Alireza Vafaei Sadr

Curriculum vita

Born: December, 11, 1987, Tehran-Iran
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Education & Qualifications:

- **2018 to present:**
  Postdoctoral member
  Physics School, IPM
  Concentrations: Machine learning (Vision), Data analysis, Computational cosmology, Observational Cosmology

- **2013-2018:**
  PhD student
  Physics, Shahid Beheshti University of Tehran
  Thesis: Clustering & Multiscale analysis of cosmological big data: Cosmic string detection in CMB

- **2011-2013:**
  Master of Science
  Shahid Beheshti University of Tehran
  Concentrations: CMB, Numerical methods and Simulation, Analytical methods to detection of non-Gaussianity
  Thesis: Investigation of primordial local non-Gaussian fluctuations on the CMB

- **2006-2011:**
  Bachelor of Science
  Physics, University of Science and Technology of Iran

Research interests:

- Data analysis and modeling
- Machine learning and deep learning (vision: segmentation, detection, registration; GAN, data visualization)
- Observational Cosmology
- Psycho-informatics, E-learning, adaptive learning

APPOINTMENTS:

- Visitor, Department of High Energy Physics , ICTP, Trieste, Italy (2015)
- Visitor, Center of Cosmology, Particle Physics and Phenomenology, Université catholique de Louvain (2015)
- Visitor, Department of Theoretical Physics, Université de Genève (2016-2017)
- Visitor, African Institute for Mathematical Sciences (AIMS), Cape Town, South Africa (2017)
- Visitor, South African Radio Astronomy Observatory (SARAO), Cape Town, South Africa (2017)

Grants and Fellowships:

- Excellence d'burcire, Université de Genève (2016)

Workshops, schools and Conferences Attended:

- Collaborative scientific software development and management of open source scientific packages, ICTP, Sharif university of technology (2018).
- Computational physics national conference, Shahid Beheshti university of Tehran (2018).
- Gravitation and cosmology national conference, Isfahan university (2018).
- SKA SET skills development workshop, African institute of mathematical sciences (2017).
- Swiss cosmo day, Basel, Switzerland (2017).
- Summer school and workshop on cosmology, ICTP, Trieste, Italy (2017).
- National conference in gravitation and cosmology, Shahid Beheshti university of Tehran (2017).
- Summer school and workshop on cosmology, ICTP, Trieste, Italy (2016).
- Workshop in computational neuroscience, Noshirvani university, Babol (2016).
- Gravitation and cosmology national conference, Sharif university of technology (2015).
- Gravitation and cosmology national conference, Sharif university of technology (2015).
- Statistical physics national conference, Zanjan University (2015).

- Summer school and workshop on cosmology, ICTP, Trieste, Italy (2014)
- Gravitation and cosmology national conference, University of Tehran (2014).
- Introduction to parallel computation cluster of SBU, Shahid Beheshti university of Tehran (2014).
- Physics national conference, University of Birjand (2013).
- Gravitation and cosmology national conference, Shahid Beheshti university of Tehran (2012).

Presentation:

- "Deep learning era", Baryons in Galaxies and Beyond, International Conference, IPM (2019)
- "Machines in the sky; looking for cosmic strings network", Computational physics national conference, Shahid Beheshti university of Tehran (2018).
- "DRAMA; a meta-algorithm for outlier detection", Computational physics national conference, Shahid Beheshti university of Tehran (2018).
- "Point source detection using deep learning", Gravitation and cosmology national conference, Isfahan university (2018).
- "Machine learning algorithm in the search of cosmic strings", Gravitation and cosmology national conference, Isfahan university (2018).
- "Blind non-Gaussianity detection using peak peak clustering statistics, Summer school on cosmology, ICTP, Trieste, Italy (2016)
- "Topological analysis of large scale structure using SDSS-III DR10", Gravitation and cosmology national conference, Sharif university of technology (2015).
- "Bias factor of anisotropic cosmological stochastic fields", Gravitation and cosmology national conference, Sharif university of technology (2015)
- "Two-point correlation function of Peaks in Planck data: Hemispherical Asymmetry", Gravitation and cosmology national conference, Sharif university of technology (2015).
- "Study of crossing statistics for Planck's data", Gravitation and cosmology national conference, Sharif university of technology (2015).
- "A comparison between Gaussian and non-Gaussian stochastic fields based on crossing", Statistical physics national conference, Zanjan university (2015).
- **"**Peak clustering and temperature fluctuations on the CMB map: Bias Factor", Summer school on cosmology, ICTP, Trieste, Italy (2014)
- "Multi-scaling analysis of CMB in the presence of Cosmic strings", Gravitation and cosmology national conference, University of Tehran (2014).
- "Simulation of non-Gaussian CMB maps and Detection by Curvelet analysis", Physics national conference, University of Birjand (2013).

- "Simulation of non-Gaussian CMB maps with an arbitrary power spectrum", Gravitation and cosmology national conference, Shahid Beheshti university of Tehran (2012).

