

# Weixuan Pan

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## EDUCATION

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**Guangzhou University**, BS in Astronomy

Sept. 2022 – Jul. 2026

- GPA: 3.48/4.0 (Average: 88.58/100)
- Research Interests: Galaxy Formation and Evolution, Structure Formation, Machine Learning
- Thesis: Evolution and Disk Stability of Milky Way-like Galaxies with Different Dark-Matter Halo Properties (in progress)

## RESEARCH EXPERIENCES

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**Effects of Dark-Matter Halo Properties on the Stability of Disk Galaxies**

Jul. 2025 – Present

*Undergrad Researcher | Advisor: Dr. Shi Shao, National Astronomical Observatories*

- Generated baseline Milky Way-like galaxy initial conditions using GALIC, establishing a stable reference model for subsequent parameter studies.
- Conducted 5 Gyr N-body simulations with GADGET-4, varying halo concentration, spin and shape.
- Computed Toomre Q, disk scale height and velocity dispersions to assess disk stability using Pynbody.

**Dust Attenuation Fitting and Analysis**

May 2025 – Present

*Undergrad Researcher | Advisor: Dr. Yewei Mao, Guangzhou University*

- Developed a Python pipeline for SED fitting of M81 using 17-band photometric data  $\chi^2$  minimization across 3 attenuation curves, with Milky Way model performing better, suggesting M81's very weak UV bump features.
- Performed Bayesian SED fitting of M81 using BAGPIPES program, evaluating Salim dust model with and without bump parameters, finding Bayesian evidence supports the no-bump model with  $\Delta \ln Z = -1.539 \pm 0.273$ .
- Characterized weak photometric constraints on M81's UV bump strength, with different statistical approaches producing uncertain conclusions about dust attenuation properties.

**Analysis on Numerical Simulation of Large-Scale Structure**

Sept. 2024 – Jun. 2025

*Undergrad Researcher | Advisor: Dr. Qiao Wang, National Astronomical Observatories*

- Investigated the effects of  $\Omega_b h^2$ ,  $\Omega_c h^2$  and  $A_s$  on the matter power spectrum using CAMB, revealing medium-scale BAO features, strong CDM scale dependence, and overall amplitude modulation across cosmic scales.
- Employed FoF algorithm to identify 2 million dark matter halo structures from N-body simulation snapshot ( $50 h^{-1}$  Mpc box size).
- Utilized Colossus and Halotools libraries to study halo statistics, revealing systematic biases in Press-Schechter mass functions and quantifying spatial clustering to provide observational constraints for structure formation.
- Completed a report about the project: [Analysis on Numerical Simulation of Large-Scale Structure](#)

## Identification and Observation of Blue Straggler Stars in COIN-Gaia 11

Nov. 2024 – Mar. 2025

Team Member | Advisor: Dr. Feng Wang, Guangzhou University

- Applied Density-Based Spatial Clustering of Applications with Noise (DBSCAN) clustering algorithm to Gaia DR3 data, identifying potential member stars of open cluster COIN-Gaia 11 after field star removal.
- Determined main sequence turn-off (MSTO) position using empirical color distribution analysis on color-magnitude diagram, classifying cluster members into main sequence (MS) and MSTO populations.
- Selected stars bluer and brighter than the MSTO in the CMD, detecting blue straggler star candidates.
- Formulated observational proposal and secured 3-night telescope allocation at 85cm telescope in Xinglong Observatory for photometric monitoring, acquiring light curves for 5 BSS candidates.

## Spectroscopy of one H II region in the external galaxy NGC 0925

May 2024 – Nov. 2024

Undergrad Researcher | Advisor: Dr. Yewei Mao, Guangzhou University

- Processed 2D FITS spectral data to extract calibrated 1D spectra using PyRAF system.
- Extracted fluxes of 10 emission lines ( $H\beta$ ,  $[OIII] \lambda 4959$ , etc.) from the corrected spectra using CCM extinction law and Gaussian profile fitting.
- Calculated dust attenuation (0.630 mag), star formation rate ( $0.019 M_{\odot} \text{ yr}^{-1}$ ), and oxygen abundance (8.293 dex) of the H II region.

## ACADEMIC PROJECTS

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### Galaxy Classification using Machine Learning

Apr. 2025 – May 2025

Advisor: Dr. Feng Wang, Guangzhou University

- Built an RNN classifier in PyTorch to categorize galaxy spectra, processing 6,000 samples across 3 spectral categories, achieving an accuracy improvement from 72% to 83%.
- Designed a CNN model in PyTorch to classify galaxy images into 7 morphological categories, assessing 5 input modes (RGB, grayscale, and individual R/G/B channels) and determining the blue channel performed best.

### Radio Astronomy Data Processing

Dec. 2024

Advisor: Jin Wang, Laboratory Instructor, Guangzhou University

- Executed baseline correction and Gaussian fitting with GILDAS on 4 CS isotopologue transitions ( $C^{32}S$ ,  $C^{33}S$ ,  $C^{34}S$ ,  $^{13}CS$  2-1 lines) at 3 galactic positions, demonstrating strong signals for all lines at G010.32.30 and weaker  $C^{33}S$  detection at G000.31.30 and G017.63.30 positions.
- Converted 3D cube data of Orion A region to 2D intensity maps using GILDAS, revealing centrally-peaked molecular gas distribution with radial intensity gradient.

## CONFERENCES AND PRESENTATIONS

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### Effects of Dark-Matter Halo Properties on the Stability of Disk Galaxies

Dec. 2025 (Upcoming)

Guangzhou University Undergraduates Research Symposium

Guangzhou, Guangdong Province

### Dust Attenuation Fitting and Analysis

Jul. 2025

Guangzhou University Undergraduates Research Symposium

Guangzhou, Guangdong Province

## EXTRA-CURRICULAR ACTIVITIES

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### Shenzhen International Dark Sky Community Field Program

May 2024

*Research Trainee*

- Measured night sky light of dark sky community employing monitoring instrument.
- Delivered astronomy education on basic principles of astronomical observations to residents and tourists, enhancing their appreciation of dark sky community and fostering greater public interest in astronomy development.

### Astronomy Dilettantes Association of Guangzhou University

2022 – 2024

*Director of Science and Technology Department*

- Organized "Sidewalk Astronomy" outreach activities to demonstrate telescope operations and interpret astronomy concepts to the public, inspiring potential astronomy enthusiasts.
- Served as judge for the 18th Guangdong Province Astronomy Olympiad semi-finals, evaluating contestants on telescope assembly and observational performance.

## HONORS AND AWARDS

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Third-Class Comprehensive Scholarship, Guangzhou University (¥1000)	2025
Outstanding Staff of the Astronomy Dilettantes Association	2024
Third-Class Comprehensive Scholarship, Guangzhou University (¥1000)	2023

## SKILLS & LANGUAGES

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**Programming:** Python, C/C++, PyTorch, HTML

**Professional Codes:** GADGET-4, GALIC, Pynbody, Colossus, Halotools, Bagpipes, Pyraf, GILDAS

**Languages:** English (IELTS: 6.5), Mandarin (Native), Cantonese (Native)