LEHMAN H. GARRISON

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

ADDRESS: Center for Computational Astrophysics
Flatiron Institute
162 5th Ave., New York, NY 10010

WEBSITE: lgarrison.github.io

EMAIL: lgarrison@flatironinstitute.org

EMPLOYMENT

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

EDUCATION

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

B.A., Astrophysical Sciences (High Honors)   Sept. 2009–June 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

PRESS

Astrophysicists Reveal Largest-Ever Suite of Universe Simulations
Press release on ABACUSSUMMIT simulations   Oct. 2021

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

8. *Self-Similarity of k-Nearest Neighbor Distributions in Scale-Free Simulations*, **Garrison, L. H.**, Abel, T., & Eisenstein, D. J. 2021a, MNRAS, accepted, arXiv:2109.06991. `https://arxiv.org/abs/2109.06991`

7. *The* ABACUS *cosmological N-body code*, **Garrison, L. H.**, Eisenstein, D. J., Ferrer, D., Maksimova, N. A., & Pinto, P. A. 2021b, MNRAS, 508, 575, doi: `10.1093/mnras/stab2482`

6. *Good and proper: self-similarity of N-body simulations with proper force softening*, **Garrison, L. H.**, Joyce, M., & Eisenstein, D. J. 2021d, MNRAS, 504, 3550, doi: `10.1093/mnras/stab1096`

5. *Checkpointing with cp: the POSIX Shared Memory System*, **Garrison, L. H.**, Eisenstein, D. J., & Maksimova, N. A. 2021c, NERSC First International Symposium on Checkpointing for Supercomputing, arXiv:2102.13140. `https://arxiv.org/abs/2102.13140`

4. *Generating approximate halo catalogues for blind challenges in precision cosmology*, **Garrison, L. H.**, & Eisenstein, D. J. 2019, MNRAS, 485, 2407, doi: `10.1093/mnras/stz600`

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, doi: `10.1093/mnras/stz634`

2. *The Abacus Cosmos: A Suite of Cosmological N-body Simulations*, **Garrison, L. H.**, Eisenstein, D. J., Ferrer, D., et al. 2018, ApJS, 236, 43, doi: `10.3847/1538-4365/aabfd3`

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, doi: `10.1093/mnras/stw1594`

Contributing Author Publications

17. *The halo light cone catalogues of AbacusSummit*, Hadzhiyska, B., **Garrison, L. H.**, Eisenstein, D., & Bose, S. 2021b, MNRAS, accepted, arXiv:2110.11413. `https://arxiv.org/abs/2110.11413`

16. *AbacusHOD: A highly efficient extended multi-tracer HOD framework and its application to BOSS and eBOSS data*, Yuan, S., **Garrison, L. H.**, Hadzhiyska, B., Bose, S., & Eisenstein, D. J. 2021, submitted, arXiv:2110.11412. `https://arxiv.org/abs/2110.11412`

15. *Constructing high-fidelity halo merger trees in AbacusSummit*, Bose, S., Eisenstein, D. J., Hadzhiyska, B., **Garrison, L. H.**, & Yuan, S. 2021, submitted, arXiv:2110.11409. `https://arxiv.org/abs/2110.11409`

14. *CompaSO: A new halo finder for competitive assignment to spherical overdensities*, Hadzhiyska, B., Eisenstein, D., Bose, S., **Garrison, L. H.**, & Maksimova, N. 2021a, MNRAS, accepted, arXiv:2110.11408. `https://arxiv.org/abs/2110.11408`

13. ABACUSSUMMIT*: A Massive Set of High-Accuracy, High-Resolution N-Body Simulations*, Maksimova, N. A., **Garrison, L. H.**, Eisenstein, D. J., et al. 2021, MNRAS, doi: `10.1093/mnras/stab2484`

12. *Accuracy of power spectrum measurements in dissipationless cosmological simulations*, Maleubre, S., Eisenstein, D., **Garrison, L. H.**, & Joyce, M. 2021, submitted, arXiv:2109.04397. `https://arxiv.org/abs/2109.04397`

11. *Testing dark matter halo properties using self-similarity*, Leroy, M., **Garrison, L.**, Eisenstein, D., Joyce, M., & Maleubre, S. 2021, MNRAS, 501, 5064, doi: `10.1093/mnras/staa3435`

10. *Quantifying resolution in cosmological N-body simulations using self-similarity*, Joyce, M., **Garrison, L.**, & Eisenstein, D. 2021, MNRAS, 501, 5051, doi: `10.1093/mnras/staa3434`

9. Corrfunc - *a suite of blazing fast correlation functions on the CPU*, Sinha, M., & **Garrison, L. H.** 2020, MNRAS, 491, 3022, doi: `10.1093/mnras/stz3157`

8. *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, doi: `10.1093/mnras/stz3423`

7. *A Hybrid Deep Learning Approach to Cosmological Constraints from Galaxy Redshift Surveys*, Ntampaka, M., Eisenstein, D. J., Yuan, S., & **Garrison, L. H.** 2020, ApJ, 889, 151, doi: `10.3847/1538-4357/ab5f5e`

6. *KELT-24b: A 5M $_J$ Planet on a 5.6 day Well-aligned Orbit around the Young V = 8.3 F-star HD 93148*, Rodriguez, J. E., Eastman, J. D., Zhou, G., et al. 2019, AJ, 158, 197, doi: `10.3847/1538-3881/ab4136`

5. Corrfunc: *Blazing fast correlation functions with AVX512F SIMD Intrinsics*, Sinha, M., & **Garrison, L. H.** 2019, 3, doi: `10.1007/978-981-13-7729-7_1`

4. *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, doi: `10.1093/mnras/sty2258`

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, ApJ, 875, 132, doi: `10.3847/1538-4357/ab1268`

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, doi: `10.1093/mnras/sty1089`

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, doi: `10.1093/mnras/stx2032`

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 (approx. a dozen annual sessions)

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