

Michael (Misha, Mykhailo) Rashkovetskyi

PhD candidate in astrophysics (cosmology)
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Fields of interest

Large-scale structure: galaxy clustering; cosmic microwave background; Hubble tension; nature of dark energy; primordial Universe

Employment

- **The Ohio State University** Columbus, OH, USA
CCAPP (Center for Cosmology and AstroParticle Physics) Fellow 2025 – 2028
– From late July 2025

Education

- **Harvard University** Cambridge, MA, USA
Ph.D. in Astronomy 2020 – 2025
M.A. in Astronomy and Astrophysics, in passing 2022
– Thesis: *Enhancing the analysis of the large-scale structure of the Universe for cutting-edge cosmological surveys with two-point correlation function and beyond* (expected May 2025)
– Advisor: Prof. Daniel Eisenstein
– Center for Astrophysics | Harvard & Smithsonian
- **Tel Aviv University** Tel Aviv-Yafo, Israel
B.Sc. in Physics, Summa Cum Laude (GPA: 98/100) 2019 – 2020
– Raymond & Beverly Sackler School of Physics & Astronomy
– Advisor: Dr. Omer Bromberg
- **Moscow Institute of Physics and Technology** Dolgoprudny, Russia
B.Sc. in Applied Mathematics and Physics, unfinished 2015 – 2018
– Department of General and Applied Physics
– Advisor: Prof. Vasily Beskin
- **Richelieu Lyceum** Odesa, Ukraine
High school, specialization in physics 2010 – 2015

Research topics and publications

- Extracting more information from DESI galaxy clustering using moderate thermal Sunyaev-Zeldovich detections
– M. Rashkovetskyi, D. J. Eisenstein, *et al.*, “Clustering of DESI Luminous Red Galaxies selected by thermal Sunyaev-Zeldovich effect detection level from ACT+Planck y map”, *in preparation*, 2025a

- Semi-analytical, semi-empirical covariance matrices for DESI with RASCALC code
 - M. Rashkovetskyi, D. Forero-Sánchez, A. de Mattia, D. J. Eisenstein, N. Padmanabhan, H. Seo, A. J. Ross, *et al.*, “Semi-analytical covariance matrices for two-point correlation function for DESI 2024 data”, *J. Cosmology Astropart. Phys.* **2025** (2025)b, no. 1, 145, [arXiv:2404.03007](#)
 - M. Rashkovetskyi, D. J. Eisenstein, *et al.*, “Validation of semi-analytical, semi-empirical covariance matrices for two-point correlation function for early DESI data”, *MNRAS* **524** (2023), no. 3, 3894–3911, [arXiv:2306.06320](#)
- Contributions to DESI BAO analysis and clustering catalogs
 - J. Moon, D. Valcin, M. Rashkovetskyi, C. Saulder, *et al.*, “First detection of the BAO signal from early DESI data”, *MNRAS* **525** (2023), no. 4, 5406–5422, [arXiv:2304.08427](#)
 - D. Forero-Sánchez, M. Rashkovetskyi, O. Alves, A. de Mattia, S. Nadathur, P. Zarrouk, H. Gil-Marín, Z. Ding, J. Yu, U. Andrade, X. Chen, C. Garcia-Quintero, J. Mena-Fernández, *et al.*, “Analytical and EZmock covariance validation for the DESI 2024 results”, 2024, [arXiv:2411.12027](#)
 - DESI Collaboration *et al.*, “DESI 2024 III: Baryon Acoustic Oscillations from Galaxies and Quasars”, 2024a, [arXiv:2404.03000](#)
 - DESI Collaboration *et al.*, “DESI 2024 II: Sample Definitions, Characteristics, and Two-point Clustering Statistics”, 2024b, [arXiv:2411.12020](#)
 - DESI Collaboration *et al.*, “DESI 2024 V: Full-Shape Galaxy Clustering from Galaxies and Quasars”, 2024c, [arXiv:2411.12021](#)
 - DESI Collaboration *et al.*, “DESI 2024 VI: cosmological constraints from the measurements of baryon acoustic oscillations”, *J. Cosmology Astropart. Phys.* **2025** (2025), no. 2, 021, [arXiv:2404.03002](#)
 - DESI Collaboration *et al.*, “DESI 2024 VII: Cosmological Constraints from the Full-Shape Modeling of Clustering Measurements”, 2024, [arXiv:2411.12022](#)
 - DESI Collaboration *et al.*, “DESI 2024 IV: Baryon Acoustic Oscillations from the Lyman alpha forest”, *J. Cosmology Astropart. Phys.* **2025** (2025), no. 1, 124, [arXiv:2404.03001](#)
 - DESI Collaboration *et al.*, “Validation of the Scientific Program for the Dark Energy Spectroscopic Instrument”, *AJ* **167** (2024)a, no. 2, 62, [arXiv:2306.06307](#)
 - DESI Collaboration *et al.*, “The Early Data Release of the Dark Energy Spectroscopic Instrument”, *AJ* **168** (2024)b, no. 2, 58, [arXiv:2306.06308](#)
 - J. Mena-Fernández, C. Garcia-Quintero, S. Yuan, B. Hadzhiyska, O. Alves, M. Rashkovetskyi, H. Seo, N. Padmanabhan, S. Nadathur, C. Howlett, S. Alam, A. Rocher, A. J. Ross, E. Sanchez, M. Ishak, *et al.*, “HOD-Dependent Systematics for Luminous Red Galaxies in the DESI 2024 BAO Analysis”, *J. Cosmology Astropart. Phys.* **2025** (2025), no. 1, 133, [arXiv:2404.03008](#)
 - C. Garcia-Quintero, J. Mena-Fernández, A. Rocher, S. Yuan, B. Hadzhiyska, O. Alves, M. Rashkovetskyi, H. Seo, N. Padmanabhan, S. Nadathur, C. Howlett, M. Ishak, L. Medina-Varela, P. McDonald, A. J. Ross, Y. Xie, X. Chen, A. Bera, *et al.*, “HOD-dependent systematics in Emission Line Galaxies for the DESI 2024 BAO analysis”, *J. Cosmology Astropart. Phys.* **2025** (2025), no. 1, 132, [arXiv:2404.03009](#)
 - U. Andrade, J. Mena-Fernández, H. Awan, A. J. Ross, S. Brieden, J. Pan, A. de Mattia, *et al.*, “Validating the galaxy and quasar catalog-level blinding scheme for the DESI 2024 analysis”, *J. Cosmology Astropart. Phys.* **2025** (2025), no. 1, 128, [arXiv:2404.07282](#)
 - E. Paillas, Z. Ding, X. Chen, H. Seo, N. Padmanabhan, A. de Mattia, A. J. Ross, S. Nadathur, C. Howlett, *et al.*, “Optimal reconstruction of baryon acoustic oscillations for DESI 2024”, *J. Cosmology Astropart. Phys.* **2025** (2025), no. 1, 142, [arXiv:2404.03005](#)

