

SIHAN (SANDY) YUAN

San Francisco Bay, CA | US Permanent Resident

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WHO AM I

- Experienced **researcher**: 50+ peer-reviewed **publications** (16 first authored), with 2000+ citations.
- Strong **coder**: 10+ years of Python exp., co-led the development of a popular open source **package**.
- Excellent **problem solver**: Gold Medal in 2012 Asia Physics Olympiad (highest score). Chinese National Physics Team (8th amongst 100,000+ participants).
- Proven **leader**: led a 70+ people working group in the \$100M DESI collaboration ([NYT News article](#)).
- Outstanding **communicator**: 30+ presentations/**lectures**. Won \$2000 in public speaking **contest**.

EXPERIENCES

Postdoctoral Research Fellow *September 2021 - Present*
Stanford University, Stanford, CA

- *Idea generation with frontier **LLMs** via prompt engineering and multi-agent reflections.*
- *Building a normalizing **flow+diffusion** based framework for simulating galaxies and cosmic structure.*
- *Implemented a **simulation-based inference** pipeline with trillion-particle simulations to infer state-of-the-art dark energy **constraints**. Validated results via **cross-validation tests**.*
- *Led a science team across 10+ countries in analyzing the first dataset from the Dark Energy Spectroscopic Instrument (DESI), critically contributing to the first **tentative discovery** of variable dark energy.*

Quantitative Research Intern *June 2019 - August 2019*
Two Sigma, New York, NY

- *Analyzed stock performance as a function of market cycle features using linear regression.*

Graduate Research Fellow *September 2016 - May 2021*
Harvard University, Cambridge, MA

- *Constructed novel clustering statistics for feature detection in million-object datasets.*
- *Modeled galaxies and their dark matter hosts with simulations and derived model posterior constraints.*
- *Accelerated Monte Carlo sampling by 1000× with Gaussian Process-based surrogate models.*
- *Extensive experiences with Python, parallel programming, and ML packages such as PyTorch and scikit-learn.*

EDUCATION

Harvard University *September 2016 - May 2021*
Ph.D. Astronomy and Astrophysics GPA: 3.96/4.00

- *Relevant coursework: Stochastic Methods for Data Analysis, Inference and Optimization; Noise and Data Analysis in Astrophysics; Computing Foundations for Computational Science.*

Princeton University *September 2012 - May 2016*
A.B. Astrophysical Sciences GPA: 3.95/4.00

- *Honors: summa cum laude, Phi Beta Kappa, Sigma Xi Book Award, Shapiro Prize For Academic Excellence*
- *Relevant coursework: Numerical Methods; Complex Analysis with Applications; Algorithms and Data Structures; Fundamentals of Statistics; Differential Equations.*

TECHNICAL SKILLS

Data Analysis	Bayesian inference, causal inference, optimization, regression, clustering.
Machine Learning	Generative models (LLMs, flows, diffusion), deep learning, PyTorch, JAX.
Programming	Expertise in Python, bash. Proficient in Java, C++, Julia, Git, SQL.
Languages	Mandarin (Native), English (Bilingual)

SERVICE & IMPACT

- Co-Investigator on James Webb Space Telescope Cycle 3 proposal 5907, *Stanford, CA* 2024
- Mentor to 2 Stanford graduate students and 1 undergrad, *Stanford, CA* 2024
- Working group chair in the Dark Energy Spectroscopic Instrument Collaboration, *Stanford, CA* 2022-2024
- KIPAC Diversity Equity & Inclusion Committee, *Stanford University* 2022-Present
- Journal Referee, *MNRAS, ApJ* 2020-Present
- Treasurer/Co-Founder, Open Labs At Harvard, *Harvard University* 2017-2018

SELECTED PUBLICATIONS

8 out of 50+ (16 first authored papers)

1. *Robust cosmological inference from non-linear scales with k -th nearest neighbor statistics*
S. Yuan, T. Abel, and R. H. Wechsler, 2024, MNRAS, 527 (2), 1993-2009 ([arXiv](#))
2. *Precise Cosmological Constraints from BOSS Galaxy Clustering with a Simulation-Based Emulator of the Wavelet Scattering Transform*
G. Valogiannis, **S. Yuan**, C. Dvorkin, 2023, Phys. Rev. D, submitted ([arXiv](#))
3. *SUNBIRD: A simulation-based model for full-shape density-split clustering*
C. Cuesta-Lazaro, E. Paillas, **S. Yuan**, et al., 2023, MNRAS, submitted ([arXiv](#))
4. *DESI 2024 VI: Cosmological Constraints from the Measurements of Baryon Acoustic Oscillations*
DESI Collaboration including **S. Yuan**, 2024, JCAP, submitted ([arXiv](#))
5. *2D k -th nearest neighbor statistics: a highly informative probe of galaxy clustering*
S. Yuan, A. Zamora, T. Abel, 2023, MNRAS, 522 (3), 3935-3947 ([arXiv](#))
6. *Stringent σ_8 constraints from small-scale galaxy clustering using a hybrid MCMC+emulator framework*
S. Yuan, L. H. Garrison, D. J. Eisenstein, and R. H. Wechsler, 2022, MNRAS, 515 (1), 871-896 ([arXiv](#))
7. *AbacusHOD: A highly efficient extended multi-tracer HOD framework and its application to BOSS and eBOSS data*
S. Yuan, L. H. Garrison, B. Hadzhiyska, S. Bose, and D. J. Eisenstein, 2022, MNRAS, 510 (3): 3301-3320 ([arXiv](#))
8. *A Hybrid Deep Learning Approach to Cosmological Constraints From Galaxy Redshift Surveys*
M. Ntampaka, D. J. Eisenstein, **S. Yuan**, and L. H. Garrison, 2020, ApJ, 889 (2): 151-166 ([arXiv](#))

NOTABLE RECENT TALKS

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|---|---------------|
| Public Lecture, Stanford | February 2024 |
| SLAC Theory Seminar, SLAC, Stanford | December 2023 |
| DESI Special Presentation, AAS Meeting, Seattle | January 2023 |
| Theoretical Astrophysics & Cosmology Seminar, University of Arizona, Tucson | April 2022 |