Experience:

- Instructor and teacher, Spring 2019
  Data science workshop series, IPM

- Teacher, Fall 2018
  Python workshop, IPM

- Co-organizer and teacher, Winter 2018
  Machine Learning workshop, Shahid Beheshti university

- Teaching Assistant, Winter-Spring 2015
  Shahid Beheshti University of Tehran
  Course: Advanced statistical physics II for PhD and MS students

- Teaching Assistant, Fall 2014
  Shahid Beheshti University of Tehran
  Course: Computational Physics for PhD and MS students

- Teaching Assistant, Fall 2014
  Shahid Beheshti University of Tehran
  Course: Physics 101 lab

- Teaching Assistant, Fall 2014
  Shahid Beheshti University of Tehran
  Course: Advanced Cosmology for PhD students

- Teaching Assistant, Fall 2014
  Shahid Beheshti University of Tehran
  Course: Computational Physics for PhD and MS students

- Teaching Assistant, Winter-Spring 2014
  Shahid Beheshti University of Tehran
  Course: Advanced statistical physics II for PhD and MS students

- Teaching Assistant, Fall 2013
  Shahid Beheshti University of Tehran
  Course: Computational Physics for PhD and MS students

Research projects:

Publications:

- “Primordial anisotropies from cosmic strings during inflation", S Jazayeri, AV Sadr, H Firouzjahi. Physical Review D 96 (2), 023512.

- Exploring white matter microstructure and olfaction dysfunction in early parkinson disease: diffusion MRI reveals new insight, S Sobhani, F Rahmani, MH Aarabi, AV Sadr, Brain imaging and behavior, 1-10.

- A Multiscale pipeline for the search of string-induced CMB anisotropies, A Vafaei Sadr, SMS Movahed, M Farhang, C Ringeval, FR Bouchet, MNRAS 475 (1), 1010-1022.

- Cosmic String Detection with Tree-Based Machine Learning, AV Sadr, M Farhang, SMS Movahed, B Bassett, M Kunz, MNRAS 478 (1), 1132-1140.

- “Utility measures in Pediatric Temporary Health States Comparison of Prone Positioning Valuation through Five Assessment Tools", S Shahjouei, AV Sadr, S Khorasani, F Nejat, Z Habibi, AA Sari. Value in health regional issues 18, 97-105.

- “Health-Related Quality of Life of Pediatric Spinal Surgery Complications", S Shahjouei, AV Sadr, S Khorasani, F Nejat, Z Habibi, AA Sari. Value in health regional issues 18, 74-77.

- “DeepSource; Point Source Detection using Deep Learning”, A Vafaei Sadr, EE Vos, BA Bassett, Z Hosenie, N Oozeer, M Lochner. Monthly Notices of the Royal Astronomical Society 484 (2), 2793-2806

- “Eigen-reconstruction of Perturbations to the Primordial Tensor Power Spectrum”, M. Farhang, A. Vafaei Sadr. The Astrophysical Journal 871 (2).

In progress:

- “Two-point correlation function of Peaks in Planck data (DR2-2015)”, A. V. Sadr, SMS Movahed, R, Sheth, M Farhang.

- “Anomaly Detection via Dimensionality Reduction and Unsupervised Clustering”, A. V. Sadr, B. Basset, M. Lochner, M, Kunz.

- “Cosmic string simulation using Generative Adversarial Networks" A. V. Sadr, E. Montahaie, M. Farhang, Mahdieh Soleymani, S. M. S. Movahed.

- “Cosmic string detection using deep learning” A. V. Sadr, M. Farhang, S. M. S. Movahed.

- “Adaptive automated cosmic string detector on Planck data (DR3-2018)” A. V. Sadr, M. Farhang, Y. Fantaye, S. M. S. Movahed.

- RFI detection using deep neural networks. A. V. Sadr, BA Bassett, Z Hosenie, N Oozeer, Y. Fantaye.

Future Directions:

- Anomaly detection, deep neural networks
- Funding cosmological data science team in Iran
- ANN for cosmological simulations specifically modify gravity test
- Implementation of dark energy and modify gravity models in Gevolution
- Psycho-informatics, e-learning

Honors and Awards:

- 2013 - PhD scholarship: Ministry of Science, Research and Technology
- 2013 - Accepted in PhD without exam
- 2013 - In the top three graduated MSc students

Skills and Qualifications:

Public speaking, Teaching, Team building and leadership, Project supervision, Conflict resolution, Research and analysis, Familiar with Scrum process

Computing skills: Linux and Windows, Microsoft Office, LaTex, Fortran 90, C++, Bash-Scripting, Python (numpy, scipy, tensorflow, matplotlib, pandas, sk-Learn, openCV, healpy, beautiful soup, networkX, SNAP), Github[1], MySQL, Mathematica, Parallel programing (Open MP and familiar with MPI), Gnuplot, HEALPix, Gevolution, CAMB, Netlogo, familiar with MATLAB

Experiences:

- Juror in Tebyan students research festival (2013,2014)
- Juror in the tournament of Iran Physics cup (2014,2015,2016,2018)
- UX designer in Soroush Application (2016-2017)
- Data analyzer in Rahpouyan corporation for patent analysis project (2016-2017)
- Co-founder of kind-companion start-up (since 2016)

References:

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