

ADRIAN E. BAYER

🔗 adrianbayer.github.io 🐙 github.com/adrianbayer ✉ abayer@princeton.edu

📍 New York Metropolitan Area, USA

EDUCATION

University of California, Berkeley, USA
Ph.D. Physics

2018–2023
Thesis adviser: Uroš Seljak

University of Cambridge, UK
Master of Advanced Study, Mathematics

2017–2018

Imperial College London, UK
MSci Physics with Theoretical Physics
Graduated top of the cohort (approx. 250 students).

2013–2017
Thesis adviser: Fay Dowker

ACADEMIC APPOINTMENTS

Princeton University, USA
Postdoctoral Researcher

2023–
Adviser: David Spergel

Simons Foundation, USA
Guest Researcher

2023–
Adviser: David Spergel

The University of Tokyo (Kavli IPMU), Japan
Visiting Researcher (3 months)

2022
Adviser: Jia Liu

Massachusetts Institute of Technology, USA
Undergraduate Researcher (2 months)

2016
Adviser: Lindley Winslow

Imperial College London, UK
Undergraduate Researcher (3 months)

2015
Adviser: Henrique Araújo

HONORS AND AWARDS

Outstanding Graduate Student Instructor Award, University of California, Berkeley, 2022

Berkeley Distinguished Graduate Fellows Video Prize (\$1,000 grant), University of California, Berkeley, 2019

The Berkeley Fellowship, University of California, Berkeley, 2018

Abdus Salam Undergraduate Prize, Imperial College London, 2017

Governors' MSci Prize in Physics, Imperial College London, 2017

Ken Allen Prize, Imperial College London, 2016

Winton Capital Prize for Outstanding Performance in Second Year Physics, Imperial College London, 2015

EPSRC Summer Vacation Bursary (£2,200 grant), Engineering and Physical Sciences Research Council, 2015

BIBLIOGRAPHY

- Bayer, A. E.**, U. Seljak, and C. Modi. “Field-Level Inference with Microcanonical Langevin Monte Carlo”. In: *40th International Conference on Machine Learning*. July 2023. arXiv: [2307.09504](https://arxiv.org/abs/2307.09504) [[astro-ph.CO](#)]
- Bayer, A. E.**, C. Modi, and S. Ferraro. “Joint velocity and density reconstruction of the Universe with nonlinear differentiable forward modeling”. In: *J. Cosmology Astropart. Phys.* 2023.6, 046 (June 2023), p. 046. DOI: [10.1088/1475-7516/2023/06/046](https://doi.org/10.1088/1475-7516/2023/06/046). arXiv: [2210.15649](https://arxiv.org/abs/2210.15649) [[astro-ph.CO](#)]
- Bayer, A. E.**, J. Liu, R. Terasawa, A. Barreira, Y. Zhong, and Y. Feng. “Super-sample covariance of the power spectrum, bispectrum, halos, voids, and their cross covariances”. In: *Phys. Rev. D* 108.4 (2023), p. 043521. DOI: [10.1103/PhysRevD.108.043521](https://doi.org/10.1103/PhysRevD.108.043521). arXiv: [2210.15647](https://arxiv.org/abs/2210.15647) [[astro-ph.CO](#)]

4. Ding, Z., C.-H. Chuang, Y. Yu, L. H. Garrison, **A. E. Bayer**, Y. Feng, C. Modi, D. J. Eisenstein, M. White, A. Variu, C. Zhao, H. Zhang, J. Meneses Rizo, D. Brooks, K. Dawson, P. Doel, E. Gaztanaga, R. Kehoe, A. Krolewski, M. Landriau, N. Palanque-Delabrouille, and C. Poppett. “The DESI N-body Simulation Project - II. Suppressing sample variance with fast simulations”. In: MNRAS 514.3 (Aug. 2022), pp. 3308–3328. DOI: [10.1093/mnras/stac1501](https://doi.org/10.1093/mnras/stac1501). arXiv: [2202.06074](https://arxiv.org/abs/2202.06074) [astro-ph.CO]
5. **Bayer, A. E.**, A. Banerjee, and U. Seljak. “Beware of fake ν ’s: The effect of massive neutrinos on the nonlinear evolution of cosmic structure”. In: Phys. Rev. D 105.12, 123510 (June 2022), p. 123510. DOI: [10.1103/PhysRevD.105.123510](https://doi.org/10.1103/PhysRevD.105.123510). arXiv: [2108.04215](https://arxiv.org/abs/2108.04215) [astro-ph.CO]
6. Kreisch, C. D., A. Pisani, F. Villaescusa-Navarro, D. N. Spergel, B. D. Wandelt, N. Hamaus, and **A. E. Bayer**. “The GIGANTES Data Set: Precision Cosmology from Voids in the Machine-learning Era”. In: ApJ 935.2, 100 (Aug. 2022), p. 100. DOI: [10.3847/1538-4357/ac7d4b](https://doi.org/10.3847/1538-4357/ac7d4b). arXiv: [2107.02304](https://arxiv.org/abs/2107.02304) [astro-ph.CO]
7. **Bayer, A. E.**, U. Seljak, and J. Robnik. “Self-calibrating the look-elsewhere effect: fast evaluation of the statistical significance using peak heights”. In: MNRAS 508.1 (Nov. 2021), pp. 1346–1357. DOI: [10.1093/mnras/stab2331](https://doi.org/10.1093/mnras/stab2331). arXiv: [2108.06333](https://arxiv.org/abs/2108.06333) [astro-ph.IM]
8. **Bayer, A. E.**, F. Villaescusa-Navarro, E. Massara, J. Liu, D. N. Spergel, L. Verde, B. D. Wandelt, M. Viel, and S. Ho. “Detecting Neutrino Mass by Combining Matter Clustering, Halos, and Voids”. In: ApJ 919.1, 24 (Sept. 2021), p. 24. DOI: [10.3847/1538-4357/ac0e91](https://doi.org/10.3847/1538-4357/ac0e91). arXiv: [2102.05049](https://arxiv.org/abs/2102.05049) [astro-ph.CO]
9. **Bayer, A. E.**, A. Banerjee, and Y. Feng. “A fast particle-mesh simulation of non-linear cosmological structure formation with massive neutrinos”. In: J. Cosmology Astropart. Phys. 2021.1, 016 (Jan. 2021), p. 016. DOI: [10.1088/1475-7516/2021/01/016](https://doi.org/10.1088/1475-7516/2021/01/016). arXiv: [2007.13394](https://arxiv.org/abs/2007.13394) [astro-ph.CO]
10. **Bayer, A. E.** and U. Seljak. “The look-elsewhere effect from a unified Bayesian and frequentist perspective”. In: J. Cosmology Astropart. Phys. 2020.10, 009 (Oct. 2020), p. 009. DOI: [10.1088/1475-7516/2020/10/009](https://doi.org/10.1088/1475-7516/2020/10/009). arXiv: [2007.13821](https://arxiv.org/abs/2007.13821) [physics.data-an]
11. Tomás, A., H. M. Araújo, A. J. Bailey, **A. Bayer**, E. Chen, B. López Paredes, and T. J. Sumner. “Study and mitigation of spurious electron emission from cathodic wires in noble liquid time projection chambers”. In: *Astroparticle Physics* 103 (Dec. 2018), pp. 49–61. DOI: [10.1016/j.astropartphys.2018.07.001](https://doi.org/10.1016/j.astropartphys.2018.07.001). arXiv: [1801.07231](https://arxiv.org/abs/1801.07231) [physics.ins-det]

