Sajjad Arzemanzadeh

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EDUCATION

University of Tehran — Tehran, Iran
M.Sc. in Biomedical Engineering (Biomechanics) — Sept. 2020 — Present
GPA: 17.91/20 (3.88/4)

University of Tehran — Tehran, Iran
B.Sc. in Mechanical Engineering — Sept. 2016 — Sept. 2020
GPA: 16.62/20 (3.45/4), Last two years GPA: 17.52/20 (3.76/4)

RESEARCH INTERESTS

- MD Simulation and Multiscale Modelling
- MEMS and BioMEMS Fabrication
- Micro- and Nano-Mechanics
- Optimization and Machine Learning

PUBLICATION

- **Arzemanzadeh, S.**, Pierron, O., & Hosseinian, E. (2023). Understanding Compound Effect of Shear and Squeeze-film Dissipation in a Silicon Lateral Micro-resonator for MEMS-based Environmental Monitoring Applications. *Sensors and Actuators A: Physical*, *345*, 114166. https://doi.org/10.1016/j.sna.2023.114166.
- Nourozi, E., **Arzemanzadeh, S.**, Mahnama, M., & Hosseinian. E. (2023). Atomistic Insights into Hydrogels: Effects of Degree of Cross-linking on Mechanical Properties of PNIPAM. *ACS Macromolecules* **(To be submitted)**.
- **Arzemanzadeh, S.**, Nourozi, E., Hosseinian, E., & Mahnama, M. (2023). Multiscale Investigation of Tissue-like Strain Stiffening of Starch-PNIPAM Biomimetic Material. *Scientific Reports* **(In Preparation)**.

RESEARCH EXPERIENCE

M.Sc. Thesis: Investigation of mechanical properties of particle reinforced PNIPAM hydrogel to create a biomimetic material — April 2022 — Present
Supervisors: Dr. E. Hosseinian and Dr. M. Mahnama — *University of Tehran*

- Carried out MD simulation to compute mechanical properties of starch and PNIPAM hydrogel.
- Derived Cohesive Zone Model (CZM) of starch-PNIPAM using pull test and umbrella sampling via GROMACS.
- Developed a MATLAB and COMSOL Multiphysics coupling framework to carry out numerical simulations of models composed of various-sized starch particles randomly dispersed in the PNIPAM hydrogel matrix.
- Identified tissue-like strain stiffening mechanism of starch-PNIPAM biomimetic material.

Graduate Research Assistant — Jan. 2021 — Present
Multiscale Simulation of Materials and Structures (MSMS) Lab, Head: Dr. M. Mahnama — *University of Tehran*

- Developed a robust dynamic crosslinking protocol for MD simulations of thermoset polymers and hydrogels.
- Investigated the effects of water content, degree of cross-linking, and degree of polymerization on mechanical properties of cross-linked PNIPAM hydrogels.

Graduate Research Assistant — Jan. 2021 — Feb. 2022
Advisor: Dr. E. Hosseinian — *University of Tehran in collaboration with Georgia Institute of Technology*

- Quantified the phase lag between fluid-induced resistant moment and the angle of rotation of silicon lateral micro-resonators by post-processing experimental results and compared them with obtained numerical results.
- Investigated the effects of variations in thermophysical properties of the fluidic medium (T, RH, P) on the Q factor of silicon micro-resonators.

B.Sc. Thesis: Accurate modeling of shear and squeeze damping of a silicon lateral rotary micro-resonator and sensitivity optimization of it — Dec. 2019 — Sept. 2020
Supervisor: Dr. E. Hosseinian — *University of Tehran*

- Developed a 3D CFD model for micro-resonators with complex geometries using dynamic meshing in ANSYS Fluent.
- Developed UDF codes to compute shear and squeeze energy loss in the vicinity of the micro-resonator's surface.
- Quantified shear-induced and squeezing flow contribution to different segments of micro-resonator's geometry.
- Optimized thickness of micro-resonator to minimize energy loss and maximize sensitivity.

Undergraduate Research Assistant April 2018 — June 2019
Surface Nano-Engineering (SNE) Research Center, Head: Dr. F. Chini *University of Tehran*
- Designed a 3D-model concept for a force surface tensiometer that measures Critical Micelle Concentration (CMC) using the Wilhelmy plate method.
- Conducted research on the design of a bubble pressure tensiometer device that measures dynamic surface tension and analyses the mobility of surfactants.

