

Sajjad Arzemanzadeh

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EDUCATION

University of Tehran

M.Sc. in Biomedical Engineering (Biomechanics)

GPA: 17.91/20 (3.88/4)

Tehran, Iran

Sept. 2020 – Present

University of Tehran

B.Sc. in Mechanical Engineering

GPA: 16.62/20 (3.45/4), Last two years GPA: 17.52/20 (3.76/4)

Tehran, Iran

Sept. 2016 – Sept. 2020

RESEARCH INTERESTS

- MD Simulation and Multi-Scale Modelling
- Finite Element Analysis
- Nanocomposites
- Nanomechanics and Quantum Mechanics
- MEMS and BioMEMS Fabrication
- Optimization and Machine Learning

PUBLICATION

- **Sajjad Arzemanzadeh**, Olivier Pierron, and Ehsan Hosseini. “*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* (**Under Review**), preprint: <http://dx.doi.org/10.2139/ssrn.4264611>.
- Erfan Nourozi, **Sajjad Arzemanzadeh**, Maryam Mahnama, and Ehsan Hosseini. “*Atomistic Insights into Cross-linked Hydrogels: Effects of Chain Length and Degree of Cross-linking on Mechanical Properties of PNIPAM.*” *ACS Macromolecules* (**To be submitted**).
- **Sajjad Arzemanzadeh**, Erfan Nourozi, Ehsan Hosseini, and Maryam Mahnama. “*Multi-scale Investigation of Tissue-like Strain Stiffening Mechanism of Starch-PNIPAM Nanocomposite.*” *Scientific Reports* (**To be submitted**).

RESEARCH EXPERIENCE

M.Sc. Thesis: Investigation of mechanical properties of particle reinforced PNIPAM hydrogel to create tissue-like nanocomposite

April 2022 – Present

Supervisors: Dr. E. Hosseini and Dr. M. Mahnama

University of Tehran

- Carried out MD simulation to compute mechanical properties of starch-PNIPAM nanocomposite.
- 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 nanocomposites composed of various-sized starch nanoparticles randomly dispersed in the PNIPAM hydrogel matrix.
- Identified tissue-like strain stiffening mechanism of starch-PNIPAM nanocomposite.

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. Hosseini

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. Hosseini

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 2021
- Design of Machine Elements II, Instructor: Dr. A. Daneshmehr Fall 2021
- Fluid Mechanics I, Instructor: Dr. F. Chini Fall 2019

Mechanical Engineer

Nov. 2020 – June 2022

Micro-Proteomics Lab, Head: Dr. V. Bazargan

- Designed a universal microfluidic 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

Multiscale Modelling of Polyethylene-Carbon Nanotube Nanocomposites

Spring 2022

Course: Nanocomposites

- Conducted atomistic MD simulations to compute mechanical properties of PE-CNT nanocomposite.
- Developed multi-scale RVE models composed of various sized and disoriented CNT fillers randomly dispersed in PE matrix.

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, L^AT_EX, 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. A. Daneshmehr

Associate Professor of Mechanical Engineering
University of Tehran
daneshmehr@ut.ac.ir

Dr. M. Mahnama

Assistant Professor of Mechanical Engineering
University of Tehran
m.mahnama@ut.ac.ir

Dr. V. Bazargan

Assistant Professor of Mechanical Engineering
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