Saba Etezad Razavi

Curriculum Vitae

Perimeter Institute for Theoretical Physics
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1 Research Interests

- Early universe Cosmology, Structure formation, Dark Matter and Dark Energy, Re-ionization
- Quasars, Compact objects and gravitational waves

2 Education

2022 - 2023 **M.Sc. Theoretical Physics** — Waterloo, Ontario
Perimeter Institute for Theoretical Physics (Permieter Scholars International)
University of Waterloo

2017 - 2022 **B.Sc. Physics** — Tehran, Iran
Sharif University of Technology (SUT) — GPA: 19.0/20

2013 - 2017 **Diploma in Mathematics and Physics** — Mashhad, Iran
Farzanegan 1 High-school
National Organization for Development of Exceptional Talents (NODET/SAMPAD)

3 Publications

2021 **Unraveling the role of cosmic velocity field in dark matter halo mass function using deep learning:** https://arxiv.org/abs/2112.14743
Saba Etezad-Razavi, Erfan Abbasgholinezhad, Mohammad-Hadi Sotoudeh, Farbod Hassani, Sadegh Raeisi and Shant Baghram

2022 **Constraining temperature fluctuations in IGM during HeII re-ionization using XQ-100 legacy survey**: (In Prep)
Saba Etezad-Razavi, Sarah Bosman, Frederick Davies

4 Research Experience

Oct 2022 - present / Perimeter Institute — **Using Fisher matrix forecast to put a limit on the Cosmological values from cross-correlating GW data and galaxy catalogues**
Dr. Neal Dalal
This is a new way!

Oct 2021 - January 2022 / AEI[1]-Paid Internship — **Understanding the accuracy and bias in the estimation of Hubble constant using BBH merger observations and galaxy catalogs**
(Git) */ Dr. Sumit Kumar*
I measured the Hubble constant by cross-correlating the distance posterior from the gravitational wave(GW) signal's parameter estimation and the GLADE+ galaxy catalogue.

Jul 2021 - Oct 2021 / MPIA[2]-Paid Internship — **Constraining temperature fluctuations from helium re-ionization using XQ100 dataset**
To be submitted to MNRAS. (Draft, Slides)
Dr. Sarah Bosman - Dr. Frederick Davies
Using the quasar spectroscopy in $3 < z < 4$ and PCA method and comparing the observed amount of transmissions in Lymanα forest to Nyx[3], a cosmological numerical simulation, we put constraints on the amount of temperature fluctuations in IGM resulted by helium re-ionization.

Jan 2020 - Jul 2021 / SUT — **Machine learning in structure formation**
Submitted to MNRAS. (arXiv, Git)
Dr. Shant Baghram - Dr. Sadegh Raeisi - Dr. Farbod Hassani
We Develop an interpretable Convolutional Neural Network (CNN) model using **Gevolution**[4]simulations, to predict the halo mass function in $z = 0$ from the simulations initial snapshot and to gain insight toward the physical process of dark matter structure formation.

Jan. 2019 - Jan. 2020 / SUT — **Probing primordial black holes (PBH) in the universe as a candidate for dark matter**
Report (Persian only) */ Dr. Shant Baghram*
I reviewed the current state of the research on Primordial Black Holes as a dark matter candidate with a focus on the physics and the potenital reach of the gravitational wave background.

5 Computer Skills

Advanced	Python, SQL, Unix operating systems, LaTeX, Mathematica
Intermediate	Julia, MATLAB, C and C++
Softwares	IRAF, ds9, PyCBC, Rockstar halo finder, Pylians3, PyGadget, Tensorflow, scikit-learn

6 Teaching Experience

Teaching Assistant SUT

Fall 2020 - *Special Relativity, instructor: Dr. Shant Baghram*

Fall 2019 - *Laboratory of general physics (acoustic, optic and fluids), instructor: Dr. Sadegh Raeisi*

Fall 2018 - *Fundamentals of Programming C & C++, instructor: Dr. Maryam Asadi*

2016 - 2017 **Teaching Astronomy and Astrophysics Olympiad** Mashhad, Iran
-Spherical Astronomy and Introduction to Cosmology and Galactic Dynamic
Farzanegan 1 high-school

7 Talks

June 2022 **Unraveling the role of cosmic velocity field in dark matter halo mass function using deep learning** Université Paris Cité - Paris
Paris Workshop on Bayesian Deep Learning for Cosmology and Time Domain Astrophysics

Feb. 2022 **Constraining IGM temperature fluctuations between redshift 3 and 4 using XQ100** Online
SAZERAC- Learning the high-redshift universe

Oct. 2021 **Constraining Temprature fluctuations in the IGM** MPIA - Heidelberg
Galaxy Coffee Seminars

