POOYAN GOODARZI

Cosmology, Data Analysis

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EDUCATION

M.Sc. in Cosmology and Gravitational Physics

Shahid Beheshti University, Tehran, Iran

📅 Sept 2018 – present

GPA: 15.3/20
Thesis title: **Stochastic Gravitational Wave Detection Based on Machine learning Approach**
Supervisor: Dr. M. Sadegh Movahed

B.Sc. in Physics

Shahid Beheshti University, Tehran, Iran

📅 Sept 2014 – June 2018

GPA: 14.4/20
Thesis title: **Complex Networks Analysis with Python**
Supervisor: Prof. G. Reza Jafari

RESEARCH INTERESTS

- Gravitational Wave Physics and Astronomy
- Using Big Data, Data Analysis and Machine Learning in Cosmology
- Weak Gravitational Lensing, Galaxy Clustering and Large Scale Structure
- Statistical Physics, Stochastic processes and Complex Systems
- Computational Cosmology

PUBLICATIONS

👥 Conference Proceedings

- Kazemi, Mahrokh, **Goodarzi Pooyan**, and Movahed Sadegh (2021). "**Searching for Stochastic Gravitational Waves by Complex Network Analysis of Pulsar Timing arrays**". In: *Proceedings of National Conference on Gravity and Cosmology, (NGC 99), Tehran, Iran, January 2021.* Physics Society of Iran.

📄 Journal Articles

- **Goodarzi Pooyan**, Kazemi Mahrokh, and Movahed Sadegh (2021). "**A Machine Learning pipeline for the search of Stochastic Gravitational Waves in Pulsar Timing Arrays**". In: *(In Prep)*.

SELECTED COURSES

- **Advanced Cosmology:** 17.8/20 — Dr. M. Farhang (2019)
- **General Relativity:** 17.7/20 — Dr. H. Shojaie (2019)
- **Stochastic Processes:** 19/20 — Dr. M.S. Movahed (2018)
- **Complex Systems:** 18.5/20 — Prof. G.R Jafari (2017)
- **Statistical Mechanics:** 17.1/20 — Prof. G.R Jafari (2016)
- **Computational Physics:** 19.5/20 — Dr. Sarkarati (2016)

SOME AUDITED AND ONLINE COURSES

- **Critical Phenomena and Phase Transitions**
  at SBU Physics by Dr. Movahed (2018)
- **Geometry and Topology**
  at SBU Physics by Dr. Shojaei (2016)
- **Solid State Physics**
  at SBU Physics by Dr. Shahbazian (2015)
- **Python for Data Science and Machine learning Bootcamp**
  online course at Udemy (2019)
- **Explorations in Cosmology**
  online course at Perimeter Institute by Dr. K. Smith (2020)
- **Matrix Methods in Data Analysis, Signal Processing and Machine Learning**
  online course at MIT by Dr. G. Strang (2020)

TEACHING EXPERIENCES

- Teaching Assistant **Advanced Statistical Mechanics** (2020)
  Dr. M.S. Movahed
- Teaching Assistant **Statistical Mechanics** (2020)
  Prof. G.R. Jafari
- Teaching Assistant **Advanced Computational Physics** (2020)
  Dr. M.S. Movahed
- Teaching Assistant **Statistical Mechanics** (2019)
  Dr. A. Hosseiny

HONORS & AWARDS

- **Ranked in top 2% of National Physics Graduate Schools Entrance Examination (2018)**
  ranked 71 among 4000 participants
- **Appreciated by the president of SBU Social Department (Dr. Azimi) for Volunteer Activities & Science Outreach (2016 & 2017)**
- **Appreciated by the SBU Physics Dean of Research (Dr. Shahbazian)for Coordination of Weekly Colloquiums (2018)**
- **Ranked in top 1% of Nationwide University Entrance Examination (2014)**
  ranked 2100 among 200000 participants of Mathematics and Physics

RESEARCH AND ACADEMIC PROJECTS

Stochastic Gravitational Wave Detection Based on Machine learning Approach (2019-Ongoing)

For my M.Sc. Thesis Project, I am using Machine Learning Techniques to look for gravitational wave signals in Simulated Pulsar Timing Arrays. Then I Employ the trained Machine on the data-sets of observed PTAs.

Topological Data Analysis of PTAs using Persistent Homology (2021-Ongoing)

A project to use Persistent Homology computational tools in Gravitational Wave detection.

Percolation description of CMB temperature anisotropy (2021-Ongoing)

In this project we are using some Critical Phenomena features of percolating systems to analyse anisotropies of CMB.

Investigating Bias Factor of an Stationary Markov Process by Exact Decomposition of the Correlation Function (2019)

During Stochastic Processes course I used the Bias factor as it is defined in the Cosmology & LSS literature and The Kramers-Moyal expansion to calculate the Unweighted Two-Point Correlation Function.

Variational Methods for the Numerical Solution of Poisson and Laplace Equation (2018)

During my Advanced Electrodynamics Course I used Variational Approach and Relaxation Method to numerically solve 2D Electromagnetism problems.

