Naomi Gluck

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Education

Yale University | Physics PhD Program - 3rd Year Aug. 2021 – Present
Thesis Advisor: Prof. Daisuke Nagai *New Haven, CT*

Stony Brook University Aug. 2017 – May 2021
Bachelor of Science in Physics *Stony Brook, NY*
Bachelor of Science in Astronomy and Planetary Sciences *Stony Brook, NY*
Minor in Music *Stony Brook, NY*

Research Experience

Graduate Research September 2021 – Present
Yale University, Prof. Daisuke Nagai *New Haven, CT*

- Ph.D Thesis: "Data-Driven Modeling of Multi-Wavelength Cosmological Surveys"
- Machine Learning with CAMELS (Cosmology and Astrophysics with MachinE Learning Simulations): Using convolutional neural networks to infer properties of the circum-galactic medium with idealized and observationally limited 2D maps of HI and X-ray.
- Baryon Pasting (BP) Collaboration: Building a differentiable gas model with mass accretion history and cosmological dependence as an update to the current BP pipeline. Developing a machine-learning BP approach using multi-fidelity models.

Argonne National Laboratory, Dr. Andrew Hearin *Lemont, IL*

- May 2022 – August 2022: Halo-Galaxy Connection Forward Modeling: Implemented new differentiable pipeline for the orbital evolutionary history galactic halos and substructure into the SatGen galaxy evolution and subhalo tracking model.

Undergraduate Research 2019 – 2021
Stony Brook University *Stony Brook, NY*

- Physics Senior Thesis, Advised by Prof. Alan Calder: Uncertainty Quantification for the evolution of solar-mass stars to white dwarfs following the MESA (Modules for Experiments in Stellar Astrophysics) open source code to determine the validity and bounds of wind parameters.
- Astronomy Senior Thesis, Advised by Prof. Fredrick Walter: Data analysis of Nova V1047 using archival spectroscopic data from Stony Brook/SMARTS to perform a spectral time analysis on two different events.

Technion Institute of Technology, Prof. Noam Soker *Haifa, Israel*

- June 2019 – April 2020: Simulated the evolution of observationally obscured Type-II Core-Collapse Supernovae using MESA open source code with metal abundance and instability calculations.

Leadership Roles

Collaboration Memberships: CAMELS, Baryon Pasting, CMB-S4, Rubin LSST

Interpretable Machine Learning Working Group at Yale (2023 – Present): Leader and organizer of bi-weekly meetings on the importance of machine learning interpretability in computational research, including seminars/talks from invited external speakers, project updates from group members, and discussions on state-of-the-art analysis techniques.

Stony Brook University Leadership Roles:
Seawolves for Israel | Secretary (2018-19), Vice President (2019-20), President (2020-21)
Hillel Board of Directors | Student Representative (2020 – 2021)
University Orchestra | Principle Oboe (2017 – 2021)

Relevant Graduate Coursework

Classical Mechanics, Quantum Mechanics I & II, Mathematical Methods, Statistical Mechanics, Computing for Scientific Research, The Theory of Galaxy Formation, Electricity and Magnetism I

Teaching and Tutoring

Guest Instructor, Yale University
PHYS 378 (Introduction to Scientific Computing and Data Science – Fall 2023)

Graduate Teaching Fellow, Yale University
PHYS 200 (Fundamentals of Physics – Fall 2021)
PHYS 120 (Quantum Physics and Beyond – Spring 2022)
PHYS/ASTR 343 (Gravity, Astrophysics, and Cosmology – Fall 2022)
PHYS 378 (Introduction to Scientific Computing and Data Science – Spring 2023)

Private STEM Tutoring (2016 – Present): In-person and online in Physics (Regents, Honors, AP Physics 1, AP Physics C), Math (Algebra, Trigonometry, Geometry, Pre-Calculus, AP Calculus AB, AP Calculus BC, Exeter Calculus Programs), Biology, Chemistry, and Earth Science.

Mentoring of Undergraduate Student Research

KJ McConnell Yale Astrophysics, Spring 2024 – Present
Junior Research: *"Comparison of Density Profile Correlations Between CAMELS Simulations"*

Oliver Lin Yale Physics, Spring 2024 – Present
Undergraduate Research: *"First steps for a Multi-fidelity Model of Baryon Pasting"*

Juliana Karp Yale Physics, Spring 2024 – Present
Junior Research: *"Classifying HST-COS Fornax-like Clusters with IllustrisTNG Simulations"*

Din-Ammar Tolj Yale Physics, Fall 2023 – Present
Junior Research: *"Modeling Gas Shape of Dark Matter Halos in TNG-300"*

Finn Gibson Yale Physics, Fall 2023
Senior Thesis: *"Correlation of Dark Matter, Gas & Stellar Profiles in CAMELS Simulations"*

Daniel Chang Yale Physics, Fall 2023 – Present
Senior Thesis: *"Probing CGM Physics with Interpretable Machine Learning"*

William Kline Yale Applied Mathematics, Spring 2023
Senior Thesis: *"Modeling Dynamical Friction of Infalling Cluster Galaxies"*

Outreach Activities

High School Talks – Physics and Academia, Trial and Error
Syosset High School (3/2023 – Hosted by Jill Johansen)
Notre Dame Academy - All Girl High School (12/2022 – Hosted by Owen Steele)

Graduate Affiliate at Yale, Berkeley College (2022 – Present): Serving as a mentor and providing undergraduate students with one-on-one advice on navigating their post-graduation journey.

