

# Alan Junzhe Zhou

The University of Chicago  
5640 South Ellis Avenue  
Chicago, IL, 60637

ajzhou@uchicago.edu  
Homepage: azhou00.github.io  
GitHub: AZhou00

## Education

---

<b>The University of Chicago</b> Ph.D. in Physics Cosmological data analysis, large-scale probabilistic deep learning	July 2024 – Present
<b>Carnegie Mellon University</b> Ph.D. in Physics (M.S. May 2024) Cosmological data analysis, large-scale probabilistic deep learning	Aug 2022 – July 2024
<b>Duke University</b> B.S. in Physics; B.S. in Mathematics; Minor in Classics <i>Highest Honors in Physics; Magna Cum Laude; GPA: 3.94/4.00</i> Dissertation: <i>Galaxy Clustering Statistics with the Dark Energy Survey</i>	Aug 2018 – May 2022
<b>The Inter-Collegiate Center for Classical Studies in Rome</b> <i>GPA: 4.00/4.00</i> Coursework and fieldwork in classical archaeology and conservation	Jan 2020 – Jun 2020

## Research Experience

---

<b>Observational and Theoretical Cosmology</b> The University of Chicago CMU, McWilliams Center for Cosmology, NSF AI Planning Institute Advisor: Scott Dodelson <b>Main effort:</b> Designing large-scale Bayesian networks and deep probabilistic models to reconstruct the 3D matter distribution evolution of the universe using large cosmological data sets. <b>Other interests:</b> Searching for Milky Way dark matter halos via simulation-based inference. Designing Bayesian parameter estimation algorithms for time-series imaging.	Aug 2022 – Present
<b>Observational Cosmology</b> Duke Cosmology Group, The Dark Energy Survey Advisor: Michael Troxel Studied noise and systematics dominated spatial correlation statistics of galaxies in cosmological survey data sets.	Apr 2020 – Aug 2022
<b>Theoretical High Energy Physics</b> Duke Physics Advisor: Shailesh Chandrasekharan Found a simple finite-dimensional quantum field theory that reproduces the statistical behavior of a class of infinite-dimensional theories. Designed efficient sampling algorithms and utilized distributed computing to validate theoretical results.	Dec 2020 – Mar 2022
<b>Experimental High Energy Physics</b> CERN (Switzerland), Duke High Energy Physics Group Advisor: Ashutosh Kotwal Searched for beyond-the-standard-model compositeness of the top quark at the Large Hadron Collider.	Apr 2019 – Aug 2019

## Publications

---

- [1] **Alan Junzhe Zhou**, Xiangchong Li, Scott Dodelson, and Rachel Mandelbaum. “Accurate field-level weak lensing inference for precision cosmology”. In: *Phys. Rev. D* 110 (2 2024), DOI: 10.1103/PhysRevD.110.023539. [arXiv:2304.01387](#).
- [2] **Alan Junzhe Zhou**, Yin Li, Scott Dodelson, Rachel Mandelbaum, Yucheng Zhang, Xiangchong Li, and Giulio Fabbian. “A Hamiltonian, post-Born, three-dimensional, on-the-fly ray tracing algorithm for gravitational lensing”. In: (2024). arXiv (accepted by JCAP): 2405.12913 (astro-ph.CO).
- [3] **Alan Junzhe Zhou** and Scott Dodelson. “Field-level multiprobe analysis of the CMB, integrated Sachs-Wolfe effect, and the galaxy density maps”. In: *Phys. Rev. D* 108 (8 Oct. 2023), DOI: 10.1103/PhysRevD.108.083506. [arXiv:2312.08934](#).
- [4] **Alan Junzhe Zhou**, Hersh Singh, Tanmoy Bhattacharya, Shailesh Chandrasekharan, and Rajan Gupta. “Spacetime symmetric qubit regularization of the asymptotically free two-dimensional  $O(4)$  model”. In: *Phys. Rev. D* 105 (5 Mar. 2022), DOI: 10.1103/PhysRevD.105.054510. [arXiv:2111.13780](#).
- [5] Tanmoy Bhattacharya, Shailesh Chandrasekharan, Rajan Gupta, Hersh Singh, and **Alan Junzhe Zhou**. “Space-time symmetric qubit regularization of asymptotically freedom”. In: *APS Division of Nuclear Physics Meeting Abstracts*. Vol. 2021. APS Meeting Abstracts. 2021.

## Talks

---

“Reconstructing the cosmic origin through data-driven forward modeling,” lunch talk, physics & astronomy, University of Pennsylvania	April 2024
“Reconstructing our cosmic origin,” Jane Street Graduate Fellowship Workshop	April 2024
“Reconstructing the origin of the universe through data-driven forward modeling,” NSF AI & data-driven astronomy seminar	April 2024
“Accurate field-level inference for precision cosmology,” ML session, department of astronomy, Tsinghua University	Feb 2024
“Accurate field-level weak lensing inference for precision cosmology,” HSC weak lensing working group	Feb 2024
“Accurate and precise weak lensing field-level inference,” IPMU, University of Tokyo	Jan 2024
“Accurate and precise weak lensing cosmology via field-level inference,” CD3 x Simons Foundation Workshop, AI-driven discovery in physics & astrophysics, University of Tokyo	Jan 2024
“Theory and practice of Monte Carlo methods II,” McWilliams software series, CMU	May 2023
“Field-level multiprobe analysis of the CMB, integrated Sachs-Wolfe effect, and galaxy density maps,” invited paper presentation, ETH Zurich	May 2023
“Field-level multiprobe cosmological analysis,” Future Science with CMBxLSS, Yukawa Institute, Kyoto University	Apr 2023
“Field-level multiprobe cosmological analysis,” the impossible problems seminar, McWilliams Center for Cosmology, CMU	Mar 2023
“Theory and practice of Monte Carlo methods I,” McWilliams software series, CMU	Mar 2023
“Measuring the galaxy clustering statistics using the Dark Energy Survey’s year 3 source catalog,” Visible Thinking Symposium, Duke University	Apr 2022
“Galaxy clustering in the Dark Energy Survey’s year 3 source catalog,” Duke Senior Research Symposium, Duke University	Apr 2022
“Spacetime symmetric qubit regularization of asymptotic freedom,” 2021 APS fall meeting	Oct 2021
“Self-calibration of intrinsic alignment,” Dark Energy Survey weak lensing working group	Aug 2021

## Awards

---

Jane Street Graduate Research Fellow	Feb 2024
Reconstructing the initial conditions of the universe ( <b>PI</b> ), NSF Advanced Cyberinfrastructure Coordination Ecosystem: Services & Support (ACCESS)	Sep 2023
Daphne Chang Memorial Award, Duke University	May 2022
CEU21 Award, 2021 American Physical Society Fall Meeting	Aug 2021
Duke University Dean's Summer Research Fellow, Duke University	May 2021
Duke University Summer IDEA Grant Award, Duke University	May 2021
Duke University Faculty Scholar Award Physics Department Nominee, Duke University	Mar 2021
Duke HEP Group ATLAS Research Grant, Duke University	May 2019

## Service and Outreach

---

Outreach video channels that explain the process behind physics research, 40K+ subscribers and 800K+ views	Aug 2023 – Present
CMU McWilliams Center Software Development Series, Organizing Committee	Dec 2022 - Present
Duke Physics Department Conduct Accountability Committee	Dec 2020 – May 2022
Duke Lyceum Interdisciplinary Mathematics Society, Executive	Sep 2020 – May 2021