Complex Networks Analysis with Python (2018)

For my B.Sc. thesis I studied Complex Networks and used NetworkX, a Python Library for analysing Complex Networks, to compute some statistical features of Simulated Networks.

Simulation and Analysis of Ising Model, Surface Growth Models and Percolation (2017)

As side project of my Introduction to Complex Systems Course, I used python to do the mentioned simulations and briefly study those systems.

Analysing Dynamics of Granular Soft Matter by Image Processing Techniques (2016)

As a member of the SBU Ibn-Sina ComplexLab our group briefly reviewed Dynamics of Granular Soft Matter and made a prototype of Experimental Setup. My job was to derive the theoretical results and analyse the Images.

COMPUTER SKILLS

- **Proficient in *Python* and it's major Scientific, Data Analysis & Visualization libraries**
  NumPy, SciPy, TensorFlow, Keras, OpenCV, pandas, NetworkX, scikit-learn, Astropy, Matplotlib, Seaborn

- **Advanced Linux user and experienced in Bash Scripting.**

- **Casually using:**
  - LaTeX (Professional)
  - C++ (Intermediate)
  - Mathematica (Intermediate)
  - Git (Intermediate)
  - Matlab (Elementary)
  - SQL (Elementary)
  - Fortran (Elementary)

TALKS & PRESENTATIONS

- **Searching for Stochastic Gravitational Waves by Complex Network Analysis of Pulsar Timing arrays** (2021)
  National Conference on Gravity and Cosmology, SBU
- **Searching for Gravitational Waves with Machines** (2020)
  Computational Cosmology Group Meeting, SBU
- **Feature Importance and Selection in Machine Learning** (2020)
  Computational Cosmology Group Meeting, SBU
- **Penrose singularity theorem** (2019)
  General Relativity Course project, SBU
- **Pseudo-Science in Iran: Reasons & Solutions** (2020)
  Backstage of Astronomy talks, Sitpor
- **An Introduction to Complexity: Is more diffrent?** (2018)
  Research Methods Course, SBU
- **An Introduction to the physics of Memristors** (2016)
  NanoPhysics Course SBU

SOME ATTENDED WORKSHOPS & CONFERENCES

- **Physics from Machine Learning Workshop (Online)**
  Summer 2020, TMLS, Emory University, USA
- **Youth in High-dimensions: Machine Learning, High-dimensional Statistics and Inference (Online)**
  Spring 2020, ICTP, Italy
- **Cosmological Structure Formation Workshop**
  Winter 2019, Sharif University of Tehran, Iran
- **Workshop on The Use of Complex Networks in Physics**
  winter 2019, School of Physics, Institute for Research in Fundamental Sciences, Iran
- **National Conference on Gravity and Cosmology**
  Winter 2019, Physics Department, University of Tehran, Iran
- **Challenges and Opportunities of High Frequency Gravitational Wave Detection (Video)**
  Summer 2019, ICTP, Italy
- **Mini Workshop on Early Universe Cosmology**
  Spring 2019, School of Astronomy, Institute for Research in Fundamental Sciences, Iran

EXTRA CURRICULUM ACTIVITIES

- **Coordinator of Computational Cosmology Group Weekly meetings (2018-Now)**

- **Coordinator of SBU Physics Weekly colloquiums (2015-2018)**

- **Organizer of Tehran Meeting on Cosmology at the Crossroads (2021), SBU**
  Member of the Organizing Committee

- **Organizer of National Conference on Statistical Physics (2021), SBU**
  Member of the Organizing Committee

- **Organizer of Complexity Economics Conference (2020) SBU & IFA**
  Member of the Organizing Committee

- **Organizer of Using Mathematica for General Relativity Workshop (2020), SBU**

- **Organizer of Machine Learning in Physics: Applications in Astronomy and Cosmology Workshop (2019), SBU**
  Member of the Organizing Committee

- **Organizer of Two day Workshop of Elementary Particles (2018), SBU**

REFEREES

Dr. M.S. Movahed
- @ Shahid Beheshti University, Tehran, Iran
- ✉ s.movahed@sbu.ac.ir
- Associate Professor of Physics, SBU
- Resident researcher, School of Physics, IPM

Prof. G.R. Jafari
- @ Shahid Beheshti University, Tehran, Iran
- ✉ g_jafari@sbu.ac.ir
- Professor of Physics, SBU
- Head of Center for Complex Networks & Social Data Science

Dr. A Hosseiny Esfidvajani
- @ Shahid Beheshti University, Tehran, Iran
- ✉ alihd22@gmail.com
- Assistant Professor of Physics, SBU

OUTREACH & VOLUNTEER ACTIVITIES

- **Technical Assistant of SBU Physics Department (2018-2020)**
  Administrator of Computational Utilities and Website

- **Organizer of SBU physics Department Open Day (2015 & 2017)**
  Physics Outreach for High school students

- **Coordinator of *Coffee and Physics* Program at SBU (2015-2017)**
  Weekly student talks and open discussions

- **Leader of SBU Physics Sky & Telescope Observation Tours (2014-2016)**

- **Guest Writer at Sitpor, a Well-known Science Communication Blog**

HOBBIES

Running   Reading Novels   Listening to Music
Listening to Podcasts   Programming for Fun