WORK EXPERIENCE

Teaching Assistant
Responsibilities: assigning and grading homework, quizzes, and projects and lecturing additional course materials.
- Mechanics of Materials I, Instructor: Dr. M. Mahnama Spring 2022
- Optimization of Mechanical Systems, Instructor: Prof. F. Kowsary Fall 2020
- Design of Machine Elements II, Instructor: Dr. A. Daneshmehr Fall 2020
- Fluid Mechanics I, Instructor: Dr. F. Chini Fall 2018

Mechanical Engineer Nov. 2020 — June 2022
Micro-Proteomics Lab
- Designed a universal platform using Nucleic Acid Amplification Test (NAAT) procedure for clinical quantitative and qualitative diagnosis.
- Conducted a feasibility study, and prepared a business plan for proposed product in Iran's market.

Mechanical Engineering Intern June 2019 — Sept. 2019
SINA Robotics and Medical Innovators
- Learned the basics of PLC programming, specifically TwinCAT 3, to rewrite codes for Sina robotic telesurgery system.
- Assembled Maxon DC motor test setups and Implemented PID controllers for them.

SELECTED PROJECTS

Neural Networks and Deep Learning Course Projects Spring 2021
Course: Neural Networks
- Implemented data augmentation and CNN network on Cifar10 dataset, transfer learning (DenseNet), object detection with YOLOv5, semantic segmentation (U-Net) on Cam Vid dataset, "LSTM, ConvLSTM, and GRU" on BTC-USD dataset, embedding and LSTM network on Sentiment context dataset, variational autoencoder on MNIST dataset, and CycleGAN on Monet2Photo dataset using Python.

A Novel Bubble-driven Micromixer/Micropump Based on Thermal-inkjet Technology Fall 2020
Course: Fluid Mechanics in Biological Systems
- Designed an extensible square-wave microchannel toward reaching an optimal design.
- Implemented a Coupled Level Set and Volume-Of-Fluid (CLSVOF) method for bubble-fluid and fluid-fluid interface tracking using ANSYS Fluent.

Piezoelectrically Actuated Diaphragm For Check Valve Micropump Spring 2019
Course: Introduction to Micro and Nanosystems
- Simulated the relationship between stroke volume and backpressure of the micropump using COMSOL Multiphysics.
- Investigated effect of piezoelectric thickness on average displacement to achieve desired pumping rate.

TECHNICAL SKILLS

Engineering Software	ANSYS Workbench, COMSOL Multiphysics, SolidWorks, ABAQUS, Digimat
Molecular Dynamics	GROMACS, LAMMPS, Materials Studio, Gaussian
Programming Language	MATLAB, Python
Operating System	HPC, Linux, Windows
Other	Microsoft Office, LaTeX, Adobe Photoshop, Adobe Illustrator

HONOURS & AWARDS

Ranked 16th in Nationwide Scientific Student Olympiad in Mechanical Engineering 2021

Full Scholarship, M.Sc. Program, Iranian University Entrance Exam 2020 — Present
School of Mechanical Engineering, University of Tehran

Ranked 49th among 10,988 Participants in Nationwide Universities Entrance Exam (M.Sc.) 2020

Full Scholarship, B.Sc. Program, Iranian University Entrance Exam 2016 — 2020
School of Mechanical Engineering, University of Tehran

Ranked 486th among 162,879 Participants in Nationwide Universities Entrance Exam (B.Sc.) 2016

Semi-finalist in Iranian National High School Student Olympiads 2014
Olympiads of Mathematics and Computer

LANGUAGE

English: Professional Working Proficiency
- TOEFL iBT: **104/120** (Reading: 28/30, Listening: 27/30, Speaking: 22/30, Writing: 27/30) Nov. 2022

Persian: Native

VOLUNTEER EXPERIENCE

Member of Scientific Association of Mechanical Engineering (University of Tehran) May 2018 – May 2019
- Managed and held 20 engineering software courses.
- Contributed to organizing and holding of faculty events, including faculty's Opening Day, Orientation Day, and Annual Event (2018).

REFERENCES

Dr. E. Hosseinian
Assistant Professor of Mechanical Engineering
University of Tehran
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Dr. M. Mahnama
Assistant Professor of Mechanical Engineering
University of Tehran
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Dr. A. Daneshmehr
Associate Professor of Mechanical Engineering
University of Tehran
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