Kangning Diao

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Education

Tsinghua University *Sept 2020 – Oct 2025 (est.)*
Ph.D. Student, Department of Astronomy

- **Advised by:** Prof. Yi Mao
- **Research interest:**

  Astronomy: Cosmology, 21 cm line, Reionization, Galactic Synchrotron, Weak lensing;

  Statistics: Differentiable simulations, Application and validation of ML models, Fast sampling methods.

University of California, Berkeley *Jan 2024 – June 2025*
Visiting Student, Berkeley Center for Cosmological Physics

- **Hosted by:** Prof. Uros Seljak

Tsinghua University *Sept 2016 – June 2020*
BS in Physics

Awards

First class comprehensive scholarship funded by Xiaomi, Tsinghua University *2023-2024*

Second class comprehensive scholarship funded by Xiaomi, Tsinghua University *2022-2023*

Outstanding teaching assistant, Department of Physics, Tsinghua University *2022-2023*

Publications

First Author

Kangning Diao, Zack Li, Richard D.P. Grumitt, Yi Mao. ***synax:*** *A Differentiable and GPU-accelerated Synchrotron Simulation Package.* Submitted to ApJS. arXiv: 2410.01136 Repo:

Kangning Diao, Richard D.P. Grumitt, Yi Mao. *Modeling Foreground Spatial Variations for 21 cm Gaussian Process Component Separation.* Submitted to ApJ. arXiv: 2407.11296 Repo:

Kangning Diao, Zhaoting Chen, Xuelei Chen, Yi Mao. *Reionization Parameter Inference from 3D Minkowski Functionals of the 21 cm Signals.* 2024, ApJ, 974, 141. arXiv: 2406.20058

Kangning Diao, Yi Mao. *Multi-fidelity Emulator for Cosmological Large Scale 21 cm Lightcone Images: a Few-shot Transfer Learning Approach with GAN.* ICML 2023 Machine Learning for Astrophysics workshop. arXiv: 2307.04976 Full version submitted to ApJ arXiv: 2502.04246 Repo:

Kangning Diao, Biwei Dai, Uros Seljak. *Detecting Out-of-Distribution with Continuous Time Flow Models on Weak Lensing Maps.* In Prep.

Others

Xiaosheng Zhao, Yuan-Sen Ting, **Kangning Diao**, Yi Mao. *Can Diffusion Model Conditionally Generate Astrophysical Images?* 2023, MNRAS, 526, 1699 arXiv: 2307.09568
Contribution: provided the GAN baseline, prepared dataset, and wrote paper.

Talks

Seminars

KIPAC Tea Talk, Stanford University *Jan. 2025*

Cosmology Lunch, Princeton University *Dec. 2024*

AstroAI Seminar, Harvard University *Oct. 2024*
Lunar Science Meeting, UC Berkeley *Sept. 2024*
Galaxy & Cosmology seminar, Tsinghua University *June. 2023*

Contributed

HI as a Cosmological Probe Conference, Nazareth, Israel *May 2023*
Global 21cm Workshop, Berkeley, U.S. *Oct 2022*
SAZERAC 21cm 2022, Virtual *May 2022*

Posters

Computing senses Cosmos, Hangzhou, China *Oct 2023*
ICML 2023 ML4Astro workshop, Hawaii, U.S. *Aug 2023*

Others

ML Session, *Introduction to Gradient Based Sampling methods*, Tsinghua University, China *Dec 2023*
ML Session, *A Quickstart for Parallel Computing with* `JAX`, Tsinghua University, China *Dec 2022*

References

Prof. Yi Mao, Tsinghua University, Beijing, China. *ymao@tsinghua.edu.cn*
Prof. Uros Seljak, UC Berkeley, Berkeley, U.S. *useljak@berkeley.edu*
Prof. Xuelei Chen, NAOC, Beijing, China. *xuelei@cosmology.bao.ac.cn*
Dr. Zack Li, UC Berkeley, Berkeley, U.S. *zackli@berkeley.edu*

Teaching Experience

Analytical Mechanics, Teaching Assistant *Fall 2022*
General Relativity, Teaching Assistant *Spring 2022*
Applications of General Relativity, Teaching Assistant *Fall 2021*
General Relativity, Teaching Assistant *Spring 2021*
General Physics I: Mechanics and Special Relativity, Teaching Assistant *Fall 2020*

Service & Outreach

Organizer of Machine Learning Session, DoA, Tsinghua *2022-2023*
Coach & Organizer of Tsinghua Student Taekwondo Association *2020-2021*
Captain of Tsinghua Taekwondo Team *2017-2018*