

# Weixuan Pan

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## EDUCATION

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<b>Guangzhou University</b> , BS in Astronomy	Sept. 2022 – Jul. 2026
<ul style="list-style-type: none"><li>• GPA: 3.48/4.0</li><li>• Research Interests: Baryon Physics, Galaxy-Halo Connection, Large-Scale Structure</li><li>• Thesis: Effect of Dark Matter Halo Properties on Disk Stability in Galaxies (manuscript in preparation)</li></ul>	
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<b>RESEARCH EXPERIENCES</b>	

<b>Effect of Dark Matter Halo Properties on Disk Stability</b>	Jul. 2025 – Present
<i>Undergrad Researcher   Advisor: Dr. Shi Shao, National Astronomical Observatories</i>	
<ul style="list-style-type: none"><li>• Generated galaxy initial conditions for MW-mass halo using GALIC, varying halo concentration, spin, and shape.</li><li>• Conducted 10 Gyr collisionless N-body simulations with GADGET-4.</li><li>• Wrote scripts to compute stability diagnostics, such as Toomre Q and bar strength.</li></ul>	

<b>Dust Attenuation Fitting and Analysis</b>	May 2025 – Present
<i>Undergrad Researcher   Advisor: Dr. Yewei Mao, Guangzhou University</i>	
<ul style="list-style-type: none"><li>• Developed a Python pipeline for SED fitting of M81 using 17-band photometric data and <math>\chi^2</math> minimization across 3 attenuation curves, with Milky Way model performing better, suggesting M81's very weak UV bump features.</li><li>• 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 <math>\Delta \ln Z = -1.539 \pm 0.273</math>.</li><li>• Characterized global weak photometric constraints on M81's UV bump strength, with different statistical approaches producing uncertain conclusions about dust attenuation properties.</li></ul>	

<b>Analysis on Numerical Simulation of Large-Scale Structure</b>	Sept. 2024 – Jun. 2025
<i>Undergrad Researcher   Advisor: Dr. Qiao Wang, National Astronomical Observatories</i>	
<ul style="list-style-type: none"><li>• Investigated the effects of <math>\Omega_b h^2</math>, <math>\Omega_c h^2</math> and <math>A_s</math> on the matter power spectrum using CAMB, revealing medium-scale BAO features, strong CDM scale dependence, and overall amplitude modulation across cosmic scales.</li><li>• Employed FoF algorithm to identify 2 million dark matter halo structures from N-body simulation snapshot (<math>50 h^{-1}</math> Mpc box size).</li><li>• 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.</li><li>• Completed a report about the project: <i>Analysis on Numerical Simulation of Large-Scale Structure</i></li></ul>	

## **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 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 ( $H\alpha$ , [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*

- Learned how to connect to remote computing resources.
- 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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### **Effect of Dark Matter Halo Properties on Disk Stability**

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 lectures on basic principles of astronomical observations, helping residents and tourists appreciate the significance of dark sky community.

### Astronomy Dilettantes Association of Guangzhou University

2022 – 2024

#### *Director of Science and Technology Department*

- Organized outreach events such as stargazing nights, public lectures, and guided tours, showcasing facilities and telescopes on campus.
- 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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Guangzhou University Comprehensive Scholarship (¥1000)

2025

Outstanding Staff of the Astronomy Dilettantes Association

2024

Guangzhou University Comprehensive Scholarship (¥1000)

2023

## SKILLS & LANGUAGES

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

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

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