Samir Kušmić

Curriculum Vitae

I am a doctorate that got his PhD at New Mexico State University studying astronomy. My interests are in galaxy populations and galactic evolution, and their cosmological implications, during the Epoch of Reionization. In my research we are using cosmological simulations to understand the properties of the IGM and CGM at Reionization. my dissertation project was to look at the relation between the galactic population, their CGM, and the IGM throughout Reionization and develop intuition on what certain quantity with observables corresponds to certain processes and properties.

UAT Keywords: Reionization (1383), Interstellar medium (847), Circumgalactic medium (1879)

Education

2023-2025 **New Mexico State University**, *Doctor of Philosophy*, Astronomy.

2020-2023 **New Mexico State University**, *Masters of Science*, Astronomy.

2015–2019 **University of Louisville**, *Bachelor of Science*, Major: Physics with Astrophysics concentration, Minor: Mathematics.
summa cum laude

Research Projects

2023–Present **Enrichment between the ISM and CGM During Reionization**, *New Mexico State University*, Astronomy Department, Dissertation Project.
We use the *Technicolor Dawn* simulation alongside radiative transfer code *Cloudy* to generate synthetic emission spectra of the galactic population, understand the faults in our models compared to observational results, and study the metal enrichment and their observables between the ISM and CGM to track the feedback history during Reionization and further test our feedback models.

2020–2024 **IGM and CGM During Reionization**, *New Mexico State University*, Astronomy Department.
We use the *Technicolor Dawn* simulation to study the state of the IGM and CGM throughout Reionization. We want to udnerstand how the structure of each element and its ionization was distributed and can it be observationally confirmed.

***ORCiD**: 0000-0002-0761-1985 kusmic.github.io*
samirkusmic@gmail.com

2019–2020 **Gamma-Ray Emissions from Galaxies: Understanding Properties with Energy**, *Max Planck Institute for Nuclear Physics, Fulbright Commission of Germany*.
We explore whether the observed Gamma ray flux is explained by complementary observations in optical, UV, and IR with the goal of constraining models of high-energy emission. This project is in indefinite hiatus due to COVID-19.

2018 **Morphological Parameters of Galaxies at** $z \sim 8$, *University of Louisville*, Department of Physics and Astronomy.
We looked at high-redshift galaxies and applied scale-invariant morphology analysis. We attempt to see if there are any trends and if further morphological application is viable for high-redshift surveys. We see these high-redshift galaxies do appear to fall under a potential category. Research presented at AAS 233rd as a poster.

2017 **Measuring Sizes & Shapes of Galaxies.**, *University of Louisville*, Department of Physics and Astronomy.
We looked at morphologies and metrics of galaxies in the CANDELS field in order to understand well Sorce Extractor fits. With our research, we try to see if Source Extractor is a good first look for the new, larger surveys that we expect in the coming decade. Research presented at AAS 231st as a poster, ACC Meeting of the Minds, and CUWiP all as posters.

Extracurricular

2024–Present **Astronomy Graduate Student Organization**, *New Mexico State University*, President.
I led the students of the department and assisted in the departmental administration. I provided updates to all students at a regular meeting every two weeks during the semesters and attended faculty meetings to voice student issues and discuss them. I also interfaced with other university organizations as the student representative of the Astronomy department.

2022–Present **Galaxy Group Meetings**, *New Mexico State University*.
I helped re-found the galaxy group meetings for the department: these are meetings where all faculty, students, and staff interested in Galactic and/or extragalactic research meet to discuss new, important papers; discuss research in breakout groups to go through recent results, fix issues, or create new ideas; and discuss topics of interest within the group to further everyone's understanding. I also assisted as coordinator, where I remind everyone about meetings and the upcoming agenda, and help the meetings flow.

2022–2023 **Astronomy Graduate Student Organization**, *New Mexico State University*, Treasurer.
I attend the Graduate Student Council meetings held bi-weekly and then report back to the Astronomy Graduate Student Organization's following meetings in order to update the astronomy graduate students about upcoming events, important votes, and updates to the Council's conference travel reimbursement budget. Additionally, I have learned and assist with applications for travel reimbursement applications sent to the Associated Students of NMSU.

2021–2022 **Astronomy Graduate Student Organization**, *New Mexico State University*, Held Office of – Webmaster.
I maintained the AGSO web pages to make sure that the presented information is up-to-date and relevant to all students within the department. Additionally, I maintained the directory pages for all graduate students whenever they need to be updated with new information, e.g. paper publications, conference attendance, research summary, etc.

