

XIAOSHENG ZHAO

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+33 0779117664 \diamond Paris, France

EDUCATION & EXPERIENCE

Tsinghua University, China

Sep 2018 - Jun 2024

PhD in Astronomy

Thesis title: Explore the cosmic dawn and the epoch of reionization with machine learning

Institut d'Astrophysique de Paris (IAP), France.

Nov 2022 - May 2024

Visitor

Wuhan University, China

Sep 2014 - Jun 2018

BS in Physics

RESEARCH INTERESTS

I am interested in interactions between machine learning (ML) techniques and astrophysics/cosmology, to understand the origin, content, and evolution of our universe. Currently, my research interests mainly focus on cosmological inference from (synergies of multi-modal) cosmological probes with the aid of ML. Broadly, my research interests include but are not limited to, implicit-likelihood (or simulation-based) inference from the 3D fields, generative modeling as an alternative to cosmological simulations, geometric ML for large-scale surveys, interpretable ML, and automatic knowledge discovery by symbolic regression from multi-modal information of the universe.

AWARDS

Comprehensive Scholarship (First-class)

2021 - 2022

(University-level scholarship)

AMD Scholarship

2020 - 2021

(Top scholarship awarded to two graduate students in the department per year)

Future Scholar Scholarship of Tsinghua University

2018

(University-level scholarship)

National Scholarship

2015 - 2016

TALKS & PRESENTATIONS (SELECTED)

Astro Coffee

Sept 2023

Informal talk: *Can Diffusion Model Conditionally Generate Astrophysical Images?*

IAS

Understanding the epoch of reionization

Mar 2023

Contributed talk: *Implicit Likelihood Inference of Reionization Parameters from 21 cm Power Spectrum and solid harmonic wavelet scattering coefficients*

Sexten, Italy

SAZERAC 21cm 2022

Mar 2022

Contributed talk: *Implicit Likelihood Inference of Reionization Parameters from the 21 cm Power Spectrum*

Virtual

SAZERAC SIP, learning the high-redshift universe

Feb 2022

Contributed talk: *Simulation Based Inference of Reionization Parameters From*

Virtual

3D Tomographic 21 cm Lightcone Images

SKA CD/EoR Science Telecon

Contributed talk: *Simulation Based Inference of Reionization Parameters From 3D Tomographic 21 cm Images*

July 2021

Virtual

HERA telecon

Invited talk: *Simulation Based Inference of Reionization Parameters From 3D Tomographic 21 cm Images*

Jun 2021

UC, Berkeley

SKILLS

Coding languages: {Python, Jax} (Fluent), {C, Shell, html&CSS} (Basic)

General: Data science and Machine learning application with Pandas, Scikit-learn, Tensorflow and Pytorch.

TRAINING AND SUMMER SCHOOL

Big Data Capability Enhancement Project

Courses: *e.g. big data system, big data analysis, big data application*

Big-data challenge: *Multi-modal short-video classification*

Sep 2021 - July 2022

Tsinghua University

Chinese Survey Space Telescope (CSST) summer school

Got certification of data processing practice

July 2022

Peking University

OUTREACH & SERVICE

I am a member of [Simons Foundation on Learning the Universe \(LtU\)](#)

I organized the [machine learning session](#) at DoA, Tsinghua.

I co-organized the joint machine learning session among DoA (Tsinghua), JBCA (Manchester) and SKAO.

Jul 2023 - Present

Mar 2021 - Mar 2022

Oct 2021 - Mar 2022

MENTORING & TEACHING EXPERIENCE

Teaching Assistant in undergraduate *Physics* course.

Feb - Jun 2019

REFERENCES

Prof. Yi Mao, Tsinghua University

ymao@mail.tsinghua.edu.cn

Prof. Benjamin D. Wandelt, Sorbonne Université & Flatiron Institute

bwandelt@iap.fr

Prof. Yuan-Sen Ting,

Australian National University & The Ohio State University

yuan-sen.ting@anu.edu.au

PUBLICATION

Refereed (first author, 56 cited from ads)

[Can Diffusion Model Conditionally Generate Astrophysical Images?](#) (5 cited)

Xiaosheng Zhao; Yuan-Sen Ting; Kangning Diao; Yi Mao

2023, MNRAS, 526, 1699

[Implicit Likelihood Inference of Reionization Parameters from the 21 cm Power Spectrum](#) (18 cited)

Xiaosheng Zhao; Yi Mao; Benjamin D. Wandelt

2022, ApJ, 933, 236

[Simulation-Based Inference of Reionization Parameters From 3D Tomographic 21 cm Lightcone Images.](#) (33 cited)

Xiaosheng Zhao; Yi Mao; Cheng Cheng ; Benjamin D. Wandelt
2022, ApJ, 926, 151

Conference proceedings

[3D ScatterNet: Inference from 21 cm Light-cones](#)

Xiaosheng Zhao; Shifan Zuo; Yi Mao
2023, ICML 2023 Workshop on Machine Learning for Astrophysics

[Evaluating Summary Statistics with Mutual Information for Cosmological Inference.](#)

Ce Sui; **Xiaosheng Zhao**; Tao Jing; Yi Mao
2023, ICML 2023 Workshop on Machine Learning for Astrophysics

Under review

[Simulation-based Inference of Reionization Parameters from 3D Tomographic 21 cm Light-cone Images - II: Application of Solid Harmonic Wavelet Scattering Transform.](#)

Xiaosheng Zhao; Yi Mao; Shifan Zuo; Benjamin D. Wandelt
2023, Submitted to ApJ, a more detailed complement to the accepted ICML paper “3D ScatterNet: Inference from 21 cm Light-cones”.

[Information-Ordered Bottlenecks for Adaptive Semantic Compression.](#)

Matthew Ho; **Xiaosheng Zhao**; Benjamin D. Wandelt
2023, submitted to The International Conference on Learning Representations (ICLR) 2024.