Mehdi Rezaie

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Research Interests

Large-Scale Structure · Cosmic Microwave Background · Deep Learning · High-Performance Computing

Academic Employment and Titles

Ohio University, Graduate Research Assistant	2016-present
Ohio University, Graduate Teaching Assistant	2015-2016
Sharif University of Technology, Graduate Assistant	2012-2015
Asia Pacific Center for Theoretical Physics, Research Assistant	2014-2015
Institute for Research in Fundamental Sciences, Graduate Research Assistant	2013-2015

Education

Ph.D., Physics, Ohio University — in progress
Supervisor: Professor Hee-Jong Seo — expected March 2021
Dissertation: " Robust Measurements of the Large-Scale Clustering of Galaxies and Quasars"

M.Sc., Physics, Sharif University of Technology — 2015
B.Sc., Physics, *Magna Cum Laude*, Shahid Chamran University — 2012

Collaboration Membership

· SDSS-IV Extended Baryon Oscillation Spectroscopic Survey (eBOSS)

Galaxy Quasar Clustering working group (2017-present): I have primarily worked on the identification and mitigation of imaging systematics; helped with the quality assurance and tests of the large-scale clustering catalogs of emission-line galaxies and quasars. My recent contribution includes the preparation of the final sample of eBOSS quasars spanning the redshift range 0.8<z<3.5 for a precise measurement of primordial non-Gaussianity parameter $f_{\rm NL}$, and for studying the impact of systematics on baryon acoustic oscillations and redshift space distortions.

· Dark Energy Spectroscopic Instrument (DESI)

Galaxy Quasar Clustering and Imaging Validation working groups (2016-present): I have contributed to the analysis of the characterization and mitigation of foreground contaminants in the photometric catalogs of emission-line galaxies and luminous red galaxies from the DESI Legacy Imaging Surveys. I have also observed for a total of 17 nights at the Mayall 4-meter telescope on Kitt Peak in Arizona. I have been involved in various analyses of the large-scale clustering of simulated datasets (e.g., QUICKSURVEY in 2017 and UNIT in 2019). My recent involvement in DESI includes the preparation of the templates for studies of systematics and the characterization of sources of systematic error for various samples in the Survey Validation phase.

HONORS / AWARDS

Graduate Student of the Week, Ohio University Graduate Student Senate, Ohio University 2018
Ranked among top 5% in my class, Sharif University of Technology 2015
Six-month Research Assistantship at the Asia Pacific Center for Theoretical Physics, South Korea 2014
Ranked third among +8000 test-takers in the nationwide qualifying exam for M.Sc. in Physics 2012
Selected as distinguished undergraduate physics student for three consecutive years 2009-2012

SKILLS

Programming: Python, BASH, FORTRAN, C/C++, Git, MPI
Machine Learning: Neural Nets, Regression, Clustering, Dimensionality Reduction, Ensemble Methods
Software: LaTeX, Jupyter Notebook, Gnuplot, Tableau

TALKS / PRESENTATIONS (SELECTED)

"*Observational Systematics in the era of Big Astronomical Data*" 2020
Scientific Computation Symposium, Ohio University, Athens, OH

"*Robust Measurements of the eBOSS and DESI Galaxy and Quasar Clustering*" 2020
235th AAS, Honolulu, HI

"*Application of Deep Learning in Cosmology*" 2019
Cosmology seminar, Sharif University of Technology, Tehran, Iran

"*Probing Dark Energy with Galaxy Clustering and Deep Learning*" 2019
Rocky Mountain Advanced Computing Consortium, Boulder, CO

"*Emission Line Galaxies photometric weights with neural networks*" 2018
eBOSS collaboration meeting, Paris, France

"*Mitigation of photometric systematics in galaxy clustering*" 2018
DECam community science workshop, Tucson, AZ

"*Mitigating systematic errors in galaxy surveys with artificial intelligence*" 2018
Cosmology Lunch, CCAPP, the Ohio State University, Columbus, OH

"*Clustering results from quicksurvey*" 2017
DESI collaboration meeting, LBNL, Berkeley, CA

MENTORING / TEACHING (SELECTED)

Summer internship with Prof. Hee-Jong Seo
Grant Merz, "*Impact of observational systematics on BAO*" 2019
Ana Bucki-Lopez, "*Hyper-parameter tuning of feed-forward neural networks*" 2018
Science & Math for Upward Bound, Ohio University 2015-2017
Teacher of high school Physics, *Soroush* high school, Tehran, Iran 2013-2014
TA for Classical Electrodynamics, graduate course, Sharif University of Technology 2013-2014

COMMUNITY INVOLVEMENT (SELECTED)

Physics Open House: Demo of telescopes, Ohio University, OH Nov 9, 2019
Science Night: Demo of angular momentum, Nelsonville, OH Mar 1, 2018
State Science Day: Judging, Ohio State, Columbus, OH May 14, 2016
Kids On Campus: demo of conductivity, Trimble Middle School, OH Jan 13, 2016

Publications

15 Total / 2 First Author / 2 Second Author

First author papers

1. Rezaie, Mehdi, Hee-Jong Seo, Ashley J. Ross, and Razvan C. Bunescu. "*Improving galaxy clustering measurements with deep learning: analysis of the DECaLS DR7 data.*" Monthly Notices of the Royal Astronomical Society 495, no. 2 (2020): 1613-1640.
2. Rezaie, Mehdi et al. "*Primordial non-Gaussianity from the Completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey I: Catalog preparation and systematic mitigation*", in preparation.

