

# 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, 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”, November 2024, [arXiv:2411.12027](#)
  - DESI Collaboration *et al.*, “DESI DR2 Results II: Measurements of Baryon Acoustic Oscillations and Cosmological Constraints”, March 2025, [arXiv:2503.14738](#)
  - DESI Collaboration *et al.*, “DESI 2024 III: Baryon Acoustic Oscillations from Galaxies and Quasars”, April 2024a, [arXiv:2404.03000](#)
  - DESI Collaboration *et al.*, “DESI 2024 II: Sample Definitions, Characteristics, and Two-point Clustering Statistics”, November 2024b, [arXiv:2411.12020](#)
  - DESI Collaboration *et al.*, “DESI 2024 V: Full-Shape Galaxy Clustering from Galaxies and Quasars”, November 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** 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 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** 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