Ali **Abolhassanzadeh Mahani**

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Education

Sharif University of Technology — *Tehran, Iran*

B.Sc. in Physics — *Sep. 2017 - Jul. 2023*

- With a focus on physics of complex systems and computational physics.
- **GPA:** 16.75 / 20 (3.47/4.0)

Shahid Sadoughi High school (NODET) — *Yazd, Iran*

High school diploma and pre-university course — *2014 - 2018*

- **NODET:** National Organization for Development of Exceptional Talents
- **Field:** Physics & Mathematics
- **GPA:** 4.0/4.0

Interests

Research Computational Neuroscience, Brain Computer Interfaces, Complex Systems

Honors & Awards

2017 **Bronze Medal,** Iran 30th National Physics Olympiad — *Tehran, Iran*

Selected Courses

Computer Simulation in Physics, (Cross-Listed)	*20/20*
Introduction to Psychology,	*20/20*
Complex Systems, (Cross-Listed)	*18/20*
Non-linear Dynamics and Chaos, (Cross-Listed)	*17.3/20*
Machine Learning in Physics, (Cross-Listed), (course materials on GitHub)	*16.6/20*

Research Experience

Growing Critical: Self-Organized Criticality in Neural Dynamics — *Tehran, Iran*

A reproduction of the original paper — *Feb. 2021 - PRESENT*

- Analyzing criticality in neuronal growth dynamics model obtained from experiments. We find self-organized criticality in this dynamics, both in theory and in simulations.
- **Advisor:** Prof. Saman Moghimi-Araghi
- **Code:** GitHub

Flow of information from visual input to motor output during a sensorimotor task — *Online*

Neuromatch Academy Summer School — *Jul. 2022*

- We define a representation for neuron activation in different brain areas and Ask in which order do the brain regions activate during a sensorimotor task.
- This research project was part of the Neuromatch Academy summer school. We presented our results in the end of the course.
- **Advisor:** Dr. Claudia Boehm, Janelia Reseach Campus, HHMI

Course Projects

Finding Criticality — *Tehran, Iran*

Course Related — *Fall 2021*

- The task for this machine learning algorithm is to distinguish between sub-criticality, super-criticality and criticality, given the probability distribution of avalanches. We develop different models, both from traditional methods and ANN[1]s and compare the results.
- **Course:** Machine Learning in Physics
- **Advisor:** Prof. Sadegh Raeisi
- **Collaborator(s):** Rozhin Mohammadikian, Fatemeh Soleimani, Ali Ghebleh
- **Code:** GitHub

Computational Physics *Tehran, Iran*

Course Related *Fall 2021*

- This is where I store my answers to assignments for the *Computer Simulations in Physics* course. As I was a TA for this course, I felt the need for students to have a point of reference when reviewing their submissions for assignments.
- **Code:** GitHub

A computational study of homophily and diffusion of common knowledge on social networks based on a model of Facebook *Tehran, Iran*

A reproduction of the original paper *Fall 2020*

- Here we analyse contagion spread and diffusion of common knowledge in a model of Facebook. We set the game theory rules on three different toy networks and simulate contagion spread.
- **Course:** Computer Simulations in Physics
- **Advisor:** Prof. Fakhteh Ghanbarnejad
- **Collaborator(s):** Sina Moammar
- **Code:** GitLab

Chaos in the Brain *Tehran, Iran*

A reproduction of the original paper *Fall 2020*

- Here we analyze the non-linear dynamics found by fitting the data from neural activity in the sleeping brain.
- **Course:** Non-Linear Dynamics and Chaos
- **Advisor:** Prof. Fakhteh Ghanbarnejad
- **Collaborator(s):** Sina Moammar
- **Code:** GitLab

Teaching Experience

Teaching Assistant, Sharif University of Technology *Tehran, Iran*

Computer Simulations in Physics *Fall 2021*

Monte Carlo, Metropolis Algorithm, Numerical Methods, Molecular Dynamics

Lecturer, Caspian Olympiad Club, NODET *Mazandaran, Iran*

Physics Olympiad *Aug. 2018 - Feb. 2019*

Classical Thermodynamics and Thermal Physics

Workshops and Conferences (attended)

Neuromatch Academy *Online*

Computational Neuroscience *Jul. 2022*

- **Certificate:** Here
- Gained expertise in neuronal data analysis in hands-on projects
- Learned how to form researchable questions and plans to answer them.
- Did research on information flow in mouse brain during a sensorimotor task

The Abdus Salam International Centre for Theoretical Physics (ICTP) *Online*

8th Workshop on Collaborative Scientific Software Development and Management of Open Source Scientific Packages *Oct. - Dec. 2021*

- **Certificate:** Here
- **Final Project:** GitLab

Certificates

Coursera (University of Washington) *Online*

Computational Neuroscience *Jul. - Aug. 2022*

- **Certificate:** Here
- Course taught by Prof. Rajesh Rao et. al.
- Learned the core concepts of computational neuroscience including but not limited to: neuronal encoding and decoding, GLMs, modeling biological neurons, artificial neural networks, RNNs and the emergence of memory, neural plasticity and learning.

Skills

Programming	Python, C/C++, Julia, LaTeX
Machine Learning	Scikit-learn, PyTorch, TensorFlow, Keras
Data Science	NumPy, SciPy, AstroPy, Matplotlib, Seaborn
Genral	Git, Unix/Linux, Auto-documentation, Computational Neuroscience
Soft Skills	Good Listener, Documentation, Flexible, Responsible, Learning Enthusiast, Extrovert
Languages	Persian (native), English (professional working proficiency), German (elementary level)

Extracurricular Activity

Department of Physics, Sharif University of Technology *Tehran, Iran*

Fundraiser *June 2019 - Jan. 2022*

- Gathered and listed structural flaws in the department and prioritized the construction costs
- Co-founded a deposit box for the department with the help of Sharif Foundation that raised over 3 Billion IRR as of spring 2022.

Department of Physics, Sharif University of Technology *Tehran, Iran*

President of Student Council *Mar. 2019 - Dec. 2021*

- Resolved problems among the faculty and students about the quality of education and methods of teaching and examination. Relayed the concerns of over 300 students.
- Negotiated with the board of directors regarding student suggestions for future courses.
- Managed over 300 lockers for students at the physics department.
- Co-organized a group to record popular courses and make them publicly available. Recorded over 10 courses.

Zharfa Complex Systems Convention *SUT, Tehran, Iran*

Member of the Executive Committee *May 2019*

- Zharfa is a multi-major scientific society of students of physics, mathematics and philosophy of science.

Quanta Club, Sharif University of Technology *Tehran, Iran*

Organizer *Mar. 2019 - Dec. 2021*

- Organized the ”Computational Physics” study group at Quanta club under the supervision of the Student Physics Scientific Association.
- Taught dynamic programming as a section of the group syllabus.
- In the second round of this club, I supervised the students and answered their questions.
- Managed all the web content regarding this study circle in this link.