

Yaghoub Shahmari

Curriculum vitae

Education

- 2022-2023 **Internship, Complexity Sciences and Evolution Unit:** Okinawa Institute of Science and Technology, Okinawa, Japan
- 2019-2025 **Bachelor of Physics:** Sharif University of Technology, Tehran, Iran
CGPA: 3.3/4.0 (4-Point GPA) Highest SGPA: 4.0/4.0 (4-Point GPA)
- 2012-2019 **Secondary School:** NODET Schools (National Organization for Development of Exceptional Talents), Tehran, Iran

Areas of Interest

Scientific Computation & Simulations in Complex Systems

Scientific skills

Adaptive Dynamics, Networks Dynamics, Agent-Based Models, Time-Series Analysis, Machine Learning, Numerical Analysis

Technical Skills

- Languages Julia programming language, Python(NumPy, SciPy, Pandas,...), C/C++/C#, Matlab
- Softwares Bash & Linux, Git, L^AT_EX, Microsoft Office, Blender, Unity (Game engine)
- Others HPC, Distributed Computing, and Parallel Algorithms, Volumetric visualization

Research Experiences

- Jul 2022 - **B.Sc. Research Project (Prof. Rouhani's Group - Physics Department):** Sharif University
Oct 2022 of Technology & Azadi Innovation Factory, Iran
- Feb 2024 - **Extended B.Sc. Research Project (Prof. Rouhani's Group - Physics Department):**
Ongoing Sharif University of Technology, Iran
- Project: **Investigating Interdependencies and High-Order interactions of Crypto-Currencies and Fiat-Currencies (Supervisor: Prof. Shahin Rouhani)**
- Description: Collected and analyzed time series data of exchange rates between various crypto and fiat currencies. Processed data using a range of methodologies, including Pearson correlation, causality tests (such as Granger test), and moving averages. Applied stochastic processes, such as Pearson correlation and Markov models, to study exchange rate dynamics and market behavior. Conducted statistical causal modeling, analyzed high-order interactions, and visualized currency valuation networks. Discovered and analyzed communities within high-order interaction graphs, delivering insights into the dependency of fiat currencies on cryptocurrencies, informing policy-making and trading strategies.
- Oct 2022 - **Research Intern (Complexity and Evolution unit, Onsite):** Okinawa Institute of Science
Oct 2023 and Technology, Japan

Oct 2023 - **Research Intern (Complexity and Evolution unit, Remote):** [Okinawa Institute of Science and Technology, Japan](#)

Oct 2024 - **Visiting Researcher (Complexity and Evolution unit, Remote):** [Okinawa Institute of Science and Technology, Japan](#)

Project: **Prolonged latency as a seasonal adaptation in infectious diseases (Supervisors: Prof. Ulf Dieckmann, Prof. Ake Brannstrom)**

Description: Developed and applied numerical algorithms in Julia to explore how seasonality influences pathogen latency in infectious diseases. Used Floquet theory and adaptive dynamics for analysis, and conducted simulations and distributed computing experiments. Visualized findings in 2D and 3D, demonstrating how evolutionary pressures favor specific dormancy durations, enabling viral persistence over years. Key contributions include efficient coding, experiment optimization, dataset analysis, and creating publication-ready graphics. This research enhances our understanding of seasonality's role in pathogen behavior.