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Technical Skills

Computational Science: Techniques of parallel computing including parallelization by both threads (OpenMP) and message passing (MPI), job submission with Slurm, and software management with Modules.
Languages: Python/Jupyter, C/C++, LaTeX, Matlab, Fortran, Mathematica
Software Skills: MESA, DS9, CCDSoft, SkyChart, Keynote, Procreate, Photoshop, Pixelmator, iMovie, LTSpice, Sibelius, MuseScore

Work Experience

BOOST Tutors and Mentors (September 2021–Present): Physics (regents, honors, AP Physics 1, AP Physics C), Math (algebra/trigonometry, geometry, pre-calculus, AP Calculus AB, AP Calculus BC, Exeter Math Programs), and Biology. Preparing students for course exams, the math and science sections of SAT/ACT exams, and AP Exams.

Business Partnership - ANG Designs.co: Established online custom graphics art company, specifically partnering with Stony Brook University Hillel, SUNY Geneseo Hillel, and the Ohio State Hillel.

StandWithUs Emerson Fellowship (August 2019 – May 2020): Partnered with other student organizations at Stony Brook University to create 12 Israel-related events that impacted approximately 150 students.

Publications

Refereed Journal Articles: Published

- **Gluck, N.**, Oppenheimer B. D., Nagai, D., Villaescusa-Navarro V., & Anglés-Alcázar, D., *An Observationally Driven Approach for Probing the Circum-Galactic Medium with Convolutional Neural Networks*, 2023, MNRAS, in press (astro-ph/2309.07912)
- Gofman, R., A., **Gluck, N.**, & Soker, N. 2020, MNRAS 494, 5230: *Enhanced mass-loss rate evolution of stars with mass greater than 18 $M_{\odot}$, and missing optically-observed type II supernovae*

Referred Journal Articles: in-prep

- **Gluck, N.**, Lau, E. T., Nagai, D., & Aung, H., *JAX-enabled Baryon Pasting Model: Impact of Halo Formation History and AGN Feedback on SZ Angular Power Spectra*
- Warburton, I., **Gluck, N.**, Nagai, D., Ntampaka, M., Aung, H., Bose, S., *Cosmology Dependence of the Universal Mass Accretion Rate of Dark Matter Halos*, to be submitted to ApJ

Galactic Atmosphere Articles

- Singh, P., Nagai, D., Oppenheimer, B. D., Lau, E., **Gluck, N.**, & Medlock, I. (2022). Galactic Gaseous Halos: Mini-Clusters Disrupted by Feedback. Galactic Atmospheres.
- Oppenheimer, B. D., Nagai, D., Lau, E., Singh, P., Contreras, A. B., **Gluck, N.**, Jones, J. D., Medlock, I., & Villaescusa-Navarro, F. (2022). A Multi-Wavelength, Multi-Model Exploration of How Feedback Disrupts Gaseous Atmospheres. Galactic Atmospheres.

Presentations

ML-IAP/CCA 2023 Debating the Potential of Machine Learning in Astronomical Surveys (contributed poster):
An Observationally Driven Approach for Probing the Circum-Galactic Medium with Neural Networks

Astronomoy x Data Science Seminar, 9/2023, Yale University (invited talk):
An Observationally Driven Approach for Probing the Circum-Galactic Medium with Neural Networks

APS April Meeting 2023, Minneapolis MN (contributed poster):
An Observationally Driven Approach for Probing the Circum-Galactic Medium with Neural Networks

KITP Workshop, 2/2023, Flatiron Institute – CCA (contributed talk):
Deep Learning the Circumgalactic Medium (CGM): Take 1

CAMELS Workshop, 12/2022, Flatiron Institute – CCA (contributed talk):
Multi-Wavelength Parameter Inference for the Circumgalactic Medium (CGM)

GAINS Conference 2022, Yale University (contributed talk):
Trial and Error, Physics Edition on success in academia as women and minorities in STEM.

Institute for Advanced Computational Science Seminar, 2021, Stony Brook University (invited talk):
Propagation of Incertitude Through Computer Simulations (with Prof. Douglas Swesty)