Lehman H. Garrison

Cosmology — Large-Scale Structure
High-Performance Computing —
N-body Simulations

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Employment

Flatiron Research Fellow 2019–present
Cosmology X Data Science Group
Center for Computational Astrophysics
Flatiron Institute, New York, NY

Education

Ph.D., Astronomy and Astrophysics 2013–2019
Harvard University, Cambridge, MA
Thesis: *Computational Modeling of Large-Scale Structure with Abacus*
Advisor: Daniel J. Eisenstein

B.A., Astrophysical Sciences (High Honors) 2009–2013
Princeton University, Princeton, NJ
Thesis: *Galactic Warp Excitation by the Magellanic Clouds*
Advisors: David N. Spergel, Naoki Yoshida (U. Tokyo)

Awards and Honors

Eric Keto Prize April 2019
Best Ph.D. Thesis in Theoretical Astrophysics at Harvard University

Smith Family Graduate Science and Engineering Fellowship
Harvard University 2013

Sigma Xi Book Award June 2013
Best Senior Thesis in Astronomy at Princeton University

Professional Service

Co-chair, DESI Cosmological Simulations Working Group Oct. 2020–

Referee, MNRAS & ApJ since 2016

Graduate Student Representative, CfA Library Committee 2017–2019

Selected Publications

First Author Publications

7. *The* Abacus *Cosmological N-body Code*, **Garrison, L. H.**, Eisenstein, D., Ferrer, D., Maksimova, N., & Pinto, P. 2021, submitted
6. *Good and Proper: Self-Similarity of N-body Simulations with Proper Force Softening*, **Garrison, L. H.**, Joyce, M., & Eisenstein, D. J. 2021, MNRAS
5. *Checkpointing with cp: the POSIX Shared Memory System*, **Garrison, L. H.**, Eisenstein, D., & Maksimova, N. 2021, NERSC First International Symposium on Checkpointing for Supercomputing
4. *Generating Approximate Halo Catalogues for Blind Challenges in Precision Cosmology*, **Garrison, L. H.**, & Eisenstein, D. J. 2019, MNRAS, 485, 2407

3. *A High-Fidelity Realization of the Euclid Code Comparison N-body Simulation with Abacus*, **Garrison, L. H.**, Eisenstein, D. J., & Pinto, P. A. 2019, MNRAS, 485, 3370
2. *The Abacus Cosmos: a Suite of Cosmological N-body Simulations*, **Garrison, L. H.**, Eisenstein, D. J., Ferrer, D., et al. 2018, The Astrophysical Journal Supplement Series, 236, 43
1. *Improving Initial Conditions for Cosmological N-body Simulations*, **Garrison, L. H.**, Eisenstein, D. J., Ferrer, D., Metchnik, M. V., & Pinto, P. A. 2016, MNRAS, 461, 4125

Contributing Author Publications

13. AbacusSummit*: A Massive Set of High-Accuracy, High-Resolution N-Body Simulations*, Maksimova, N., **Garrison, L. H.**, Eisenstein, D., et al. 2021, submitted
12. CompaSO*: A new halo finder for competitive assignment to spherical overdensities*, Hadzhiyska, B., Eisenstein, D., Bose, S., **Garrison, L. H.**, & Maksimova, N. 2021, submitted
11. *Constructing high-fidelity halo merger trees in* AbacusSummit, Bose, S., Eisenstein, D., Hadzhiyska, B., et al. 2021, submitted
10. *Testing Dark Matter Halo Properties Using Self-Similarity*, Leroy, M., **Garrison, L. H.**, Eisenstein, D., Joyce, M., & Maleubre, S. 2021, MNRAS, 501, 5064
9. *Quantifying Resolution in Cosmological N-body Simulations Using Self-Similarity*, Joyce, M., **Garrison, L. H.**, & Eisenstein, D. 2021, MNRAS, 501, 5051
8. *corrfunc–a Suite of Blazing Fast Correlation Functions on the CPU*, Sinha, M., & **Garrison, L. H.** 2020, MNRAS, 491, 3022
7. *Corrfunc: Blazing Fast Correlation Functions with AVX512FSIMD Intrinsics*, Sinha, M., & **Garrison, L. H.** 2018, Workshop on Software Challenges to Exascale Computing, 3
6. *Cosmology with Galaxy-Galaxy Lensing on Non-Perturbative Scales: Emulation Method and Application to BOSS LOWZ*, Wibking, B. D., Weinberg, D. H., Salcedo, A. N., et al. 2020, MNRAS, 492, 2872
5. *Emulating Galaxy Clustering and Galaxy-Galaxy Lensing into the Deeply Non-Linear Regime: Methodology, Information, and Forecasts*, Wibking, B. D., Salcedo, A. N., Weinberg, D. H., et al. 2019, MNRAS, 484, 989
4. *A Hybrid Deep Learning Approach to Cosmological Constraints From Galaxy Redshift Surveys*, Ntampaka, M., Eisenstein, D. J., Yuan, S., & **Garrison, L. H.** 2019, arXiv preprint arXiv:1909.10527
3. *Testing the Detection Significance on the Large-scale Structure by a JWST Deep Field Survey*, Zhang, H., Eisenstein, D. J., **Garrison, L. H.**, & Ferrer, D. W. 2019, The Astrophysical Journal, 875, 132

2. *Exploring the Squeezed Three-Point Galaxy Correlation Function with Generalized Halo Occupation Distribution Models*, Yuan, S., Eisenstein, D. J., & **Garrison, L. H.** 2018, MNRAS, 478, 2019

1. *Using Galaxy Pairs to Investigate the Three-Point Correlation Function in the Squeezed Limit*, Yuan, S., Eisenstein, D. J., & **Garrison, L. H.** 2017, MNRAS, 472, 577

Outreach

Mentor, CUNY Hackathon — Jan. 2021
- Supported weekend hackathon teams at the City University of New York

Comedian, Science Riot/New York Academy of Sciences — July 2020
- Wrote and delivered a short stand-up comedy routine about N-body cosmology

Observer, Harvard Observing Project — 2014–2019
- Taught undergrads and community members how to make scientific measurements on a telescope

Volunteer, Cambridge Explores the Universe — Summers 2015–2018
- Ran CfA outreach activities at the Cambridge Science Festival

Author, BiteScis Lesson Plan: Shooting for the Stars — March 2018
- Created an open-access high school physics lesson plan based on Breakthrough Starshot

Guest Instructor, SAO Latino Initiative — Summers 2017 – 2019
- Lectured and tutored on introductory Python

Tutor, Banneker & Aztlán Institute — Summer 2017
- Tutored on introductory Python and physics

Teaching

Organizer, SciWare — 2020–
- Co-organized and taught Flatiron-internal workshops on scientific software best practices

Instructor, Software Carpentry — since Spring 2021
- Certified instructor for Software Carpentry, a scientific software pedagogy program

Teaching Fellow
- PHYS P-17010 *Introduction to Cosmology* — Summer 2017
- AST S-35 *Fundamentals of Contemporary Astro.* — Summer 2015
- CS 109 *Data Science* — Fall 2013

Lecturer, Wolbach Library at the Harvard-Smithsonian CfA — 2017
- Lecture series on modern Python for astronomy, beginner to expert level