **Mirramezani, M.**, Cimadomo, P., Ahsan, E., Clavijo, L., Shavelle, D., Shadden, S.C., "Mathematical modeling of blood flow for non-invasive assessment of the hemodynamic significance of peripheral vascular diseases", *Journal of Angiology & Vascular Surgery*. 6 (76):16856, 2021. [\[Link\]](#)
8. Cohen, A.J., Patino, G., **Mirramezani, M.**, Srirangapatnam, S., Tresh, A., Cheema, B., Tai, J., Romero, D., Enriquez, A.C., Baskin, L., Shadden S.C., Breyer, B.N., "Novel measurement tool and model for aberrant urinary stream in 3D printed urethras derived from human tissue", *Plos One*. 15(11), e0241507, 2020. [\[Link\]](#)
7. **Mirramezani, M.**, Shadden, S.C., "A distributed lumped parameter model of blood flow", *Annals of Biomedical Engineering*. 48(11), 2870-2886, 2020. [\[Link\]](#)
6. **Mirramezani, M.**, Diamond, S.L., Litt, H.L., Shadden, S.C., "Reduced order models for transstenotic pressure drop in the coronary arteries", *Journal of Biomechanical Engineering*. 141(3):031005, 2019. [\[Link\]](#)

- JBME Editors' Choice Paper for 2019

5. **Mirramezani, M.**, Herbig, B.A., Stalker, T.J., Netley, L., Cooper, M., Weisel, J.W., Diamond, S.L., Sinno, T., Brass, L.F. Shadden, S.C., Tomaiuolo, M., "Platelet packing density is an independent regulator of the hemostatic response to injury", *Journal of Thrombosis and Haemostasis*. 16(5), 973-983, 2018. [\[Link\]](#)

- JTH Editors' Highlight and Cover Photo

4. **Mirramezani, M.**, Mirdamadi, H.R., Ghayour, M., "Nonlocal vibrations of shell-type CNT conveying simultaneous internal and external flows by considering slip condition", *Computer Methods in Applied Mechanics and Engineering*. 272, 100-120, 2014. [\[Link\]](#)
3. **Mirramezani, M.**, Mirdamadi, H.R., Ghayour, M., "Innovative coupled fluid-structure interaction model for carbon nano-tubes conveying fluid by considering the size effects of nano-flow and nano-structure", *Computational Materials Science*. 77, 161-171, 2013. [\[Link\]](#)
2. **Mirramezani, M.**, Mirdamadi, H.R., "Effects of nonlocal elasticity and Knudsen number on fluid-structure interaction in carbon nanotube conveying fluid", *Physica E: Low-Dimensional Systems and Nanostructures*. 44, 2005-2015, 2012. [\[Link\]](#)
1. **Mirramezani, M.**, Mirdamadi, H.R., "The effects of Knudsen-dependent flow velocity on vibrations of a nano-pipe conveying fluid", *Archive of Applied Mechanics*. 82, 879-890, 2012. [\[Link\]](#)

SELECTED CONFERENCE PROCEEDING PUBLICATIONS

7. **Mirramezani, M.**, Cimadomo, P., Ahsan, E., Clavijo, L., Shavelle, D., Shadden, S.C., "Mathematical modeling of blood flow to evaluate the hemodynamic significance of peripheral vascular lesions", *AHA Scientific Sessions*, 2020.
6. **Mirramezani, M.**, Shadden, S.C., "A reduced order modeling method for cardiovascular flow", *Computational and Mathematical Biomedical Engineering*, Sendai, Japan, 2019.
5. **Mirramezani, M.**, Shadden, S.C., "Reduced order modeling of coronary blood flow", *World Congress of Biomechanics*, Dublin, Ireland, 2018.

- ASME-BED Student Paper Competition Finalist

4. **Mirramezani, M.**, Shadden, S.C., "Comparison of different models for non-invasive FFR estimation", *Bulletin of the American Physical Society* 62, Denver, US, 2017.
3. **Mirramezani, M.**, Herbig, B.A., Stalker, T.J., Netley, L., Cooper, M., Weisel, J.W., Diamond, S.L., Sinno, T., Brass, L.F., Shadden, S.C., Tomaiuolo M., "Convection denied: platelet packing density is an independent regulator of the hemostatic response to injury", *ISTH*, Berlin, Germany, 2017.
2. **Mirramezani, M.**, Tomaiuolo, M., Stalker, T.J., Shadden, S.C., "3D reconstruction of the hemostatic plug transport microenvironment", *Summer Biomechanics, Bioengineering and Biotransport Conference*, Arizona, US, 2017.
1. **Mirramezani, M.**, Tomaiuolo, M., Stalker, T.J., Shadden, S.C., "Computational reconstruction and fluid dynamics of in-vivo thrombi from the microcirculation", *Bulletin of the American Physical Society* 61, Portland, US, 2016.

PATENTS

- **Mirramezani, M.**, Shadden, S.C., "Reduced order model for computing blood flow dynamics", US and International PCT Application No. PCT/US2020/039765.
- **Mirramezani, M.**, Shadden, S.C., "A non-invasive technique for assessment of peripheral artery disease", US and International PCT Application No. PCT/US2021/035969.

TEACHING AND MENTORSHIP EXPERIENCES

- **Graduate Student Researcher Mentorship** Fall 2021 - Present
 - Student: Deniz Oktay, Princeton University
 - Research Topic: Developing a robust differentiable simulator for the large-deformation of mechanical metamaterials.
Princeton University

- **Undergraduate Student Researcher Mentorship** Summer 2022
 - Student: James Bowden, Caltech
 - Research Topic: Topology optimization for material design via machine learning. Princeton University
- **Undergraduate Student Researcher Mentorship** Spring 2021 - Fall 2021
 - Student: Tim Hoogenraad, UC Berkeley
 - Research Topic: Evaluation of different flow diverter geometries to reduce intra-aneurysmal blood flow. UC Berkeley
- **Berkeley Master of Engineering Mentorship Program** Fall 2019 - Spring 2020
 - Student: Paul Cimadomo, Master of Engineering, EPFL
 - Research Topic: Image-based CFD for cardiovascular diseases prevention and detection. UC Berkeley
- **Design of Planar Machinery** Fall 2015
 - Graduate Student Instructor**
 - Department of Mechanical Engineering
 - UC Berkeley
- **Applied Vibrations** Spring 2012 & Fall 2012
 - Graduate Student Instructor**
 - Department of Mechanical Engineering
 - Isfahan University of Technology
- **Mechanics of Materials I and II** Fall 2011 & Spring 2013
 - Graduate Student Instructor**
 - Department of Mechanical Engineering
 - Isfahan University of Technology

OUTREACH

- Johns Hopkins Center for Talented Youth Biomechanical Engineering in Healthcare, UC Berkeley
- DaVinci Camp, UC Berkeley

PROFESSIONAL SERVICE AND MEMBERSHIP

- Journal Reviewer
 - Journal of Fluid Mechanics
 - Journal of Biomechanical Engineering
 - Biomechanics and Modeling in Mechanobiology
 - International Journal for Numerical Methods in Biomedical Engineering
 - Computer Methods and Programs in Biomedicine
 - Quantitative Imaging in Medicine and Surgery
 - Computational Mechanics
 - AIP Advances
- Membership
 - American Physical Society
 - American Society of Mechanical Engineers