- X. Chen, Z. Ding, E. Paillas, S. Nadathur, H. Seo, S. Chen, N. Padmanabhan, M. White, A. de Mattia, P. McDonald, A. J. Ross, A. Variu, A. Carnero Rosell, B. Hadzhiyska, M. M. S. Hanif, D. Forero-Sánchez, *et al.*, “Extensive analysis of reconstruction algorithms for DESI 2024 baryon acoustic oscillations”, 2024, [arXiv:2411.19738](#)
- J. Yu, A. J. Ross, A. Rocher, O. Alves, A. de Mattia, D. Forero-Sánchez, J.-P. Kneib, A. Krolewski, T. Lan, M. Rashkovetskyi, *et al.*, “ELG spectroscopic systematics analysis of the DESI Data Release 1”, *J. Cosmology Astropart. Phys.* **2025** (2025), no. 1, 126, [arXiv:2405.16657](#)
- A. Pérez-Fernández, L. Medina-Varela, R. Ruggeri, M. Vargas-Magaña, H. Seo, N. Padmanabhan, M. Ishak, *et al.*, “Fiducial-cosmology-dependent systematics for the DESI 2024 BAO analysis”, *J. Cosmology Astropart. Phys.* **2025** (2025), no. 1, 144, [arXiv:2406.06085](#)
- S. F. Chen, C. Howlett, M. White, P. McDonald, A. J. Ross, H. J. Seo, N. Padmanabhan, *et al.*, “Baryon acoustic oscillation theory and modelling systematics for the DESI 2024 results”, *MNRAS* **534** (2024), no. 1, 544–574, [arXiv:2402.14070](#)
- Inhomogeneous recombination relieving Hubble tension
 - M. Rashkovetskyi, J. B. Muñoz, D. J. Eisenstein, and C. Dvorkin, “Small-scale clumping at recombination and the Hubble tension”, *Phys. Rev. D* **104** (2021), no. 10, 103517, [arXiv:2108.02747](#)
- The dynamics of highly magnetized jets propagating in the medium
- Orthogonal radiopulsars and their statistics
 - E. M. Novoselov, V. S. Beskin, A. K. Galishnikova, M. M. Rashkovetskyi, and A. V. Biryukov, “Orthogonal pulsars as a key test for pulsar evolution”, *MNRAS* **494** (2020), no. 3, 3899–3911, [arXiv:2004.03211](#)
- Pulsar losses mechanisms
 - V. S. Beskin, A. K. Galishnikova, E. M. Novoselov, A. A. Philippov, and M. M. Rashkovetskyi, “So how do radio pulsars slow-down?”, in “*Journal of Physics Conference Series*”, vol. 932, p. 012012. 2017

