

# Saloni Agrawal

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| <b>Research Interests</b>  | I am 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.  |                      |  |
| <b>Education</b>           | <i>Bachelor of Science in Physics, Minor in Computer Science</i><br>University of California, San Diego<br>GPA: 3.4 / 4.0   | Sep 2021 – Jun 2025  |  |
| <b>Awards and Honors</b>   | <a href="#">Undergraduate Summer Research Award (\$7500)</a><br><a href="#">Triton Research &amp; Experiential Learning Scholars (TRELS; \$1000)</a><br><a href="#">PSCFA Scholar Award (Pacific Southwest Collegiate Forensics Association)</a>  | 2024<br>2023<br>2023 |  |
| <b>Publications</b>        | <p>Coil, A., <b>Agrawal, S.</b>, Rupke, D., “Widespread Shocks in an Odd Radio Circle Host Galaxy,” Year (2025) <a href="#">(in preparation)</a>.</p> <p>Coil, A., <b>Agrawal, S.</b>, Perrotta, S., “Kinematics and Extent of AGN Outflows with KCWI” Year (2025) <a href="#">(in preparation)</a>.</p>  |                      |  |
| <b>Research Experience</b> | <p><i>Dynamics of Globular Clusters using CMC-COSMIC</i><br/>Post-Baccalaureate Researcher, PI: <a href="#">Prof. Kyle Kremer</a><br/>Jun 2025 – Present<br/>UCSD</p> <ul style="list-style-type: none"><li>Set up and executed CMC-COSMIC simulations on the San Diego Supercomputer Center (Expanse) to investigate dense stellar clusters.</li><li>Investigated how varying binary mass fractions and black hole retention affect long-term cluster evolution.</li></ul> <p><i>Active Galactic Nuclei using KCWI Spectroscopy</i><br/>Undergraduate Researcher, PI: <a href="#">Prof. Alison Coil</a><br/>Aug 2023 – Present<br/>UCSD</p> <ul style="list-style-type: none"><li>Built Python pipelines for KCWI data reduction and emission-line fitting (continuum modeling, Gaussian decomposition).</li><li>Mapped spatial kinematics and outflow velocities across multiple AGN host galaxies and characterized black hole–driven outflows using multi-component velocity and dispersion fields.</li></ul> <p><i>Dark Matter Backgrounds in the XENONnT Detector</i><br/>Undergraduate Researcher, PI: <a href="#">Prof. Kaixuan Ni</a><br/>Jun 2022 – May 2023<br/>UCSD</p> <ul style="list-style-type: none"><li>Designed algorithms to identify sources of single-electron backgrounds in XENONnT.</li><li>Presented findings at the XENON Collaboration Meeting; authored internal reports under TRELS fellowship.</li></ul> <p><i>Machine Learning for Particle Physics (JetNet)</i><br/>EXPAND Mentee, PI: <a href="#">Prof. Javier Duarte</a><br/>Dec 2021 – Jun 2022<br/>UCSD</p> <ul style="list-style-type: none"><li>Contributed to JetNet, a machine learning library for particle jet classification.</li><li>Trained convolutional neural networks for high-dimensional jet image recognition.</li></ul> |                      |  |

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| <b>Teaching Experience</b>        | <u>Analytical and Writing Program (AWP) Mentor</u><br>University of California, San Diego   | Sep 2022 – Mar 2023                          |
|                                   | <ul style="list-style-type: none"> <li>Mentored students in AWP 4A and 4B, strengthening analytical writing skills.</li> <li>Guided students in preparing writing portfolios to satisfy the UC Entry Level Writing Requirement.</li> </ul>  |  |
| <b>Talks and Posters</b>          | <p>“<i>Supermassive Black Hole Driven Outflows in Nearby Galaxies</i>”<br/>Summer Program for Undergraduate Research in Science, UCSD</p> <p>“<i>Suggested Solution to Eliminate Background Noise in XENONnT</i>”<br/>XENON Collaboration Meeting</p> <p>“<i>Investigating Background Emission in the XENONnT Detector</i>”<br/>Gulf Coast Undergraduate Research Symposium, Rice University</p> <p>“<i>Progress on JetNet Development</i>”<br/>EXPAND Program Research Presentation, UCSD</p>  | Sep 2024<br>Jun 2023<br>Oct 2022<br>May 2022 |
| <b>Relevant Coursework</b>        | <p><b>Physics:</b> Classical Mechanics, Electromagnetism, Quantum Mechanics, Statistical Mechanics, Optics, Computational Physics I/II</p> <p><b>Astrophysics:</b> Galaxies, Black Holes, Stars, Observational Astrophysics</p> <p><b>Math:</b> Calculus, Differential Equations, Linear Algebra, Probability/Statistics</p> <p><b>Computer Science:</b> Data Structures, Algorithms, Computer Organization, Theory of Computation, Discrete Math</p>   |  |
| <b>Skills</b>                     | <p><b>Programming:</b> Python, C/C++, IDL, Assembly</p> <p><b>Libraries:</b> NumPy, SciPy, Matplotlib, Astropy, pandas, h5py, PyTorch</p> <p><b>Tools:</b> Git, SLURM, Jupyter, LaTeX, Unix/Linux, KCWI/PypeIt Pipeline</p> <p><b>High-Performance Computing:</b> MPI workflows, parallel job scheduling, scaling, memory optimization on SDSC/Expanse</p>  |  |
| <b>Outreach</b>                   | <p>Instructor/Mentor, STEM Girl Summer</p> <ul style="list-style-type: none"> <li>Taught physics using hands-on demonstrations for high school students.</li> </ul> <p>Volunteer, Barrio Logan Science and Art Expo</p> <ul style="list-style-type: none"> <li>Led interactive demonstrations explaining mechanics and planetary systems.</li> </ul> <p>Volunteer, Young Scientist Club, Caramel Creek Elementary</p> <ul style="list-style-type: none"> <li>Assisted students in carrying out scientific demonstrations to understand basic scientific concepts</li> </ul>   | Summer 2023<br>2022<br>2022                  |
| <b>Extracurricular Activities</b> | <p><b>UCSD Blackstone LaunchPad</b></p> <ul style="list-style-type: none"> <li>Developed a startup for creative and affordable campus merchandise.</li> <li>Gained experience in entrepreneurship, innovation, and project development.</li> </ul> <p><b>Society of Physics Students (SPS)</b></p> <ul style="list-style-type: none"> <li>Organized and hosted undergraduate research events and lightning talks.</li> </ul> <p><b>UCSD Speech and Debate Team</b></p> <ul style="list-style-type: none"> <li>Won Silver in NPDA debate(Novice division) at <b>PLNU Forensics tournament</b></li> <li>Won Gold in Impromptu Speech(Open Division) at <b>PSCFA Spring Champs 2023</b></li> <li>Won Gold in NPDA debate(Open Division) at UCSD intra-mural competition</li> </ul> | 2022–2023<br>2022<br>2021–2023               |