Saloni Agrawal

(858) 333-0356
saagrawal@ucsd.edu
http://yourwebsiteifyouhaveone.com

Research Interests

I am broadly interested in using simulations to study the formation and dynamics of supermassive black holes and galaxies. My current research spans analyzing Active Galactic Nuclei using integral-field spectroscopy and studying globular cluster dynamics using N-body Monte Carlo simulations.

Education

Bachelor of Science in Physics, Minor in Computer Science Sep 2021 – Jun 2025
University of California, San Diego
GPA: 3.5 / 4.0

Awards and Honors

Undergraduate Summer Research Award ($7500) 2024
Triton Research & Experiential Learning Scholars (TRELS; $3000) 2023
PSCFA Scholar Award (Pacific Southwest Collegiate Forensics Association) 2023

Publications

Coil, A., **Agrawal, S.**, Rupke, D., "Widespread Shocks in an Odd Radio Circle Host Galaxy," *Journal Name*, Year (20XX).

Research Experience

Dynamics of Globular Clusters using CMC-COSMIC Jun 2025 – Present
University of California, San Diego
Post-Baccalaureate Researcher, Mentor: Dr. Kyle Kremer

- Set up and executed CMC-COSMIC simulations on the San Diego Supercomputer Center (Expanse).
- Investigated how varying binary mass fractions and black hole retention affect long-term cluster evolution.

Active Galactic Nuclei using KCWI Spectroscopy Aug 2023 – Present
University of California, San Diego
Undergraduate Researcher, Mentor: Dr. Alison Coil

- Built Python pipelines for KCWI data reduction and emission-line fitting (continuum modeling, Gaussian decomposition).
- Mapped spatial kinematics and outflow velocities across multiple AGN host galaxies and characterized black hole–driven outflows using multi-component velocity and dispersion fields.

Dark Matter Backgrounds in the XENONnT Detector Jun 2022 – May 2023
University of California, San Diego
Undergraduate Researcher, Mentor: Dr. Kaixuan Ni

- Designed algorithms to identify sources of single-electron backgrounds in XENONnT.
- Presented findings at the XENON Collaboration Meeting; authored internal reports under TRELS fellowship.

Machine Learning for Particle Physics (JetNet) Dec 2021 – Jun 2022
University of California, San Diego
EXPAND Mentee, Mentor: Dr. Javier Duarte

- Contributed to `JetNet`, a machine learning library for particle jet classification.
- Trained convolutional neural networks for high-dimensional jet image recognition.

Teaching Experience

Analytical and Writing Program (AWP) Mentor Sep 2022 – Mar 2023
University of California, San Diego

- Mentored students in AWP 4A and 4B, strengthening analytical writing and argumentation skills.
- Guided students in preparing writing portfolios to satisfy the UC Entry Level Writing Requirement.

Talks and Posters

"Supermassive Black Hole Driven Outflows in Nearby Galaxies" Sep 2024
Summer Program for Undergraduate Research in Science, UCSD

"Suggested Solution to Eliminate Background Noise in XENONnT" Jun 2023
XENON Collaboration Meeting

"Investigating Background Emission in the XENONnT Detector" Oct 2022
Gulf Coast Undergraduate Research Symposium, Rice University

"Progress on JetNet Development" May 2022
EXPAND Program Research Presentation, UCSD

Relevant Coursework

Physics: Classical Mechanics, Electromagnetism, Quantum Mechanics, Statistical Mechanics, Optics, Computational Physics I/II, Galaxies, Black Holes, Stars, Observational Astrophysics
Math: Calculus, Differential Equations, Linear Algebra, Probability/Statistics, Discrete Math
Computer Science: Data Structures, Algorithms, Computer Organization, Theory of Computation

Skills

Programming: Python, C/C++, IDL, Assembly
Libraries: NumPy, SciPy, Matplotlib, Astropy, pandas, h5py, PyTorch
Tools: Git, SLURM, Jupyter, LaTeX, Unix/Linux, KCWI/PypeIt Pipeline
High-Performance Computing: MPI workflows, parallel job scheduling, scaling, memory optimization on SDSC/Expanse

Outreach

Instructor/Mentor, STEM Girl Summer Summer 2023

- Taught physics using hands-on demonstrations for high school students.

Volunteer, Barrio Logan Science and Art Expo 2022

- Led interactive demonstrations explaining mechanics and planetary systems.

Extracurricular Activities

UCSD Blackstone LaunchPad 2022–2023

- Developed a startup for creative and affordable campus merchandise.
- Gained experience in entrepreneurship, innovation, and project development.

Society of Physics Students (SPS) 2022

- Organized undergraduate research events and lightning talks.

UCSD Speech and Debate Club 2021–2023

- Competed in Parliamentary Debate; earned multiple awards in regional tournaments.