

TANVEER KARIM

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POSITIONS

Nov 2023 - Present	Faculty of Arts & Sciences Fellow	University of Toronto
Summer 2023	Postdoctoral Fellow	Harvard University

EDUCATION

May 2023	PhD in Astrophysics	Harvard University
2019	AM in Astrophysics	Harvard University
2017	BS in Physics & Astronomy	University of Rochester

ASTROPHYSICS RESEARCH EXPERIENCES

2023 – Present University of Toronto

As a Arts & Sciences Fellow, and a member of the Dark Energy Spectroscopic Instrument (DESI) collaboration, I am currently participating the following projects:

- Leading the cross-correlation analysis of Year 1 DESI emission-line galaxies (ELGs) sample and the Atacama Cosmology Telescope (ACT) CMB lensing map to constrain cosmological models
- Investigating the impact of stellar streams and dust maps on ELG angular clustering

2017 – 2023 Harvard University

Dissertation: Precision Cosmology from Emission-Line Galaxies
Committee: Daniel Eisenstein (Advisor), Douglas Finkbeiner (Chair), Cora Dvorkin, John Kovac

As a National Science Foundation (NSF) Graduate Research Fellow working with Dr. Daniel Eisenstein and Dr. Douglas Finkbeiner, I participated in the DESI collaboration to:

- lead the cross-correlation analysis between Legacy Surveys ELGs and Planck CMB lensing maps to constrain cosmological models
- quantify and develop mitigation procedures for observational systematics affecting cross-correlation measurements
- developed python package of GSPICE, a Gaussian Process-like algorithm that produces data-driven spectral templates
- validated empirically ELG target selection algorithms to assist in deciding the final DESI ELG target selection

2016 – 2017

Maria Mitchell Observatory

As a collaborator working with Dr. Andrew Fox, I led a project on the Fermi Bubbles, a giant plasma lobe at the center of the Milky Way, to identify new high-velocity clouds (HVCs) and analyzed their kinematics to detect a velocity gradient relationship between the Bubbles and the HVCs. I also have assisted in additional projects led by my collaborators, including a recent Nature Astronomy result showing that the HVCs are a heterogeneous population having dual origins.

2013 – 2016

University of Rochester

As a collaborator working with Dr. Eric Mamajek, I led a project on the Galactic Coordinate System where I proposed a new definition of the Galactic Coordinate System and developed a model to measure solar height relative to the Milky Way plane, one of the most well-accepted and cited solar height measurements in the literature.

2015 – 2016

Vanderbilt University & Cerro Tololo Inter-American Observatory, Chile

As a collaborator with Dr. Cesar Briceño and Dr. Keivan Stassun, I led a project on the T-Tauri star population in the Orion OB1 Association to measure rotation periods of 2000 stars using periodogram and wavelet algorithms and verified theoretical models relating stellar angular momentum evolution to stellar age.

SELECTED HONORS AND AWARDS

2023 – Present

University of Toronto Arts & Sciences Postdoctoral Fellowship: awarded to outstanding recent doctoral students advanced training in their field of study

- 2023 Kavli Fellow: awarded to a selected cohort consisting of recipients of prestigious fellowships, awards, and other honors, as well as from nominations by the National Academy of Sciences members and other participants
- 2023 Barbara Bell Dissertation Fellowship: awarded to two graduating Ph.D. students annually who play key roles in research and undergraduate education at Harvard
- 2022 Ford Foundation Dissertation Fellowship Alternate: highly competitive national dissertation year fellowship awarded to ~ 5% of the applicants
- 2019 National Science Foundation Graduate Research Fellow
- 2015 – 2017 Take Five Scholar: selective tuition-free one-year scholarship provided to undergraduates at the University of Rochester to pursue a topic outside the student’s major. Topic: "Muslim Characters in Russian Literature"
- 2016 Goldwater Scholar: highly selective federal scholarship awarded to approximately 200 students annually who show exceptional promise of becoming the next generation of research leaders in STEM fields
- 2015 National Society of Physics Students Leadership Scholarship: awarded annually to 12 students who exhibit high scholarship performance and exhibit the potential and intention for continued scholastic development in physics
- 2015, 2016 President’s Award for Undergraduate Research: the highest undergraduate research award at the University of Rochester
- 2013 – 2016 Continuing Student Scholarship: highly selective scholarship awarded to approximately 30 students annually to recognize the outstanding achievements of University of Rochester students

SELECTED SERVICE, LEADERSHIP & OUTREACH EXPERIENCES

- 2020 – 2023 RESPOND Crisis Translation: As the project manager of the Bangla translation team, I manage a team of 15 volunteers to offer pro bono translation services to immigrants, refugees, and asylum seekers as well as immigration-based non-profits.

