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 and Astrophysics — *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** January (2025)b 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** September (2023) 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** November (2023) 5406–5422, arXiv:2304.08427
  - D. Forero-Sánchez, M. Rashkovetskyi, O. Alves, *et al.*, "Analytical and EZmock covariance validation for the DESI 2024 results", J. Cosmology Astropart. Phys. **2025** April (2025) 055, arXiv:2411.12027
  - DESI Collaboration *et al.*, "DESI DR2 Results II: Measurements of Baryon Acoustic Oscillations and Cosmological Constraints", March 2025a, arXiv:2503.14738
  - DESI Collaboration *et al.*, "DESI 2024 III: baryon acoustic oscillations from galaxies and quasars", J. Cosmology Astropart. Phys. **2025** April (2025)b 012, arXiv:2404.03000
  - DESI Collaboration *et al.*, "DESI 2024 II: Sample Definitions, Characteristics, and Two-point Clustering Statistics", November 2024a, arXiv:2411.12020
  - DESI Collaboration *et al.*, "DESI 2024 V: Full-Shape Galaxy Clustering from Galaxies and Quasars", November 2024b, arXiv:2411.12021
  - DESI Collaboration *et al.*, "DESI 2024 VI: cosmological constraints from the measurements of baryon acoustic oscillations", J. Cosmology Astropart. Phys. **2025** February (2025) 021, arXiv:2404.03002
  - DESI Collaboration *et al.*, "DESI 2024 VII: Cosmological Constraints from the Full-Shape Modeling of Clustering Measurements", November 2024, arXiv:2411.12022
  - DESI Collaboration *et al.*, "Data Release 1 of the Dark Energy Spectroscopic Instrument", March 2025, arXiv:2503.14745
  - DESI Collaboration *et al.*, "Validation of the Scientific Program for the Dark Energy Spectroscopic Instrument", AJ **167** February (2024)a 62, arXiv:2306.06307
  - DESI Collaboration *et al.*, "The Early Data Release of the Dark Energy Spectroscopic Instrument", AJ **168** August (2024)b 58, arXiv:2306.06308
  - DESI Collaboration *et al.*, "DESI DR2 Results I: Baryon Acoustic Oscillations from the Lyman Alpha Forest", March 2025a, arXiv:2503.14739
  - DESI Collaboration *et al.*, "DESI 2024 IV: Baryon Acoustic Oscillations from the Lyman alpha forest", J. Cosmology Astropart. Phys. **2025** January (2025)b 124, arXiv:2404.03001
  - U. Andrade, E. Paillas, J. Mena-Fernández, Q. Li, A. J. Ross, S. Nadathur, M. Rashkovetskyi, A. Pérez-Fernández, H. Seo, N. Sanders, O. Alves, X. Chen, N. Deiosso, A. de Mattia, M. White, *et al.*, "Validation of the DESI DR2 Measurements of Baryon Acoustic Oscillations from Galaxies and Quasars", March 2025, arXiv:2503.14742
  - 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** January (2025) 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** January (2025) 132, arXiv:2404.03009
  - K. Lodha, R. Calderon, W. L. Matthewson, A. Shafieloo, M. Ishak, J. Pan, C. Garcia-Quintero, D. Huterer, G. Valogiannis, L. A. Ureña-López, N. V. Kamble, D. Parkinson, A. G. Kim, G. B. Zhao, J. L. Cervantes-Cota, J. Rohlf, F. Lozano-Rodríguez, J. O. Román-Herrera, *et al.*, "Extended Dark Energy analysis using DESI DR2 BAO measurements", March 2025, arXiv:2503.14743
  - W. Elbers, A. Aviles, H. E. Noriega, D. Chebat, A. Menegas, C. S. Frenk, C. Garcia-Quintero, D. Gonzalez, M. Ishak, O. Lahav, K. Naidoo, G. Niz, C. Yèche, *et al.*, "Constraints on Neutrino Physics from DESI DR2 BAO and DR1 Full Shape", March 2025, arXiv:2503.14744
  - 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** January (2025) 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** January (2025) 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", November 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** January (2025) 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** January (2025) 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** October (2024) 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** November (2021) 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** April (2020) 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. December 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*
- **APS Global Physics Summit (contributed talk)** — Anaheim, CA, USA
  Clustering of DESI LRG selected based on ACT DR6 + Planck tSZ map — *March 18, 2025*
- **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 Insitute of Physics and Technology — *July 1-12, 2019*
- **13th School of Modern Astrophysics** — Dolgoprudny, Russia
  Moscow Insitute 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** — Nizhniy Arkhyz, Russia
  Special Astrophysical Observatory — *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 animations** — with Claire Lamman+
  Early version used in the press-release and following news articles — *Nov 19, 2024 – Mar 2, 2025*

Languages

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