Oct. 2021 **Constraining Temprature fluctuations in the IGM** SUT - Online
Cosmo Seminars

Oct. 2020 **Primordial Black Holes as a candidate for Dark Matter** SUT - Tehran

Aug. 2020 **The Theory of Electrons and Protons** SUT - Tehran
A review on Paul Dirac's seminal early works in search of a relativistic quantum theory
Session 1 - **Session 2**

8 Awards and Honors

2022 **Perimeter Scholars International award** Waterloo, Ontario
Full scholarship by University of Waterloo and award from Perimeter Institute for Theoretical Physics - More info

2016 **National Astronomy and Astrophysics Olympiad** Tehran, Iran
Young Scholars Club, bronze medalist

2016 - present **Member of National Elite Foundation and awarded full scholarship for undergraduate studies**
Iran National Elites Foundation (INEF) is a statewide organization and consists of members with significant scientific and executive background.

2015 **Member of the national team of the 8th international scientific league of PAYA in physics** Tehran, Iran

2010 and 2013 **National Organization for Development of Exceptional Talents** Iran
Accepted in the junior school and high school Entrance Examination

9 Languages

Native	Persian
Fluent	English - TOEFL iBT score : 106

[0] AEI: Max Planck Institute for Gravitational Physics, Albert Einstein Institute - Hannover/ Germany
[1] MPIA: Max Planck Institute for Astronomy - Heidelberg/ Germany
[2] Nyx Simulation: https://amrex-astro.github.io/Nyx/
[3] Millennium Simulation: https://wwwmpa.mpa-garching.mpg.de/millennium/
[4] Gevolution Simulation: https://arxiv.org/abs/1604.06065

10 Conferences and Workshops (Organized)

Nov. 2018 **Dark Matter Day** convention — Physics Department of SUT
Member of organizing committee

May. 2018 **The 6th Workshop on "Collaborative Scientific Software Development and Management of Open Source Scientific Package"**
Member of local organizing staff — International Centre for Theoretical Physics (ICTP), Tehran, Iran

11 Conferences and Workshops (Attended)

Jan 2020 **Cosmology 2021: The rise of field theory**

July - August 2020 **DESY summer school in particle physics**
Terascale Summer School

July 2020 **New England Workshop on Theoretical Cosmology, Gravity, and Fields**

July 2019 **15th Summer School on Modern Astrophysics**
Astrosoma 2019 — Moscow Institute of Physics and Technology(MIPT)

May-June 2019 **Data Science workshops** — Iranian Institute for Research in Fundamental Sciences(IPM)
Statistical analysis, Machine learning, Deep learning(ANNs, Tensorflow)

Feb. 2019 **4th IPM Workshop on Particle Physics Phenomenology**
IWPPP — IPM

Jan. 2018 **Workshop on Recent Progress in Hydrodynamics and Quantum Chaos (HQC)** — IPM

Feb. 2018 **Cosmology: From theory to observations** — IPM

12 Outreach and engagement

2018 - present Involved in scientific magazines such as member of scientific and interview committee of **Shabahang Trade Magazine** (about astronomy and cosmology), and member of the scientific committee of **Takane Trade Magazine**; Takane is ranked the best Persian scientific journal by Iran Ministry of Science, Research and Technology.

Sep. 2018 - Sep. 2019 Host and presenter of **Tea and Physics Meetings**
Tea and Physics is a series of successful weekly meetings at Physics department of Sharif University for faculty and students to discuss scientific news and physics phenomena behind everyday observations.

Sep. 2018 - 2022 Representer of **Zharfa Student Society**
Zharfa is a multi-major scientific society of students of physics, mathematics and philosophy of science.

Dec. 2019 - Sep. 2020 **Host of Philosophy of physics gatherings**
We started a series of conferences and meetings for reading historical papers in quantum mechanics together with the goal of investigating different philosophical approaches of quantum mechanics.

Dec. 2018 **Sharif University Open Day** — Physics Department of SUT
Performing experiments for high school students

13 Hobbies

Reading Novels, Creative writing, Hiking, Cycling, Playing Piano, Bouldering, Random walking!

14 References

Dr. Shant Baghram, *Associate Professor* — *baghram@sharif.edu*
SUT, Department of Physics

Dr. Sarah E. I. Bosman, *Research Fellow* — *bosman@mpia.de*
MPIA - Heidelberg

Dr. Sadegh Raeisi, *Assistant Professor* — *sraeisi@sharif.edu*
SUT, Department of Physics

Dr. Sumit Kumar, *Research Fellow* — *sumit.kumar@aei.mpg.de*
AEI - Hannover