Shashank Dattathri | Curriculum Vitae

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shashankd98

Citizenship: United States of America

Education

- **Master of Science** **2020-2021**
  Physics Major
  Indian Institute of Science, Bangalore

- **Bachelor of Science (Research)** **2016-2020**
  Physics Major
  Indian Institute of Science, Bangalore

Employment

- **Research Assistant** **2021-Present**
  Department of Astronomy
  University of Michigan, Ann Arbor

Publications

- **Dattathri S**, Sharma P. "Cosmological evolution of gas and supermassive black holes in idealized isolated halos". MNRAS (submitted). `https://arxiv.org/abs/2111.04751`.
- **Dattathri S**, Mangalam A. "Stellar capture rates in galactic nuclei containing a supermassive binary black hole". (Under preparation, draft available on request).

Research Experience

Research Projects

- **Deprojection and Dynamical Modelling of Barred Galaxies**
  Guided by Prof. Monica Valluri *Aug 2021-Present*
  I am developing a method to deproject the 3D density distribution of barred galaxies, focusing on peanut/X-shaped bars. I will use the constructed densities to make predictions for the mass of supermassive black holes at the center of barred galaxies through Schwarzschild modelling.

- **Semi-Cosmological Simulations of Baryons in Growing Halos**
  Guided by Prof. Prateek Sharma *Aug 2020 - Sept 2021*
  Thesis link: `https://github.com/shashankd98/Semi_Cosmo` Master's Thesis
  Using hydrodynamic simulations, I studied the evolution of baryonic gas in cosmologically growing dark matter halos. I analyzed the gas density profiles and baryon fraction evolution in the presence of radiative cooling and AGN jet feedback. I examined the cooling cycles in the halo core and the growth of supermassive black holes across cosmological time.

- **Stellar Capture Rates in Galactic Nuclei Containing a Supermassive Binary Black Hole**

Guided by Prof. Arun Mangalam *June 2019 - July 2020*

Thesis link: `https://github.com/shashankd98/Binary_BH` Bachelor's Thesis

I analyzed the orbital dynamics of field stars around supermassive binary black holes to develop a model for the flux into the loss cone of the primary black hole as a function of time. I made predictions for the tidal disruption event detection rates and the fraction of them originating in binary black holes.

Internships and Term Projects

- **Turbulent Power Spectrum of the Interstellar Medium**

  Guided by Prof. Nirupam Roy *Feb 2020 - June 2020*

  Link: `https://github.com/shashankd98/ISM_Power_spec`

  I wrote a code to analyze the turbulent power spectrum of the various phases of the interstellar medium using data from the LAB survey. I also calculated the solenoidal fraction in the velocity field of the Orion B molecular cloud using data from the IRAM-30m telescope.

- **Computational Modelling of Scattering of Electromagnetic Waves by Nanoparticles**

  Guided by Prof. Murugesan Venkatapathi *May 2019 - Aug 2019*

  Link: `https://github.com/shashankd98/Nano_Scattering`

  I used the software Discrete Dipole Scattering (DDSCAT) to investigate the wavelength dependence of the dielectric function and scattering cross sections of nanoparticles of different compositions and sizes. I used Mie theory to obtain the corresponding theoretical results, and analyzed the discrepancies between the two.

Conferences and Presentations

- 239th Meeting of the American Astronomical Society, Salt Lake City, USA (*upcoming*).
- IAUS 362: Predictive Power of Computational Astrophysics as a Discovery Tool, Nov 2021, **poster presentation**.
- 1^{st} KIAA Forum on Gas in Galaxies for Early Career Scientists (KooGiG-Junior), Nov 2021, **poster presentation**.
- KITP Program: Fundamentals of Gaseous Halos, Jan-March 2021.
- 39^{th} Annual Meeting of the Astronomical Society of India (ASI), Feb 2021, **poster presentation**.
- Undergraduate Physics Symposium, Presidency College, Kolkata, Sept 2020, **contributed talk**.

Awards and Honors

- **First Class with Distinction** in Master of Science, Indian Institute of Science 2021
- **First Class with Distinction** in Bachelor of Science (Research), Indian Institute of Science 2020
- **All India Rank 148** in the Physics Graduate Aptitude Test in Engineering (99.3 percentile) 2020
- Awardee of the **Visiting Student Program Fellowship** by the Indian Institute of Astrophysics 2019
- Awardee of the **Summer Research Fellowship** by the Indian Academy of Sciences 2018
- Awardee of the **KVPY Fellowship** by the Department of Science and Technology, Government of India 2016
- Awardee of the **NTSE Fellowship** by the Government of India 2014

Relevant Courses

- **Astrophysics:** Fundamentals of Astrophysics, Radiative Processes in Astrophysics, Fluids and Plasmas, Galaxies and Interstellar Medium, General Relativity and Cosmology
- **Physics:** Classical Mechanics, Electromagnetic Theory, Quantum Mechanics (I and II), Statistical Mechanics, General Physics Laboratory, Mathematical Methods of Physics, Condensed Matter Physics, Computational Physics, Nuclear and Particle Physics

Computer Skills

- **Programming Languages:** C, C++, Python, Java, MATLAB/Octave
- **Software:** PLUTO, AGAMA, Imfit, DDSCAT, SciDAVis, Mathematica, MS Office

Outreach and Extracurriculars

- Astronomy activity leader in F.E.M.M.E.S., an initiative by the University of Michigan to encourage girls to explore STEM fields through engaging activities and experiments.
- Core committee member of Pravega 2018, Indian Institute of Science's annual science and cultural fest. One of our flagship events was an aeromodelling workshop for underprivileged students, organized in collaboration with Airbus.
- Mentor for students aspiring in astrophysics as part of the IISc UG Mentorship Program.
- Member of the IISc basketball team, represented my university in national-level tournaments.
- Member of Rhythmica, the institute-wide music club of IISc, as a Western violinist.
- Participated in several city and national level Model United Nations conferences.