Second author papers

3. Merz, Grant, **Mehdi Rezaie** et al. "*Testing the Effect of Systematic Error Mitigation Methods on the BAO signal in the eBOSS DR16 Catalogs*", in preparation.
4. Zarrouk, Pauline, **Mehdi Rezaie**, Anand Raichoor, Ashley J. Ross, Shadab Alam, Robert Blum, David Brookes et al. "*Baryon Acoustic Oscillations in the projected cross-correlation function between the eBOSS DR16 quasars and photometric galaxies from the DESI Legacy Imaging Surveys.*" MNRAS (2020), submitted (arXiv: 2009.02308).

Collaboration papers

5. Mueller, Eva et al. (incl. **Mehdi Rezaie**) "*The Completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey: Primordial non-Gaussianity in Fourier Space*" in preparation.
6. Gil-Marin, Hector, Julian E. Bautista, Romain Paviot, Mariana Vargas-Magana, Sylvain de la Torre, Sebastien Fromenteau, Shadab Alam et al. (incl. **Mehdi Rezaie**) "*The Completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey: measurement of the BAO and growth rate of structure of the luminous red galaxy sample from the anisotropic power spectrum between redshifts 0.6 and 1.0.*" Monthly Notices of the Royal Astronomical Society (2020).
7. Raichoor, Anand, Arnaud de Mattia, Ashley J. Ross, Cheng Zhao, Shadab Alam, Santiago Avila, Julian Bautista et al. (incl. **Mehdi Rezaie**) "*The completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey: Large-scale Structure Catalogues and Measurement of the isotropic BAO between redshift 0.6 and 1.1 for the Emission Line Galaxy Sample.*" MNRAS (2020), submitted (arXiv: 2007.09007).
8. de Mattia, Arnaud, Vanina Ruhlmann-Kleider, Anand Raichoor, Ashley J. Ross, Amelie Tamone, Cheng Zhao, Shadab Alam et al. (incl. **Mehdi Rezaie**) "*The Completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey: measurement of the BAO and growth rate of structure of the emission line galaxy sample from the anisotropic power spectrum between redshift 0.6 and 1.1.*" MNRAS (2020), submitted (arXiv: 2007.09008).
9. Ross, Ashley J., Julian Bautista, Rita Tojeiro, Shadab Alam, Stephen Bailey, Etienne Burtin, Johan Comparat et al. (incl. **Mehdi Rezaie**) "*The Completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey: Large-scale Structure Catalogs for Cosmological Analysis.*" Monthly Notices of the Royal Astronomical Society (2020).
10. Alam, Shadab, Marie Aubert, Santiago Avila, Christophe Balland, Julian E. Bautista, Matthew A. Bershady, Dmitry Bizyaev et al. (incl. **Mehdi Rezaie**) "*The Completed SDSS-IV extended Baryon Oscillation Spectroscopic Survey: Cosmological Implications*

from two Decades of Spectroscopic Surveys at the Apache Point observatory." Physical Review D (2020), submitted (arXiv: 2007.08991).

11. Ahumada, Romina, Carlos Allende Prieto, Andres Almeida, Friedrich Anders, Scott F. Anderson, Brett H. Andrews, Borja Anguiano et al. (incl. **Mehdi Rezaie**) "*The 16th data release of the Sloan Digital Sky Surveys: first release from the APOGEE-2 Southern Survey and full release of eBOSS Spectra.*" The Astrophysical Journal Supplement Series 249, no. 1 (2020): 3.
12. Dey, Arjun, David J. Schlegel, Dustin Lang, Robert Blum, Kaylan Burleigh, Xiaohui Fan, Joseph R. Findlay et al. (incl. **Mehdi Rezaie**) "*Overview of the DESI legacy imaging surveys.*" The Astronomical Journal 157, no. 5 (2019): 168.
13. Khaledi-Nasab, Ali, M. Sabaeian, **M. Rezaie**, and M. Mohammad-Rezaee. "*Linear and nonlinear tunable optical properties of intersubband transitions in GaN/AlN quantum dots in presence and absence of wetting layer.*" Journal of the European Optical Society-Rapid publications 9 (2014).

COLLABORATION WHITE PAPERS

14. Aghamousa, Amir, Jessica Aguilar, Steve Ahlen, Shadab Alam, Lori E. Allen, Carlos Allende Prieto, James Annis et al. (incl. **Mehdi Rezaie**) "*The DESI experiment part I: Science, targeting, and survey design.*" arXiv preprint arXiv:1611.00036 (2016).
15. Aghamousa, Amir, Jessica Aguilar, Steve Ahlen, Shadab Alam, Lori E. Allen, Carlos Allende Prieto, James Annis et al. (incl. **Mehdi Rezaie**) "*The DESI experiment part II: Instrument design.*" arXiv preprint arXiv:1611.00037 (2016).