Ali Ekramian

(+98) 9962496303 • ali.ekramian@sharif.edu
physics.sharif.edu/ ali.ekramian/ • ali-ekramian

Education

Sharif University of Technology September 2020 - February 2025 (Expected)

Bachelor of Science in Physics

- Current GPA: 18.76/20.00

Research Interests

Biophysics, Soft Matter Physics, Optical Tweezers, Neuroscience, Fluid Dynamics, Dynamical Systems

Research Experiences

Soft Matter Physics Lab October 2023 - Present

Under supervision of Dr. Nader S. Reihani & Dr. Saman Moghimi

- Currently involved in a team project focused on designing experiments in soft matter physics and fluid dynamics for an advanced educational lab course, including:
  - Hele-Shaw Cell: Designed and optimized a user-friendly setup to observe Saffman–Taylor instability by injecting different fluids into a Hele-Shaw cell, illustrating the formation of finger-like patterns.
  - Capillary Action: Designed an experiment setup to determine the surface tension of fluids using capillary action.
  - Hydraulic Jump: Developed a setup to measure observable quantities in a hydraulic jump under various boundary conditions.

Optical Tweezers & Biological Micromanipulation Lab June 2023 - Present

Under supervision of Dr. Nader S. Reihani

- Working on setting up a system that combines optical tweezers and digital holography method for our project that measures the mechanical and topological properties of red blood cells.
- Developed a digital holography setup using a Mach-Zehnder interferometer to capture interference patterns and perform phase reconstruction, used to investigate the characteristics of red blood cells.
- Synthesized $1\mu\mathrm{m}$ silica beads for optical trapping experiments in our lab.
- Collaborating on a team project to measure the mechanical and structural properties of red blood cells using innovative techniques with optical tweezers.
- Utilized a Leica confocal microscope to capture high-resolution images of various samples.

Experiences

Internship & Summer School

- **The 28th Special School on Topics in Physics** | **Certificate** Summer 2023
  Institute for Advanced Studies in Basic Sciences (IASBS) in Zanjan, Iran

Articles | **Link**

Three articles in Takane Journal. The journal of department of physics in Sharif University of Technology

- Ali Ekramian, Fateme RamezanZade. (2024). *Persian Language Processing with Network Science Methods*. Journal of Takane
- Ali Ekramian, Fateme RamezanZade. (2023). *Measurement of DNA elasticity using optical tweezers and modeling this phenomenon*. Journal of Takane
- Ali Ekramian, Fateme RamezanZade. (2022). *History of Classical Thermodynamics*. Journal of Takane

Teaching Assistant

- **Optical Physics** - Dr. Nader S. Reihani This Semester
- **BioPhysics** - Dr. Nader S. Reihani Spring 2024
- **Thermodynamics and Statistical Mechanics 2** - Dr. Vahid Karimipour Fall 2023
- **Physics 4 (Modern Physics)** - Dr. Ali Khademi Fall 2023
- **Thermodynamics and Statistical Mechanics 1** - Dr. Vahid Karimipour Spring 2023
- **Physics 4 (Modern Physics)** - Dr. Ali Khademi Spring 2023
- **Physics 4 (Modern Physics)** - Dr. Alireza Z. Moshfegh Fall 2022

Achievements

National Student's Olympiad in Physics July 2024
Ranked 10th nationwide

National University Entrance Exam (Master's Konkur) February 2024
Ranked 28th in physics major nationwide

Accepted in National Entrance Exams for Exceptional Talented Students (NODET) June 2014

Selected Courses

Biophysics	20.0 / 20.0	**Foundation of Neuroscience**	19.2 / 20.0
Nonlinear Dynamics & Chaos	20.0 / 20.0	**Network Science**	19.0 / 20.0
Optical Physics	19.6 / 20.0	**Simulation in Physics & Lab**	17.5 / 20.0
Elementary Particles	20.0 / 20.0	**Cosmology**	19.5 / 20.0

Projects

Persian Language Processing with Network Science Methods | Github Fall 2023
Group project applying network science techniques to analyze co-occurrence graphs of Persian words, uncovering their structural properties. Calculated network measures such as degree distribution, centrality, assortativity, and clustering coefficient to characterize patterns in Persian prose and poetry.

Psychophysical Task for Animal/Non-Animal Rapid Categorization | Github Fall 2023
Designed a psychophysical task in Python to test rapid categorization of animal/non-animal images by human subjects. Compared human performance with results from the H-MAX model implemented in MATLAB.

Protein Analysis | Github Spring 2023
Conducted data analysis on various proteins (e.g., DNA polymerase, insulin) during a Biophysics course. Utilized the Protein Data Bank (PDB) for data and simulations.

Bifurcation Structure and Stability of Localized States in Dryland Vegetation Spring 2023
Reproduced findings from Fernandez-Oto et al. (2020) in detail as part of the Nonlinear Dynamics and Chaos course.

Ising Model Simulation | Github Spring 2023
Developed a Python-based simulation of the Ising model for arbitrary lattice sizes. Visualized spin arrangements and plotted Magnetization, Energy, Heat Capacity, and Magnetic Susceptibility versus Temperature.

Molecular Dynamics Simulation | Github Spring 2023
Simulated the motion of 100 particles in a 2D box using Python, plotting the system's Energy, Positions, Temperature, Pressure, and Autocorrelation over time.

Logistic Map and Feigenbaum Constants | Github Spring 2023
Illustrated the chaotic behavior in the logistic map using Python, including bifurcation diagrams, and computed the Feigenbaum constants δ and α.

Percolation Simulation | Github Spring 2023
A Python project that simulates percolation on a 2D lattice using coloring algorithms to analyze the infinite cluster at different probabilities. It visualizes cluster size distribution and percolation thresholds.

Double Pendulum | Github Spring 2021
Project written in C/C++ that solves the equations and simulates the motion of a double pendulum, including animated visualizations, while also demonstrating the chaotic behavior of the system.

Extracurricular Activity

Organizer, Physics Open Day Event 2024
Planned and executed experiments, organized seminars, and led guided tours of all departmental labs for high school students.

Head of Quanta, Physics Study Circles, Sharif University of Technology | Link 2022 & 2023
Organized various article reading, problem solving study circles and scientific presentations at Quanta.

Co-Head of Sharif Physics Scientific Student Association | Link 2022
Coordinated various departmental events, including Astronomy Day and the "Introduction to Fields of Physics" seminar series. Managed mentorship programs for first-year students and organized workshops on LaTeX, Mathematica, and Julia programming. Facilitated problem-solving workshops for Physics 1 & 2 and General Mathematics 1 & 2.

Skills

Programming Languages & Softwares: Python, Mathematica, C/C++, LaTeX, Julia, Matlab, HTML, LabVIEW

Languages

Persian: Native **English:** Advanced (IELTS 7.0) **French:** Elementary **German:** Beginner