

ALEXANDER ROSS

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EDUCATION

University of Washington

Seattle, WA ◊ Graduation June 2027

- *Bachelor of Science* in Physics & Astronomy with College Honors
- *Minors* in Aeronautics & Astronautics and Applied Mathematics

Honors Thesis: Neutron Star Equation of State and Nuclear Mass Model Uncertainty in Kilonova Observables
Advisor: Professor Sanjay Reddy

Selected Coursework: Graduate Astrophysical Thermodynamics (ASTR 507), Atomic Physics (PHYS 421), High Energy Astrophysics (ASTR 423), Graduate ISM/IGM (ASTR 541), Graduate Exoplanets (ASTR 558)

PUBLICATIONS

Ross, A., Imai, A., Mumpower, M., Ristić, M., & Wollaeger, R. (2026). Kilonova Signatures of Nuclear Mass Model and Composition Variations. *The Astrophysical Journal*, in preparation for submission in November 2026.

Ross, A., Khullar, G., Hutchison, T., Berry, D., Ghosh, A., et al. (2026). LEGGOS III: Mapping Star Formation and Dust in Gravitationally Lensed Galaxies with SUMAC, a UMAP and Clustering Framework. *Research Notes of the American Astronomical Society*, submitted. [arXiv:2606.20801](https://arxiv.org/abs/2606.20801).

Zhao, T., Yan, F., **Ross, A.**, & Lattimer, J. (2026). A Partially Supervised Latent-Space Variational Autoencoder for Generating Neutron Star Equations of State. *Machine Learning: Science and Technology*, published. doi.org/10.1088/2632-2153/aea51c.

Abedi, P., Sharon, K., Hutchison, T., Bayliss, M., Florian, M., Khullar, G., ... **Ross, A.**, et al. (2026). LEGGOS II: Strong Lens Model and Source-Plane Projection of the Clumpy Star-Forming Galaxy SGAS J111020.0+645950.8 at $z = 2.481$. *The Astrophysical Journal*, submitted. [arXiv:2606.20804](https://arxiv.org/abs/2606.20804).

Khullar, G., Florian, M., Bayliss, M., ... **Ross, A.**, et al. (2026). LEGGOS I: The JWST LEGGOS Survey — LEnsing and Galaxy Growth: Observing Substructures — Unpacks the Nature of Clumpy Star Formation and Quenching in Gravitationally Lensed Galaxies beyond Cosmic Noon. *The Astrophysical Journal*, submitted. [arXiv:2606.20845](https://arxiv.org/abs/2606.20845).

Hutchison, T. A., Khullar, G., Rigby, J. R., Florian, M. K., ... **Ross, A.**, Rivera-Thorsen, T. E., et al. (2025). JWST and The Waz Arc I: Spatially Resolving the Physical Conditions within a Post-Starburst Galaxy at Redshift 5 with NIRSpec IFS. *The Astrophysical Journal*, submitted. [arXiv:2512.02000](https://arxiv.org/abs/2512.02000).

RESEARCH EXPERIENCE

Los Alamos National Laboratory - Nuclear Astrophysics Summer Student Jun 2026 – Aug 2026

PIs: Dr. Marko Ristić (LANL), Dr. Ryan Wollaeger (LANL) *Los Alamos, NM*

- Built an end-to-end pipeline on LANL HPC systems predicting kilonova light curves and spectra, coupling r-process nucleosynthesis (PRISM) to Monte Carlo radiative transfer (SuperNu).
- Ran nucleosynthesis across seven nuclear mass models on a 30-tracer ensemble from GRMHD disk-wind simulations, spanning the ejecta's electron fraction distribution.
- Found a $\sim 40\%$ spread in peak luminosity across mass models, well below single- Y_e estimates, and traced the brightest model's excess to spontaneous fission of superheavy ($Z \geq 100$) nuclides.
- Co-first author on a paper in preparation for *ApJ*; presented a poster at APS DNP 2026 (CEU-funded).

NASA Goddard Space Flight Center - Gravitational Astrophysics Intern Jun 2025 – Aug 2025

PIs: Dr. Eleonora Castelli (NASA GSFC, UMBC), Dr. John Baker (NASA GSFC) *Greenbelt, MD*

- Built LISAView, an open-source analysis and visualization toolkit (Python/C++) for data from the Laser Interferometer Space Antenna (LISA), adopted into the official LISA mission data-analysis pipeline.
- Implemented time-series generation, adaptive whitening, dynamic spectrograms, and Q-transform-based anomaly detection to identify and characterize transient signals and instrumental artifacts, validated on Lisa Data Challenge data.

- Collaborating with 20+ LISA scientists internationally to extend the toolkit within the mission's end-to-end data-analysis framework.

Institute for Nuclear Theory - Nuclear Astrophysics Research Intern

Mar 2025 – May 2026

PIs: Professor Sanjay Reddy (INT), Dr. Tianqi Zhao (INT)

Seattle, WA

- Developed a partially supervised latent-space variational autoencoder (Python/TensorFlow) that compresses neutron star equations of state into a three-dimensional latent space: two supervised observables (M_{max} , $R_{1.4}$) plus one learned variable.
- Reconstructed Skyrme EOSs with high fidelity, reproducing M_{max} and $R_{1.4}$ to within 0.08% mean absolute error; sampled EOSs are causal, thermodynamically stable, and satisfy imposed observable constraints.
- Quantified how latent perturbations map to decoded EOSs, tying the learned latent variable mainly to the crust-core transition region and yielding an interpretable parameterization for multimessenger Bayesian inference.
- Co-author on published paper in *Machine Learning: Science and Technology*, and presented work at numerous symposia and lectures.