SELECTED TALKS

Hawaii Convention Center, Honolulu HI, USA	July 2023
International Conference on Machine Learning (ICML), Workshop on Machine Learning for Astrophysics “Field-Level Inference with Microcanonical Langevin Monte Carlo”	
Sexten Center for Astrophysics, Sexten, Italy	July 2023
New Strategies For Extracting Cosmology From Future Galaxy Surveys Workshop “Field-Level Inference with Microcanonical Hamiltonian Monte Carlo”	
Center for Computational Astrophysics, Flatiron Institute, New York NY, USA	May 2023
Cosmic Connections Symposium “Field-Level Inference with Microcanonical Hamiltonian Monte Carlo”	
Institute for Advanced Studies, Princeton NJ, USA	December 2022
Cosmology Lunch “Towards Optimal Measurement of the Neutrino Mass using Large-Scale Structure”	
Center for Computational Astrophysics, Flatiron Institute, New York NY, USA	December 2022
Cosmology X Data Science Meeting “Towards Optimal Measurement of the Neutrino Mass using Large-Scale Structure”	
University of Pennsylvania, Philadelphia PA, USA	December 2022
CMB Meeting “Towards Optimal Measurement of the Neutrino Mass using Large-Scale Structure”	
Université de Montréal, Montréal, Canada	November 2022
Astromerique Speaker Series “Massive Neutrino Information in Large-Scale Structure and Field-Level Inference”	

Vipolže, Slovenia Berkeley Center for Cosmological Physics Summer Workshop “Massive Neutrino Information in Large-Scale Structure and Field-Level Inference”	July 2022
The University of Tokyo (Hongo Campus), Tokyo, Japan GPU Workshop “Cosmological simulations on GPU with tensorflow”	May 2022
The University of Tokyo (Kavli IPMU), Kashiwanoha, Japan APEC Seminar “Towards detecting neutrino mass using non-linear cosmic structure”	April 2022
Kyoto University (Yukawa Institute for Theoretical Physics), Kyoto, Japan Cosmology with Weak Lensing: Beyond the 2-pt Statistics “Detecting neutrino mass using nonlinear cosmic structure”	April 2022
Institut d’Astrophysique de Paris, Paris, France Journal Club – Univers “Detecting neutrino mass using nonlinear cosmic structure”	February 2022
Center for Computational Astrophysics, Flatiron Institute, New York NY, USA Learn the Universe “The Look-Elsewhere Effect”	August 2021
Pennsylvania State University, State College PA, USA Statistical Challenges in Modern Astronomy VII “The Look-Elsewhere Effect from a Unified Bayesian and Frequentist Perspective”	June 2021
University of Cambridge (Kavli Institute for Cosmology), Cambrigde, UK KICC 10th Anniversary Symposium “Look Elsewhere” (poster)	September 2019

REFEREEING

Journal of Cosmology and Astroparticle Physics (JCAP), 2023
 Astrophysical Journal Letters (ApJL), 2023
 Monthly Notices of the Royal Astronomical Society (MNRAS), 2022
 Machine Learning for Astrophysics Workshop, International Conference on Machine Learning (ICML), 2022, 2023

TEACHING

Graduate Student Instructor for *Bayesian Data Analysis and Machine Learning for Physical Sciences*, 2021
 Teaching Assistant for *Python for Physics*, Imperial College London, 2016

MENTORING

Yici Zhong (graduate student at The University of Tokyo, co-advised with Jia Liu)
 Project: HalfDome Cosmological Simulations for Stage IV Surveys
 Malika Golshan (undergraduate student at UC Berkeley, co-advised with Vanessa Böhm via N3AS)
 Project: Can AI reliably learn neutrino physics from N-body simulations?
 Berkeley Compass Mentor, 2022
 Adopt-a-Physicist Mentor, 2020