ADRIAN E. BAYER

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📍 Berkeley, CA, USA

EDUCATION

University of California, Berkeley, USA — 2018 - 2023
Ph.D. Physics — Thesis adviser: Uroš Seljak

University of Cambridge, UK — 2017 - 2018
Master of Advanced Study, Mathematics

Imperial College London, UK — 2013 - 2017
MSci Physics with Theoretical Physics — Thesis adviser: Fay Dowker
Graduated top of the cohort (approx. 250 students).

VISITING RESEARCH POSITIONS

The University of Tokyo (Kavli IPMU), Japan — 2022
Visiting Researcher — Adviser: Jia Liu

Massachusetts Institute of Technology, USA — 2016
Undergraduate Researcher — Adviser: Lindley Winslow

HONORS AND AWARDS

Outstanding Graduate Student Instructor Award, Univeristy 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

SELECTED TALKS

Cosmology Lunch, **Institute for Advanced Studies**, Princeton NJ, USA — December 2022
"Towards Optimal Measurement of the Neutrino Mass using Large-Scale Structure"

Cosmology X Data Science Meeting, **Flatiron Institute**, New York NY, USA — December 2022
"Towards Optimal Measurement of the Neutrino Mass using Large-Scale Structure"

CMB Meeting, **University of Pennsylvania**, Philadelphia PA, USA — December 2022
"Towards Optimal Measurement of the Neutrino Mass using Large-Scale Structure"

Astromerique Speaker Series, **Université de Montréal**, Canada — November 2022
"Massive Neutrino Information in Large-Scale Structure and Field-Level Inference"

Berkeley Center for Cosmological Physics Summer Workshop, **Vipolže**, Slovenia — July 2022
"Massive Neutrino Information in Large-Scale Structure and Field-Level Inference"

GPU Workshop, **The University of Tokyo**, Japan — May 2022
"Cosmological simulations on GPU with tensorflow"

APEC Seminar, **The University of Tokyo (Kavli IPMU)**, Japan — April 2022
"Towards detecting neutrino mass using non-linear cosmic structure"

Cosmology with Weak Lensing: Beyond the 2-pt Statistics, **Kyoto University (YITP)**, Japan — April 2022
"Detecting neutrino mass using nonlinear cosmic structure"

Journal Club – Univers, **Institut d'Astrophysique de Paris (IAP)**, Paris, France   February 2022
"Detecting neutrino mass using nonlinear cosmic structure"

Learn the Universe, **Center for Computational Astrophysics (CCA)**, Flatiron Institute, USA August 2021
"The Look-Elsewhere Effect"

Statistical Challenges in Modern Astronomy VII, **The Pennsylvania State University**, USA   June 2021
"The Look-Elsewhere Effect from a Unified Bayesian and Frequentist Perspective"

KICC 10th Anniversary Symposium, **Kavli Institute for Cosmology, Cambridge**, UK   September 2019
"Look Elsewhere" (poster)

BIBLIOGRAPHY

1. **Bayer, A. E.**, C. Modi, and S. Ferraro. *Joint velocity and density reconstruction of the Universe with nonlinear differentiable forward modeling.* 2022. arXiv: 2210.15649 [astro-ph.CO]

2. **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.* 2022. arXiv: 2210.15647 [astro-ph.CO]

3. 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. arXiv: 2202.06074 [astro-ph.CO]

4. **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. arXiv: 2108.04215 [astro-ph.CO]

5. 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. arXiv: 2107.02304 [astro-ph.CO]

6. **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. arXiv: 2108.06333 [astro-ph.IM]

7. **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. arXiv: 2102.05049 [astro-ph.CO]

8. **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. arXiv: 2007.13394 [astro-ph.CO]

9. **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. arXiv: 2007.13821 [physics.data-an]

10. 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. arXiv: 1801.07231 [physics.ins-det]

REFEREEING

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

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

Malika Golshan (undergraduate 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