Kangning Diao

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1999-08

EDUCATION

Tsinghua University Aug 2020 - Jun 2023

Astronomy Doctor

Advisor: Prof. Yi Mao

Research interest:

Epoch of Reionization (EoR) physics: differentiable model, foreground removal based on machine learning (ML)

Astrostats: non-Gaussian statistics, ML-aided Bayesian inference

Tsinghua University Aug 2016 - Jun 2020

Physics Bachelor

RESEARCH EXPERIENCE

Multi-fidelity emulation of 21 cm simulations with GAN Apr 2022

- We generated 30000 small-scale EoR simulations and 100 large-scale simulations with open-source software 21cmFAST.
- We trained a styleGAN2-based GAN with small-scale images.
- We transfer the GAN to the large-scale images, preserving the statistical distribution.
- Preliminary results show our GAN works well with <80 large-scale simulations, especially recovered large-scale correlations.
- We try to make it generates more kind of physical fields now.

Epoch of Reionization Parameter Inference with 21cm 3D Minkowski Functionals Jan 2021 - Present

- We simulated the 21 cm signal observed by next-generation radio telescopes.
- We calculated the 3D Minkowski fuctionals (MFs) and explained the impact of observational effects.
- Using the MFs as our summary statistics, we run MCMC to get the constraining power of MFs.
- MFs are comparable to the traditional power spectrum on a large scale. Combining MFs and power spectrum tends to give better results.
- Gave a recorded talk on SAZERAC 21 cm 2022

21 cm Foreground Separation with hierarchical Gaussian Process Nov 2022 - Present

- Traditional Gaussian process assumes hyper-parameters to be global, which contradicts the reality
- We designed a Multi-platform workflow, powered by JAX
- We assume the hyperparameters in each pixel are drawn from the same distribution
- Our method outperforms the traditional GP on simulated MeerKAT-like survey data

LEADERSHIP EXPERIENCE

Class Physics 62

Class President

Taekwondo team of Tsinghua University

Team Leader

SKILLS LIST

- Programming: C/C++, Python, Java
- Language: Chinese, English
- Hobbies: Guitar, Basketball, Photograph, Work out

Courses

Courses

Physical Cosmology B

Advanced Observational Astrophysics B+

Statistics and Numerical Methods B-

Introduction to Dialectics of Nature B+

Radiative Processes in Astrophysics B

Stellar Physics A-

Institutional Buy-side Investment in China A

Chinese Marxism and Contemporary World A-

English for Doctoral Students B

Galactic Physics A-

Comprehensive Examination in the Major Field A

Special Topics in Theoretical Astrophysics P