- 2023 Harvard University Department of Astronomy Admissions Committee: As the elected student representative, I read applications of the astronomy PhD program applicants and deliberated with members to select the Class of 2023.
- 2021 – 2022 DESI DEI Committee: As a member of the Diversity, Equity, and Inclusion (DEI) committee of the Dark Energy Spectroscopic Instrument (DESI) Collaboration, I help organize DEI-related activities in the collaboration, specifically focusing on designing and analyzing demographic and climate survey questionnaire sent out the collaboration at-large.
- 2021 Center for Astrophysics Director Selection Committee: As a member of the student working group within the selection committee, I helped facilitate discussion among the students to prepare an interview questionnaire and served as an interviewer.
- 2019 – 2021 DESI Outreach Committee: As a member of the DESI outreach committee, I helped develop the curriculum and organize events to offer a hands-on tutorial on how to do cosmology research for high school students and I also help with translating the DESI website into Bangla.
- 2018 – 2019 Equity & Inclusion Journal Club, Harvard University: As an organizer, I maintained the website of the journal club and helped identify speakers to give talks on various aspects of diversity and identity that pertain to astronomy and astrophysics as a field as well as the broader society.
- 2015 – 2017 Hiring Committee Member, Rush Rhees Library: As a long-term student librarian of the Physics, Optics and Astronomy Library at the University of Rochester, I served as a voting member in the hiring committees for the Engineering and the Physics, Optics and Astronomy libraries.

TEACHING

- Spr 2022 *Life as a Planetary Phenomenon*, Harvard University, Teaching Fellow & Guest Lecturer
- Spr 2021 *Prediction: The Past & The Present of the Future*, Harvard University, Teaching Fellow
- Sum 2019 *Public Speaking for Scientists*, Banneker Institute, Harvard University, Course Instructor
- Spr 2019 *Life as a Planetary Phenomenon*, Harvard University, Teaching Fellow
- Sum 2019 *Celestial Coordinate System*, Banneker Institute, Harvard University, Course Instructor

Spr 2016	<i>Relativity, Black Holes and the Big Bang</i> , University of Rochester, Teaching Assistant
Spr 2015	<i>Mechanics for Engineers (Self-Paced)</i> , University of Rochester, Teaching Assistant
Spr 2014	<i>Cosmic Origins of Life</i> , University of Rochester, Teaching Assistant
Fal 2013	<i>General Physics I</i> , University of Rochester, Teaching Assistant

MENTORING

2022	Ryhan Mortuza, mentorship on career and research practices through the SAO-UMass Latino Initiative Program at the Center for Astrophysics
2022	Raisha Islam, mentorship on career through the University of Oxford Careers Service Pro-Mentor Programme
2018 - 2021	assisted ~ 10 students with graduate school applications by providing detailed essay feedback and helping build a list of programs to apply to
2012 - 2018	Bangladeshis Beyond Border, co-administered Facebook group with 124,000 members and provided guidance to undergraduate applicants from Bangladesh

ADDITIONAL RESEARCH EXPERIENCES

2016 – 2017	Stanford US-Russia Forum As a US delegate, I participated in the Stanford US-Russia Forum, a Stanford University-led initiative dedicated to fostering a better relationship between the US and Russia, where I investigated issues that hinder scientific collaboration between the two countries, identified new promising research areas for collaboration, and presented findings to Russian and US policymakers in Moscow, Russia and in Stanford, CA respectively.
2016 – 2017	University of Rochester As a Take Five Scholar, I conducted a year-long independent study on the topic <i>Muslim Characters in Russian Literature</i> under Dr. John Givens where I extensively read and critically analyzed writings of Muslim, Caucasian, and Russian writers from the Russian Empire and Soviet Union, focusing on the depiction of Muslim characters and wrote a senior thesis titled <i>From Circassia to Chechnya: Depiction of the Caucasus through the lens of Tolstoy</i> , analyzing how Tolstoy's portrayal of the Caucasian War contrasted with that of Caucasian writers of the same period.