2017–2019 **Society of Women in Physics and Astronomy**, *University of Louisville*, Held Office of – Chamberlain (Treasurer).
I secured continued funding for two years" or "expanded funding by reaching out to alumni and government resources. I assisted in preparing students to attend the CUWiP conferences during my time of service and assisted in preparing the Science Day field trip for middle-school students in March of 2019, which included organizing the event and volunteering to prepare and present for the astronomy booth during the event.

2017–2018 **Society of Physics Students**, *University of Louisville*, Held Office of – Social Officer.
I organized social events for fellow students to hang out and get to know each other. I also helped organize the chapter's lab visits and the solar eclipse viewing event in 2017.

Outreach

April 8, 2024 **Total Eclipse Viewing**.
I assisted in the ushering and helping the viewing of the partial eclipse on NMSU main campus by the Astronomy building. This included getting people solar viewing filters until we ran out and pointing a solar telescope at the eclipse and keeping track of it in the telescope.

February 15, 2024 **School Visit (Mission Academy)**.
We set up a meteorite booth and sunspotters with solar telescopes for Sun viewing. I assisted in running the solar viewing, which included ushering the children, tracking the Sun in the telescopes, and providing interesting information.

June 20, 2023 **Campus Visit hosted by TRIO Upward Bound**.
This was a multi-demonstration event. We set up a lunar phase demonstration using Oreos to show how the lunar phases are created. We set up a meteorite booth, and sunspotters with solar telescopes. I assisted mainly with the solar viewing. We also hosted a small Q&A panel for the students to learn what it is like to go into astronomy from undergraduate into potential future steps beyond graduate school.

May 4, 2023 **May the Fourth Be With You! @ Berino Elementary**.
We set up a meteorite booth and a bedsheet gravity demonstration. I assisted mainly with the gravity demonstration. We asked for the childrens assistance and showed hands-on how gravity works for planets: this includes orbiting, binaries, and mass differences.

April 20, 2023 **STEM Family Night @ Cesar Chavez Elementary**.
We set up a meteorite booth and sunspotters with solar telescopes for Sun viewing. I assisted in running the solar viewing, which included ushering the children, tracking the Sun in the telescopes, and providing interesting information.

2022–2023 **NMSU Night at the Museums**.
I participated in this event twice for April 29, 2022 and Spetember 20, 2023. This was a university-sponsored event open to the whole public. We held a booth demonstrating various meteorites, handed printouts of the that night's sky and a tour of what each object is, and telescopes pointed to various astronomical objects; I have assisted in the latter two most. On the second time this event happened, we included a portable planetarium showing slides of various astronomical images and developed demonstrations based on young stars, nebulae, and the Milky Way; I was involved with that mainly.

Awards and Achievements

2025 **Outstanding Graduate Student, New Mexico State University College of Arts & Sciences:** Given to me for my efforts in research and teaching as a graduate assistant.

2022 **Merit-Based Enhancement Award, New Mexico State University:** Given to me for my efforts in research and teaching as a graduate assistant.

2018 **William Marshal Bullitt Scholar, University of Louisville:** Given to astronomy students with an exceptional undergraduate in studies and research.

2018 **Bullitt Best Paper Award in Astronomy, University of Louisville:** annual award for best astronomy paper in the university. My paper was my research poster over my work with Dr. Holwerda: Morphological Parameters of Galaxies at $z \sim 8$ in the BoRG and CANDELS Survey.

2018 **Joined ΣΠΣ (Sigma Pi Sigma) Physics Honors Society**

2018 **James T. Drautman Award Co-Recipient, University of Louisville Department of Physics and Astronomy:** Annual award given to excellent sophomores and juniors of the department.

2017 **Bullitt Best Paper Award in Astronomy Co-Recipient, University of Louisville:** annual award for best astronomy paper in the university. My paper was my research poster over my work with Dr. Holwerda: Measuring the Sizes & Shapes of Galaxies.

2016–2018 **Academic Commonwealth Scholarship, University of Louisville:** Continual financial award of 2800 US$ for as long as I achieve a GPA of a 3.0

2015–2016 **Trustees Scholar, University of Louisville:** Awarded one semester of financial aid of 2000 US$

2015–2019 **University of Louisville College of Arts and Sciences Dean's List**

First-Author Publications

2024 **Galaxy-Absorber Association in the Epoch of Reionization: Galactic Population Luminosity Distribution for Different Absorbers at 10$\geq z \geq$5.5**, eprint arXiv:2405.00177

2022 **Assuming Ionization Equilibrium and the Impact on the Lyα Forest Power Spectrum during the End of Reionization at 8 $\geq z \geq$ 5**, 2022ApJ...931...46K

2019 **Morphological Parameters of Galaxies at z $\sim$ 8 in the BoRG and CANDELS Survey**, 2019RNAAS...3..134K

2019 **Morphometric analysis and application in galaxy evolution and high-redshift surveys**, *Bachelor of Science Honors Thesis*, https://ir.library.louisville.edu/honors/201/

Teaching Experience

2025–Present **Instructor on Record**, *New Mexico State University*, Las Cruces, NM.
I taught the mini-semester, online, asynchronous courses of the introductory astronomy course (ASTR-1115). My responsibilities included administering assignments and labs, grading said assignments, assisting students when they had issues, and create solutions with issues from third-party applications and tools we used for such teaching.

