SIHAN (SANDY) YUAN

San Francisco Bay, CA | US Permanent Resident

sihany@stanford.edu | Professional Website | Google Scholar | LinkedIn

WHO AM I

- Experienced **researcher**: 50+ refereed publications (16 first authored), and 1200+ citations (h-index 19).
- Strong **coder**: 10+ years of Python exp., co-led the development of a popular open source package.
- Excellent **problem solver**: Gold Medal in Asia Physics Olympiad (highest score). Chinese National Team (8th amongst 100,000+ participants).
- Proven **leader**: chaired 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

- *Currently building a normalizing flow+diffusion based framework for generating realistic galaxies.*
- *Leveraging contrastive learning to train a joint embedding space for multi-modal image and spectral data.*
- *Implemented a simulation-based inference pipeline with trillion-particle simulations and k-th nearest neighbor statistics to derive the strongest dark energy constraints.*
- *Devised key cross-validation tests to assess the robustness of our model predictions.*
- *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

- *Worked on the technicals team.*

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

- *Constructed novel clustering statistics for pattern/feature detection in million-object datasets.*
- *Modeled large datasets with neural networks and derived posterior constraints in a Bayesian framework.*
- *Drastically accelerated MCMC sampling 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	Inference (Bayesian inference, simulation-based inference, causal inference), optimization, regression, sampling, clustering, deep learning/generative AI.
Programming	Expertise in Python (NumPy, PyTorch, numba), bash, HPC, parallel programming. Proficient in Java, C++, Julia, Git. Familiarity with 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
- 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

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