SELECTED TALKS

Invited

6. **Karim, T.** "Constraining Cosmology with Emission-Line Galaxies", Yale Cosmology Seminar 2023.
5. **Karim, T.** "Measuring the Growth of the Universe with Multiple Datasets", Maria Mitchell Association Science Speaker Series, talk, 2023.
4. **Karim, T.**, "Model Minority myth and its impact on policymaking: A case study on Asian-Americans", European Astronomical Society Early Career Astronomers Session, 2022.
3. **Karim, T.**, et al., "Cross-correlation of Planck CMB lensing with DESI-like emission-line galaxies in Legacy Surveys", DESI Collaboration Meeting Plenary Talk, 2021.
2. **Karim, T.**, et al., "Angular cross-correlation of Planck CMB lensing with DESI-like emission-line galaxies in Legacy Surveys", Carnegie Mellon Cosmology Seminar, 2021.
1. **Karim, T.**, "Unraveling the Universe with Spectroscopy and Big Data", Maria Mitchell Association Science Speaker Series, 2021.

Contributed

2. **Karim, T.** "Precision Cosmology with Emission-Line Galaxies", AAS Winter Meeting, talk, 2024.
1. **Karim, T.** et al., "Cosmological Constraints from Cross-Correlation of Planck CMB Lensing and DESI-like Emission Line Galaxies in the Legacy Surveys", APS April Meeting, talk, 2022.

ADDITIONAL INTERESTS

Languages

I am passionate about language justice and access to education and resources regardless of anyone's linguistic capabilities, exemplified by my involvement in organizations such as RESPOND. I also personally enjoy learning languages with different levels of proficiency in six languages – English (native), Bangla (native), Russian (intermediate B1 level), Hindi/Urdu (conversational), and Persian (beginner A1/A2 level).

JOURNAL PUBLICATIONS

13. **Karim, T.**, et al., "Cross-Correlation between DESI-like Emission Line Galaxies in the Legacy Surveys and Planck CMB Lensing", expected submission February 2024.
12. **Karim, T.**, et al., "On the Impact of Observational Systematics on Cosmological Parameter Inference", *MNRAS*, 2023, 525, 311 – 324.
11. Myers, A., et al., "The Target Selection Pipeline for the Dark Energy Spectroscopic Instrument", *AJ*, 2023, 165, 22.
10. Raichoor, A., et al., "Target Selection and Validation of DESI Emission Line Galaxies", *AJ*, 2023, 165, 126.
9. Ashley, T., et al., "Diverse metallicities of Fermi bubble clouds indicate dual origins in the disk and halo", *Nature Astronomy* Vol. 6, 968 - 975, 2022.
8. Abareshi, B., et al., "Overview of the Instrumentation for the Dark Energy Spectroscopic Instrument", *AJ*, 164, 62, 2022.
7. Raichoor, A., et al., "Preliminary Target Selection for the DESI Emission Line Galaxy (ELG) Sample", *RNAAS* 4, 180, 2020.
6. **Karim, T.**, et al., "Validation of Emission-Line Galaxies Target Selection Algorithms for the Dark Energy Spectroscopic Survey Using the MMT Binospec", *MNRAS* 497, 4587, 2020.
5. Ashley, T. et al., "Mapping Outflowing Gas in the Fermi Bubbles: A UV Absorption Survey of the Galactic Nuclear Wind", *ApJ*, 898, 128, 2020.
4. **Karim, T.**, et al., "Probing the Southern Fermi Bubble in Ultraviolet Absorption Using Distant AGNs", *ApJ* 860, 98, 2018.
3. **Karim T.** & Mamajek, "Revised Geometric Estimates of the North Galactic Pole and the Sun's Height Above the Galactic Midplane", *MNRAS*, 465, 472, 2017.
2. **Karim, T.**, Paramanova, K., Stepanova, D., "The Hidden Potential of University-level Science and Technology Collaborations between the US and Russia", *The Stanford US-Russia Forum Research Journal*, Vol. VIII, 1, 2017.
1. **Karim, T.**, et al., "The Rotation Period Distributions of 4-10 Myr T Tauri Stars in Orion OB1: New Constraints on Pre-main-sequence Angular Momentum Evolution", *AJ* 152, 198, 2016.