UW Astronomy Department - Extragalactic Astronomy Researcher

Nov 2024 – Present

PI: Dr. Gourav Khullar (UW)

Seattle, WA

- Member of the 25+ person LEGGOS collaboration (faculty, postdocs, students) studying gravitationally lensed galaxies with JWST to resolve stellar populations at cosmic noon.
- Developed SUMAC, an unsupervised machine-learning pipeline (Python; UMAP + HDBSCAN) that clusters spaxel-level JWST NIRSpec IFU spectra to identify physically distinct stellar-population regions, replacing manual, subjective region selection with a reproducible method.
- Applied SUMAC to the lensed galaxy SGAS J1110+6459 ($z = 2.48$), characterizing clusters with UV continuum slopes and Balmer break diagnostics.
- Released SUMAC as open-source software and research note ([10.5281/zenodo.20800724](https://doi.org/10.5281/zenodo.20800724)); received an outstanding figure award for its interactive visualization at the UW extragalactic astronomy symposium.

PRESENTATIONS

Kilonova Signatures of Nuclear Mass Model Variations in a Variable Electron Fraction Outflow (Poster)

Oct 2026

American Physical Society Division of Nuclear Physics Conference

Philadelphia, PA

Kilonova Signatures of Nuclear Mass Model and Composition Variations (Talk and Poster)

Aug 2026

Los Alamos National Laboratory Student Symposium

Los Alamos, NM

SUMAC: Software for the Uniform Manifold Approximation of Clusters (Talk)

May 2026

UW Extragalactic Astronomy Research Symposium

Seattle, WA

Stellar Biographies: A Tour of the Strangest Star Remnants in the Universe (Public Lecture)

May 2026

Theodor Jacobsen Observatory Open House

Seattle, WA

A Semi-Supervised Variational Autoencoder for Generating Neutron Star Equations of State (Talk)

May 2026

Mary Gates Research Symposium

Seattle, WA

Data-Driven Generation of Neutron Star Equations of State Using Variational Autoencoders (Talk)

Sep 2025, Nov 2025, May 2026

INT INTURN Lecture Series

Seattle, WA

LISA at a Glance: A Quick-Look Tool for Low Latency Gravitational Wave Data Analysis (Poster)

August 2025

Using Machine Learning to Map Star Formation at Cosmic Noon with Gravitational Lensing (Talk)
May 2025**LEADERSHIP EXPERIENCE**

Husky Satellite Lab Student Organization — Lead Propulsion Engineer Sep 2024 – Present

- Leading a team of 20 undergraduate students in engineering a hot-gas CubeSat propulsion system.
- Performed cis-lunar orbital simulations in MATLAB and GMAT, applying vector calculus and orbital mechanics to reduce system wet mass requirement by 15% and total impulse demand by 10%.

Husky Robotics Team Student Organization — Instrumentation Science Lead Jun 2024 – Present

- Constructing a Mars rover, leading the instrumentation team for soil and atmospheric analysis. Spearheading the research and development for data processing, in-situ spectroscopy and geochemical analysis.
- Taught 100+ students about the principles of spectroscopy, geochemistry, and research methods.
- Designed and led experiments for biological analysis, Raman spectroscopy, and fluorimetry, allowing the team to determine the target molecule that will be most indicative of biological life, reducing our identification time by 75%.

AWARDS

- **Aug 2026:** American Physical Society DNP CEU Award, Philadelphia, PA
 - Selected and provided funding to present research poster at the APS Division of Nuclear Physics meeting
- **Jul 2026:** Rhodes and Marshall Scholarship Nominee, University of Washington, Seattle, WA
- **Jul 2026:** Triangle Fraternity Outstanding Engineer, Architect, Scientist of the Year Award, Denver, CO
 - Selected as one from over 1400 members for strong potential to make an impact in my field
- **Apr 2026:** Husky 100 Award, University of Washington, Seattle, WA
 - Recognized for connecting research across LANL, NASA Goddard, and UW
 - Selected as one of only two STEM juniors from a pool of undergraduates, graduates, and professional students across all three UW campuses
- **Nov 2025:** Barry Goldwater Scholarship Nominee, University of Washington, Seattle, WA
- **Nov 2025:** Mary Gates Research Scholar, University of Washington, Seattle, WA

VOLUNTEER EXPERIENCE

UW Science Explorers — Lesson Planner and Instructor Jan 2026 – Present

- Created and taught hands-on lessons in engineering and science to over 50 students in an underserved West Seattle elementary school.
- Organized transportation, material acquisition, communications, and lesson plans in collaboration with other instructors.

UW Undergraduate Physics Mentoring Program — Communications Director Jan 2026 – Present

- Optimized mentor-mentee pairings by analyzing interests and skills, promoting a sense of community in the department.
- Guided undergraduates interested in research to opportunities that best suited their skillset and area of interest.

RELEVANT SKILLS

Programming Languages Python, Mathematica, C++, Fortran**Software and Libraries** PRISM, SuperNu, Bilby, GWpy, Astropy, TensorFlow, PyTorch, scikit-learn, UMAP, Git/GitHub, MPI, Slurm**HOBBIES AND OTHER INTERESTS**

- Glacier Mountaineering, Scuba Diving (PADI-certified), Trombone, Banjo, Astrophotography, Soccer