Selected Courses

Spring 2020 Introduction to Universe (Dr. B.Mashhoon) - Grade: A

Spring 2021 Modeling Statistical Phenomena (Dr. F.Ghanbarnejad) - Grade: A

Spring 2021 Thermodynamic and Statistical Physics 1 (Dr. O.Akhavan) - Grade: A

Fall 2021 Thermodynamic and Statistical Physics 2 (Dr. O.Akhavan) - Grade: A

Fall 2021 Computer Simulation in Physics (Dr. M.R.Ejtehadi) - Grade: A

Fall 2021 Computer Simulation in Physics Lab (Dr. M.R.Ejtehadi) - Grade: A

Fall 2021 Introduction to Neuroscience (Dr. A. Ghazizadeh) - Grade: B

Spring 2022 Complex Systems (Dr. S.Ruhani) - Grade: A

Spring 2022 Data Science & HPC (Dr. H.R.Arian) - Grade: A

Spring 2024 Astrophysics Lab (Dr. R.Rezaei) - Grade: A

Summer 2024 Electro-Acoustic Lab (Dr. S.Moghimi) - Grade: A

Teaching Experiences

Spring 2024 TA of the "Computer Simulation in Physics" course by Prof. A.Vaezi

Links: [GitHub repository](#)

Selected Course Projects

Dec 2020 **Simulation of Mechanical Random Walker System:** Python simulation for Analytical Mechanics 1. Calculated particle forces and accelerations, simulating falls and collisions. Derived final location distributions, demonstrating the central limit theorem.

[GitHub repository](#)

May 2021 **Simulation of Janus Bunch:** Developed a simulation for the Janus Bunch device as part of Analytical Mechanics 2. Numerically solved dynamics of two-phase coupled oscillators using Python, exploring behavior, synchronization, and visualizing system phases and properties.

[GitHub repository](#)

May 2021 **Investigating the effects of Prevention and Quarantine on SIR:** Term project for Modeling Statistical Phenomena under Dr. F. Ghanbarnejad. Explored prevention and quarantine impacts on SIR models using complex networks and mean field models. Optimized simulation algorithm, transitioning from Python to C for better performance. Successfully executed on HPC cluster, with analysis visualized in Python, revealing effects on disease outbreaks.

[GitHub repository](#)

Jan 2022 **Motor Cortex Electrophysiology: Analyzing Macaque Monkey Behavior:** Contributed to a Neuroscience term project by examining electrophysiological data from the motor cortex of macaque monkeys during a reach-to-grasp task. Managed data cleaning, analysis, algorithm development, visualization, and technical aspects, providing insights into brain event sequences.

[GitHub repository](#)

Mar 2022 **Analyzing the Commodity Market Data:** Spontaneous project supervised by Prof. S. Rouhani during the Complex Systems course. Explored modeling commodity prices through time series analysis. Managed data acquisition and cleaning, performed analysis, visualized results, and investigated correlations between market entries, constructing a network to illustrate relationships.

[GitHub repository](#)

Jul 2022 **The Effect of Rumor Dynamics on Disease Dynamics:** Collaborated during the Sharif SocioPhysics summer school on a project exploring misinformation's impact on COVID-19 dynamics. Investigated rumor influence on disease spread and mortality using a mean-field model. Provided numerical solutions, adapted code from Julia to Python, and visualized results. Uncovered how misinformation accelerates disease propagation without accurate information.

[GitHub repository](#)

Other Archives

Spring 2021 **Modeling Infectious Diseases** Archive of some of the course assignments

[GitHub repository](#)

Fall 2021 **Computer Simulation in Physics** Archive of the course assignments

[GitHub repository](#)

Fall 2023 **Network Science** Archive of some of the course assignments and course project

[GitHub repository](#)

Spring 2024 **Astrophysics Laboratory** Archive of the course assignments

[GitHub repository](#)

Summer 2024 **Electro-Acoustic Laboratory** Archive of the course assignments

[GitHub repository](#)

Community

2020-2021 Main member of the Committee, Public relations manager, and Graphist of Sharif Physics Student Scientific Association, [Link](#)

2020-2021 Head of Scientific News-Reading of Department, [Link](#)

2020-2021 Co-founder and lecturer of "Lambda Scientific Circle", [Link](#)

Fall 2020 Organizer of the "Introducing the Branches of Physics" Conference, [Link](#)

Spring 2021 Organizer of the "Introduction to Complex Systems" event, [Link](#)

Summer 2021 Member of the executive team at Sharif Socio-Physics School, [Link](#)

Winter 2022 Lecturer of the SPSSA Julia Workshop, [Link](#)