Taylor Knapp

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OBJECTIVE

I am seeking opportunities to implement diverse problem-solving skills, learn novel analytical approaches, and contribute my unique perspective as an astrophysics graduate student to various professional settings.

EDUCATION

Caltech, Department of Physics, Mathematics, and Astronomy — Pasadena, CA
Astrophysics Ph.D. Student — Sept. 2023 - present

Brown University — Providence, RI
Majors: Sc.B. Astrophysics (Honors), A.B. Mathematics, GPA: 3.83/4.00 — Sept. 2019 - May 2023

APPLIED EXPERIENCE

Human Frontier Collective Specialist, Scale AI — March 2025 - present
- Composes challenging problems to test AI models to be robust in the STEM space, specializing in differential geometry and astrophysics.
- Collaborates and communicates with other specialists to learn more about the frontiers of AI and how it pertains to a variety of academic and research fields.

ARC Seminar Chair, Caltech Theoretical Astrophysics Including Relativity Dept. — Oct. 2024 - present
- Organizes weekly graduate student speakers for long-standing student seminar series within the Caltech physics and astronomy department.
- Promotes and leads a protected space for graduate students to learn from one another's research and gain confidence in asking questions in a seminar setting.

Residential Associate, Caltech Student & Family Experience — June 2024 - present
- Provides mentorship and guidance to Caltech undergraduate residents while enforcing Caltech housing policies to cultivate a safe and respectful academic environment.
- Brainstorms and holds creative events on and off campus to academically and socially engage Caltech undergraduate residents.

Research and Development Intern, Goulston Technologies — Monroe, NC
Staples & Nonwovens Division — Summer 2023
- Modified preexisting chemical formula to establish a formula data baseline to then apply material informatics machine learning algorithms.
- Executed precise testing techniques to investigate hydrophilicity and durability induced by various chemical substitutions and modifications for an improved sanitary product top sheet.

ACADEMIC EXPERIENCE

Physics Graduate Student, Caltech — Pasadena, CA
LIGO Laboratory, SXS Collaboration — Sept. 2023 - present
- Incorporates novel nonlinear fitting algorithms into large-scale and computationally intensive numerical relativity simulation codes to produce more accurate gravitational waveforms.
- Executes large-scale simulations and runs diagnostics on the returned data to evaluate wellness of models and their fits for binary black hole systems.

Undergraduate Research Assistant, Brown University — Providence, RI
Legacy Survey of Space & Time (LSST) — Jan. 2020 - May 2023
- Implemented a multi-step pipeline analysis tool to process telescope images of galaxies.
- Organized, wrote, and presented an honors senior thesis using my research results.

LIGO Summer Undergraduate Research Fellow (SURF), Caltech — Pasadena, CA
LIGO Laboratory — Summer 2022

- Developed a general and generic model fitting algorithm (Reverse Jump Markov Chain Monte Carlo) for describing gravitational wave background energy spectra.
- Applied the generalized RJMCMC fitter to recover binary black hole (BBH) merger density rate distributions given a simulated GWB energy spectrum.

SCIENTIFIC PUBLICATIONS

- T. Knapp, P. Meyers, A. Renzini. (2025). *A model-agnostic gravitational-wave background characterization algorithm.* arXiv:2507.08095 [gr-qc].
- SXS Collaboration. (2025). *The SXS Collaboration's third catalog of binary black hole simulations.* arXiv:2505.13378 [gr-qc].
- T. Knapp, et. al. (2024). *Parameter control for eccentric, precessing binary black hole simulations with SpEC.* arXiv:2410.02997v1 [gr-qc].
- T. Knapp and J. Steele. (2024). *The moon wears a crown: Babylonian reports of earthshine.* Astronomische Nachrichten, e20230101.
- B. Roy, T. Knapp, C. Miller, A. Dinku, H.W. Ade, M. Wu and B. Vlahovic. (2020). *Millimeter wave transmission and reflection responses of organic semiconductor materials*, Data in Brief , Vol. 28, 104996 (2020).

MAGAZINE & POPULAR SCIENCE PUBLICATIONS

- T. Knapp. (2023). *The Earliest Astronomers: A Brief Overview of Babylonian Astronomy*, Astrobites.
- K. Arcand, T. Knapp, M. Watzke. (2023). *How to Color the Universe*, Frontiers for Young Minds.
- S. Clardy, L. Isenhower, B. Conrad, T. Knapp, V. Haslett, J. Bauer, E. Rasmussen. (2022). *...and Astronomy*, The Society of Physics Students (SPS) Observer, Vol. 56(1), Spring 2022. pg. 24.
- T. Knapp, J. Hall, I. Horst, J. Chen. (2022). *Breaking Through Barriers in Physics*, The Society of Physics Students (SPS) Observer, Vol. 55(3), Winter 2022. pg. 15.

CONFERENCES & PRESENTATIONS

- Pacific Coast Gravity Meeting, *A detailed look on the accuracy of BBH simulations with SpEC*, Fullerton, CA, 4-5 April 2025.
- American Physical Society Global Physics Summit, *A detailed look on the accuracy of BBH simulations with SpEC*, Anaheim, CA, 17-20 March 2025.
- American Physical Society April Meeting, *Controlling Parameters in Eccentric & Precessing NR Waveforms,* Sacramento, CA, 3-6 April 2024.
- Pacific Coast Gravity Meeting, *Controlling Spin and Eccentricity of BBH NR Simulated Waveforms*, UC Santa Barbara, 1-2 March 2024.
- AAS 241st Meeting, *Low-Redshift Galaxy Cluster Infall Velocity Mass Profile and Correspondence to Features in Weak Gravitational Lensing*, Seattle, WA, 8-12 January 2023.
- AIP Society of Physics Students (SPS) Physics Congress, *Approximating Simulated Stochastic Gravitational Wave Background BBHs with RJMCMC Interpolation*, Washington D.C, 8-13 September, 2022.

HONORS & AWARDS

- R. Bruce Lindsay Prize for Excellence in Physics, Brown University 2023
- Sigma Xi Research Honor Society Induction
- SPS 2022 Physics Congress Research Presentation Award, 3rd Overall
- Society of Physics Students (SPS) and Sigma Pi Sigma Physics Honor Society Induction
- Brown University Undergraduate Teaching and Research Award Recipient, Spring 2020 & 2021

SKILLS & TRAININGS

- CPR, First-aid, Fire safety
- Python, C/C++, HTML/CSS, Java
- High Performance Computing (HPC) and computing cluster management
- 3D printing, ceramics, fiber arts and construction