

SHUBHAM SHARMA
ASTROPHYSICS UNDERGRADUATE

TORONTO, ON | SH.SHARMA@MAIL.UTORONTO.CA | <https://github.com/shubhamsharma-astro>

EDUCATION

University of Toronto *September 2025 - April 2029 expected*

- Astronomy and Physics Specialist, Mathematics Minor
- Astronomy and Physics Specialist Student Association (APSSA) Vice President
- Astrotours Volunteer
- Astronomy Union and Physics Union member/volunteer

Relevant Coursework: CSC108, PHY151, PHY152, PHY199, MAT137, STA220, PHY198, MAT223

- **Topics Covered:** Rotational Dynamics, Python, R, Dark Matter, Special Relativity, Forces, Kinematics, Calculus, Linear Algebra, Dark Energy, Cosmology

Southridge Senior School *September 2020 - June 2025*

- UBC Physics Olympics Team Captain
- Physics and Engineering Club Founder and Leader
- Academic Honors award
- Senior Physics Departmental award
- Service Award
- Senior Performing Arts Departmental Award
- AP Scholar with Distinction

Relevant Coursework: AP Physics 1, AP Physics 2, AP Comp-Sci Principle, AP Chemistry, AP Calc BC, AP English Literature

ASTRONOMY PROJECTS/EXPERIENCE

Project: Numerical Modeling of Thin Black Hole Accretion Disk Thermodynamics

June 2025 – August 2025

Built a Shakura-Sunyaev thin accretion disk solver from first principles in Python, deriving the temperature profile, energy dissipation rate, and multi-temperature blackbody spectrum analytically before implementing them numerically. Validated the analytic scaling relations $T \propto M^{(1/4)}$ and $T \propto M^{(-1/2)}$ numerically to within 2% across four decades in black hole mass. Produced five publication-style figures demonstrating that stellar mass black holes ($10 M_{\odot}$) emit in soft X-rays while supermassive black holes ($10^8 M_{\odot}$) emit in the ultraviolet, consistent with observed X-ray binary and AGN spectra.

Tools: Python, NumPy, Matplotlib, Jupyter Notebook

Repository: github.com/shubhamsharma-astro/shakura-sunyaev-disk

Project: Using Gravitational Lensing and X-Ray Data to show the existence of Dark Matter within Abell 2744

December 2024 - May 2025

Used Python, Astropy, Numpy, matplotlib and Jupyter Notebook, to find and visualize discrepancies between the total mass of the Pandora cluster from Kappa Convergence Maps and the baryonic mass inferred from Chandra's X-ray photon counts thus extrapolating the existence of non-luminous matter within the Pandora Cluster.

ROP274 - Chaos, Complexity and Emergence

April 2026 - Present

Working with Brad Bass and focusing on learning and simulating chaos, emergence and complexity. I will be focusing on its application to real world problems, particularly to fields such as astrostatistics and computational astrophysics

AWARDS

Senior Physics Departmental Award

Awarded to the top overall physics student across both grade 11 and 12 for both passion and academic excellence

Southridge School Academic Scholar Award:

Awarded to the top students in the school with a threshold grade average of 95%

AP Scholar with Distinction

This award is given to students who achieve an average greater than 3.5 on AP exams

SKILLS

Computer Science

Python, numpy, matplotlib, astropy, Java,

Data Science

Taking courses online relating python to data science and astronomical data science, pursuing a minor in applied data science at UofT. Familiarity in working with big catalogs

Non-Academic Courses Currently Taking: Astro330 (Open-Source Berkeley Astrophysical Computation Lab), Python for Astronomy, Python for Data science (Coursera), ROP274 (Chaos, Emergence and Complexity)

VOLUNTEER

Astro Tours Volunteer *Nov 2025 - present*

Volunteer for the Graduate Department's AstroTours program. This involves managing demonstrations and helping with the telescopes on top of Burton Tower.

Evergreen Collective Director of Fundraising *June 2023- Sept 2025*

Oversaw the planning and execution of various fundraising efforts towards varying environmental concerns such as the Jasper wildfire. Worked a team of executive members to organize events and causes to work by reaching out to sponsors and volunteers