2020–Present **Graduate Teaching Assistant**, *New Mexico State University*, Las Cruces, NM.

I taught the laboratory sections for our introductory astronomy class (ASTR-1115), which covers a broad spectrum of topic from nearby on Earth (e.g. seasons), our Sun and Solar System, stars, galaxies, and basic cosmological observation (i.e. Hubble's Law); and the Planets (ASTR-1120) which also includes planetary geology. This includes physical properties of objects, and how astronomers measure them (e.g. parallax, optics, and spectroscopy). I have taught in both an in-person and online environment. Additionally, I grade for these lab sections and assist in grading when needed from the professor. I have taught a total of six semesters so far. One semester ASTR-1115 FYE (First-Year Experience) was tailored for incoming first-year undergraduates to teach them important topics alongside developing skills for collegiate education.

2017–2019 **Undergraduate Teaching Assistant**, *University of Louisville PRIMES Program*, Louisville, KY.

I taught in a laboratory and I helped offer students office hours for the elementary astronomy class. As well, I taught and I helped students during recitation for the freshman calculus-based physics for classical mechanics, rotational and wave motion, and thermodynamics.

2016–2017 **CRLA-Certified Level 2 Tutor**, *University of Louisville REACH Center*, Louisville, KY.

Responsibilities included planning small group sessions, mediating student interaction, facilitating student learning in many introductory physics courses, assessing the progress of each individual student, and providing end-of-course study session prior to finals.

Conferences/Presentations

May 2024 **First Stars VII**, *Flatiron Institute*.

Presented poster: ISM Conditions within Cosmological Simulations of Reionization

Jun. 2023 **American Astronomical Society's 242nd Meeting 2022**, *AAS*.

Presented oral presentation: Galaxy-Absorber Association in the Epoch of Reionization: Galactic Population Luminosity Distribution for Different Absorbers at $10 \leq z \leq 5.5$

Jul. 2022 **National Astronomy Meeting 2022**, *RAS*.

Presented a poster: Assuming Ionization Equilibrium and the Impact on the Lyman-α Forest Power Spectrum during the End of Reionization at $8 \leq z \leq 5$.

Nov. 19, 2021 **37th Annual New Mexico Symposium**, *NRAO*.

Presented a virtual poster: Assuming Ionization Equilibrium and the Impact on the Lyman-α Forest Power Spectrum during the End of Reionization at $8 \leq z \leq 5$.

Jun. 2021 **SAZERAC 2.0**.

Attended all talks.

Jan. 2019 **American Astronomical Society's 233st Meeting**, *AAS*.
Presented a poster: Morphological Parameters of Galaxies at $z \sim 8$ in the BoRG and CANDELS Survey.

Jan. 2018 **American Astronomical Society's 231st Meeting**, *AAS*.
Presented a poster: Measuring the Sizes & Shapes of Galaxies.

Grants

2025 **Universite Paris-Sarclay STAR Φ Fellowship**, *Pending*.

2024 **NSF Astronomy & Astrophysics Postdoctoral Fellowship**, *Declined*.

2024 **NASA ROSES-23 FINESST**, *Declined*.

2023 **JWST Cycle 3 AR Theory**, *Declined*.

2023 **NASA ROSES-22 FINESST**, *Declined*.

2022 **NASA ROSES-21 FINESST**, *Declined*.

2021 **NSF Graduate Research Fellowship**, *Declined*.

2021 **New Mexico Space Grant Graduate Research Fellowship**, *Declined*.

2019 **Fulbright Fellowship**, *Accepted*.
This grant was for a 10-month paid research period at MPIK in Heidelberg, Germany to work on the 'Gamma-Ray Emissions from Galaxies: Understanding Properties with Energy' project.

Further References

Most Recent:

Dr. Kristian Finlator, *New Mexico State University*.

Dr. Joe Burchett, *New Mexico State University*.

Dr. Moire Prescott, *New Mexico State University*.

Previous Collaboration:

Dr. Benne Holwerda, *University of Louisville*.

Dr. Gerard Williger, *University of Louisville*.

Dr. Richard Tuffs, *Max Planck Institute for Nuclear Physics*.