Benjamin Horowitz

bhorowitz@princeton.edu 860-951-5652

Education

University of California, Berkeley — Berkeley, CA *Fall 2014–Spring 2020*

MA, Physics (2015), Ph.D. (2019)

Thesis: *Optimal Reconstruction of Cosmological Density Fields* (Advisor: Prof. Uros Seljak)

Yale University — New Haven, CT *Fall 2010 – Spring 2014*

B.S. in Mathematics and Physics

Academic Appointments

Princeton Astronomy — Princeton, NJ *Spring 2020 – Present*

Postdoctoral Research Associate focused on statistical analysis and machine learning of large survey data.

Lawrence Berkeley National Lab — Berkeley, CA *Spring 2019 – Fall 2019*

Graduate Student Research Associate

Kavli Institute for the Physics and Mathematics of the Universe — Kashiwanoha, JP *Fall 2018*

Japanese Society for Promotion of Science Visiting Graduate Research Fellow

Hosted by Prof. Khee Gan Lee and Prof. Masahiro Takada

University of California, Berkeley — Berkeley, CA *Fall 2014–Spring 2018*

National Science Foundation Graduate Research Fellow

Research Interests

Machine Learning and Optimization Methods

Large Scale Structure and the Cosmic Web

Intergalactic and Intracluster Medium Physics

Grants, Awards, and Recognitions

DOE Science Graduate Student Research Award — Berkeley, CA *Spring 2019*

NSF-JSPS Graduate Research Opportunities Worldwide Fellowship — Kashiwanoha, JP *Fall 2018*

NSF Graduate Research Fellowship — Berkeley, CA *Fall 2014*

NASA Connecticut Space Grant Consortium Fellowship — New Haven, CT *Summer 2012*

Students Advised

Jupiter Ding (Princeton University Undergraduate, Summer 2021 – Present): Differentiable Analysis of Hydrodynamical Simulations

Adam Rebei (Princeton University Undergraduate, Summer 2019 – Present): Optimal Power Spectrum Estimation from Lyman Alpha Tomography

Yi Kang (Tsinghua University Undergraduate, Summer 2019 – Present): Machine learning approach to predicted Lyman Alpha Forest Flux (w/ Yin Li, Prof. Khee-Gan Lee)

Zihao Li (Sichuan University Undergraduate, Summer 2019 – Summer 2021): Optimal Void Reconstruction from Next Generation Spectroscopic Observations (w/ Prof. Zheng Cai)

Nishant Misra (UC Berkeley Undergraduate, Summer 2019 – Present): Gaussianization of the Lyman Alpha Forest (w/ Prof. Uros Seljak)

Benjamin Zhang (UC Berkeley Undergraduate, Spring 2019 – Spring 2020): Accurate Wiener Filtering from Lyman Alpha Tomography

Selected Talks

CCA/NYU Cosmology X Machine learning Workshop — Virtual *9/2021*
Dark Energy Spectroscopic Instrument Machine Learning Club — Virtual *6/2021*
Bay Area Likelihood Free Inference Meeting — Berkeley Institute for Data Science, Berkeley, CA *12/2019*
Thirty Meter Telescope Science Meeting 2019 — Xiamen University, Xiamen, China *11/2019*
First Galaxies, First Structures — Paris Observatory, Paris, France *10/2019*
Cosmic Web 2019 — Royal Observatory, Edinburgh, Scotland, UK *6/2019*
COSMOS 2019 — Center for Computational Astrophysics, New York City, NY *5/2019*
Interstellar Medium Program of Studies Seminar — UCSC, Santa Cruz, CA *5/2019*
Dark Universe Conference — Kyoto, Japan *2/2019*
Cosmology Seminar — Institute of Astronomy and Astrophysics, Academia Sinica, Taipei, Taiwan *12/2018*
Colloquium, Theoretical Astrophysics Group — Osaka University, Osaka, Japan *11/2018*
Nonlinear Universe 2018 — Smartno, Slovenia *08/2018*
Advances in Cosmology in Light of Data — NORDITA, Stockholm, Sweden *07/2017*

Teaching Experience

Course	Institution	Role	Semester
Scientific Programming with Python	UC Berkeley	Instructor	Summer 2019
Cosmology and Relativistic Astrophysics	UC Berkeley	TA	Spring 2018
Physics for Future Presidents	UC Berkeley	TA	Fall 2018
Introduction to Cosmology	Stanford	Instructor	Summer 2016
Electricity and Magnetism	UC Berkeley	TA	Spring 2015
History of Mathematics	Yale	TA	Fall 2013
Calculus I	Yale	TA	Spring 2013

Service

Referee, **Monthly Notices of The Royal Astronomy Society**, **Astrophysical Journal**

Learning Unlimited — Cambridge, MA *Spring 2013 – Present*

Executive Director (2015-Present), Director of Development (2013-2015)

Leads volunteer organization to spread and support student-run educational enrichment programs ("Splash") to various colleges and universities around the United States. Programs reach over 12,000 secondary school students annually in ten states.