Teaching experience

- **Astronomy 200: Radiative Processes in Astrophysics** Harvard University
Teaching Fellow *Fall 2023*
- **Astronomy 201: Astrophysical Fluids & Plasmas** Harvard University
Teaching Fellow *Spring 2023*
- **Astronomy 130: Introduction to Cosmology** Harvard College
Teaching Fellow *Fall 2022*

Public presentations

- **APS April meeting (contributed talk)** Minneapolis, MN, USA
First Detection of the BAO Signal from Early DESI Data *April 18, 2023*

- **Cosmology from Home 2023 (contributed talk co-presenter)** online
First Detection of the BAO Signal from Early DESI Data (on YouTube) July 4, 2023
- **ITC Luncheon (talk)** Cambridge, MA, USA
Semi-analytic covariance matrices for 2PCF of DESI galaxies (on YouTube) September 28, 2023
- **IX Essential Cosmology for the Next Generation (talk)** Playa del Carmen, Mexico
Clustering of DESI galaxies selected based on ACT thermal SZ map December 5, 2024
- **Frontiers in Cosmology and Gravitational Physics (poster)** Portsmouth, UK
Fast semi-analytical covariance matrices for 2PCF of galaxies and quasars May 20-23, 2024
- **VIII Essential Cosmology for the Next Generation (poster)** Playa del Carmen, Mexico
RascalC: Empirical 2PCF Covariance Matrices without Mocks Nov 30 - Dec 3, 2022
- **CMB-S4 Summer Meeting (poster)** online
Small-scale Clumping at Recombination and the Hubble Tension August 9-13, 2021
- **CMB-S4 Spring Meeting (poster)** online
Hubble Tension with Small-Scale Clumping March 8-12, 2021
- **Physics of Neutron Stars - 2017 (poster)** Saint-Petersburg, Russia
On the light-curve anomalies of radio pulsars July 10-14, 2017

Other conferences and schools

- **DESI December** Cancún, Mexico
DESI Collaboration December 10-13, 2024
- **DESI July** Marseille, France
DESI Collaboration July 9-12, 2024
- **Fundamental Physics from Future Spectroscopic Surveys** Berkeley, CA, USA
Lawrence Berkeley National Laboratory May 6-8, 2024
- **DESI December** Waikoloa, HI, USA
DESI Collaboration December 11-14, 2023
- **DESI July** Durham, UK
DESI Collaboration July 17-21, 2023
- **Michigan Cosmology Summer School** Ann Arbor, MI, USA
University of Michigan June 5-9, 2023
- **DESI December** Cancún, Mexico
DESI Collaboration December 5-9, 2022
- **DESI June** Berkeley, CA, USA
DESI Collaboration June 21-24, 2022
- **15th School of Modern Astrophysics** Dolgoprudny, Russia
Moscow Institute of Physics and Technology July 1-12, 2019
- **13th School of Modern Astrophysics** Dolgoprudny, Russia
Moscow Institute of Physics and Technology July 3-21, 2017
- **International School of Subnuclear Physics - 2017** Erice, Italy
"Ettore Majorana" Foundation and Centre for Scientific Culture June 14-23, 2017
- **International school on particles, fields and strings** Moscow, Russia
National Research University "High School of Economics" April 17-24, 2017

- **Astronomical practice**
Special Astrophysical Observatory

Nizhniy Arkhyz, Russia
June 25 – July 2, 2016

Awards, grants and honors

Dean’s Certificate in Recognition of Outstanding Academic Achievements (TAU) 2019–2020
 Stipend for excellent students of MIPT in the name of A.Abramov 2016–2017
 International Physics Olympiad, bronze medal Mumbai, 2015
 International Physics Olympiad, silver medal Astana, 2014

Selected open source contributions (<https://github.com/misharash>)

- RASCALC C++ & Python
Fast semi-analytic covariance matrices library/program 2022-2024
- RASCALC **scripts** Python
DESI covariance matrix pipeline for 2-point correlation function (scripts) 2024
- PYCORR Python
Library for 2-point correlation function estimation 2024

Outreach

- **DESI redshift-space distortions animation (co-author)** with Claire Lamman
Used in the press-release and following news articles Nov 19, 2024

Languages

- **Russian: native**
- **Ukrainian: fluent**
- **English: advanced**
- **Hebrew: advanced**
- **German: intermediate**