Splash at Yale — New Haven, CT *Spring 2011 – Present*

Executive Director (2011-2013), Board Member (2014 - Present)

Cofounded educational outreach organization, registered as a 501(c)(3). Program reaches approximately 2,000 students annually.

Observing Proposals

Co-Investigator on successful UC-Keck proposals 2018B_U095, 2019A_U052, 2019B_U180 for CLAMATO DR2.

Affiliations

Lawrence Berkeley National Lab, Center for Computational Cosmology

Kavli Institute for the Physics and Mathematics of the Universe

Prime Focus Spectrograph (PFS)

COSMOS Lyman-Alpha Mapping And Tomographic Observations (CLAMATO)

Large Synoptic Survey Telescope - Dark Energy Science Collaboration (LSST-DESC)

Papers/Publications

Led/Co-Led

BH, Lee, K.G., et al. (2021) *CLAMATO Data Release 2.* Accepted to ApJS. arXiv:2109.09660 [astro-ph:CO]

BH, et al. (2021) *HyPhy: Deep Generative Conditional Multiscale Posterior Mapping of Hydrodynamical Physics*. Submitted to ApJ. arXiv:2106.12675 [astro-ph:CO]

Li[†], Z., **BH**, and Cai, Z. (2021) *Improved Lyman Alpha Tomography using Optimized Reconstruction with Constraints on Absorption (ORCA)*. The Astrophysical Journal 916.20 (2021). arXiv:2102.12306 [astro-ph:GA]

BH, Zhang[†],B, et al. (2020) *TARDIS Paper II: Synergistic Density Reconstruction from Lyman-alpha Forest and Spectroscopic Galaxy Surveys with Applications to Protoclusters and the Cosmic Web*. The Astrophysical Journal 906.2 (2021): 110. arXiv:2007.15994 [astro-ph:CO]

BH, et al. (2019) *TARDIS Paper I: A Constrained Reconstruction Approach to Modeling the $z \sim 2.5$ Cosmic Web Probed by Lyman-α Forest Tomography*. The Astrophysical Journal 887.1 (2019): 61 arXiv:1903.09049 [astro-ph:CO]

BH, Seljak, U., Aslanyan, G. (2018) *Efficient Maximum Likelihood Reconstruction of Fields from Cosmological Data*. Journal of Cosmology and Astroparticle Physics 2019 (10), 035. arXiv:1810.00503 [astro-ph:CO]

BH, Ferraro, S., Sherwin, D. (2017) *Reconstructing Small Scale Lenses from the Cosmic Microwave Background*. Monthly Notices of the Royal Astronomical Society 485 (3), 3919-3929. arXiv:1710.10236 [astro-ph:CO]

BH (2016) *Revisiting Primordial Black Holes Constraints from Ionization History*. arXiv:1612.07264 [astro-ph.CO]

BH, Seljak, U. (2016) *Cosmological Constraints from the Thermal Sunyaev Zeldovich Power Spectrum*. Monthly Notices of the Royal Astronomical Society 469 (1), 394-400. arXiv:1609.01850v2 [astro-ph.CO]

Zinn, R., **BH**, et al. (2014) *La Silla Quest RR Lyrae Star Survey: Region 1 Sextans to Virgo*. The Astrophysical Journal 781.1: 22. arXiv:1312.1602 [astro-ph.GA]

Member of Main Science Team

Greene, J., et al. (including **BH**) (2022) *The Prime Focus Spectrograph Galaxy Evolution Survey .* arXiv:2206.14908 [astro-ph.GA]

Kooistra, R., Lee, K.G., and **BH** (2022) *Constraining the Fluctuating Gunn-Peterson Approximation, Using Lyman-α Forest Tomography at z=2* arXiv:2201.10169 [astro-ph.CO]

Harrington, P., Mustafa, M., Dornfest M., **BH**, and Lukic, Z. (2021) *Fast, high-fidelity Lyman-α forests with convolutional neural networks*. arXiv:2106.12662 [astro-ph.CO]

Baltay, C., et al. (including **BH**) (2013) *The La Silla-QUEST Low Redshift Supernova Survey.* Publications of the Astronomical Society of the Pacific 125.928: 683. APA

Hadjiyska, E., et al. (including **BH**) (2012) *La Silla-QUEST Variability Survey in the Southern Hemisphere.* arXiv preprint arXiv:1210.1584. [astro-ph.GA]

Baltay, C., et al. (including **BH**) (2012) *The La Silla-QUEST Southern Hemisphere Variability Survey.* The Messenger 150: 34-38.

Conference Proceedings and Other Published Work

Zhang [†], B, et al. (incuding **BH**). (2021) *Forecasting High-z Galaxy-Cosmic Web Alignments for Subaru-PFS*. Proceedings of the AAS 53.

BH, et al. (2014) *Expanded RR Lyrae Search in the Southern Hemisphere with the La Silla-QUEST Survey*. Proceedings of the AAS 223.

BH, et al. (2013) *Modular Python-based Code for Thomson Scattering System on NSTX-U*. Bulletin of the APS 58.

BH (2013) *Group Theoretic Construction of Conformal Field Theories*. Harvard College Math Review, Spring 2013. arXiv:1312.6196 [hep-th]

[†]Student (co-)advised