

# Jinning LIANG

Wuhan University, Wuhan, 430000, P. R. China

(+86) 189 - 7728 - 5216      jinning.liang@durham.ac.uk

ORCID ID: 0000-0001-8405-2921

Personal Website: [jinningliang.com](http://jinningliang.com)

## EDUCATION

<b>The Institute for Computational Cosmology, Durham University</b> <i>Ph.D. in Physics, Advisor: Prof. Cedric Lacey</i>	Oct 2023 - Present
<b>School of Physics and Technology, Wuhan University (WHU)</b> <i>Bachelor of Science in Physics</i>	Sep 2019 - Jun 2023
➤ <b>Astronomy Class</b> (Selected from pool of 280 students due to outstanding performance and enthusiasm for astronomy)	Sep 2020 - Jun 2023
➤ <b>GPA: 3.79/4.00; 90.12/100; Ranking: 1/196</b>	
➤ <b>Core coursework and Grades:</b> Fluid Mechanics (98), Thermodynamics and Statistical Physics (98), Machine Learning (96), Computational Physics (95)	
<b>The Kavli Institute for Astronomy and Astrophysics, Peking University</b> <i>Visiting Scholar</i>	Mar 2023 - Apr 2023
<b>Department of Astronomy, Peking University</b> <i>CSST-Galaxies Observation Summer School Student</i>	Jul 2022
<b>Shanghai Academic Observatory (SHAO)</b> <i>Visiting Scholar</i>	Jan 2022 - Feb 2022

## PUBLICATIONS

- [1] **Constrain the Dark Matter Distribution of Ultra-diffuse Galaxies with Globular-Cluster Mass Segregation: A Case Study with NGC5846-UDG1**  
Jinning Liang, Fangzhou Jiang et al.,  
Submitted to ApJ, 2023, <https://arxiv.org/abs/2304.14431>
- [2] **The Dynamics and Structure of Massive Galaxies in Cosmological Simulation**  
Jinning Liang, H.J. Mo et al.,  
In preparation, 2023
- [3] **Assessing stellar yields in Galaxy chemical evolution: benchmark on observational stellar abundance patterns,**  
Jinning Liang, E. Gjergo & X. Fan,  
*Monthly Notices of the Royal Astronomical Society*, Apr 2023, <https://doi.org/10.1093/mnras/stad1013>
- [4] **Deflection and Gravitational lensing of null and timelike signals in the Kiselev black hole spacetime in the weak field limit**  
H. Liu (co-first author), Jinning Liang (co-first author) & J. Jia,  
*Classical and Quantum Gravity*, Volume 39, Number 19, Sep 2022, <https://doi.org/10.1088/1361-6382/ac8b56>
- [5] **GalCEM I - A Publicly-Available Detailed Isotopic Chemical Evolution Code**  
E. Gjergo, A.G. Sorokin, A. Ruth, E. Spitoni, F. Matteucci, X. Fan, Jinning Liang et al.,  
*The Astrophysical Journal Supplement*, Volume 264, Issue 2, id.44, 22 pp. Feb 2023,  
<https://doi.org/10.3847/1538-4365/aca7c7>

## RESEARCH EXPERIENCE

- Evolution of Globular-Clusters in Ultra-Diffuse Galaxies with *SatGen*** | Peking University | Research Assistant  
Apr 2022 - Present  
Advisor: Fangzhou Jiang, Assistant Professor at Peking University
- Developed a physical model of the dynamical evolution of globular clusters in the semi-analytical simulation *SatGen*
  - Created a practical and simplified stellar density profile to fit stellar density profile of NGC5846-UDG1
  - Applied novel model to the Milky Way and NGC5846-UDG1 and compared results to observational globular-clusters data
  - Tested parameter degeneracy and constrained parameters of dark matter halo of UDG1 using Markov Chain Monte Carlo in multiprocessing

**Invited Talk (online):** University of Arizona  
**Title:** Globular Clusters in UDGs

- Investigation of Massive Galaxy Dynamics in *IllustrisTNG100*** | UMass | Research Assistant  
Mar 2022 - Present  
Advisor: Houjun Mo, Professor at University of Massachusetts Amherst
- Performed gaussian mixture model to decompose structures of massive galaxies ( $>10^{11}M_{\odot}$ ) in *IllustrisTNG100* into halos, bulges and disks

- Performed principal component analysis to dynamical, age and metallicity distribution of stellar particles of massive galaxies in different structures and reconstructed them
- Generated a dynamical template for massive galaxies based on eigenvectors of principal component analysis with a series of principal components as parameters

**Formation of Galaxies through Galaxy Merger and Galaxy Falling in *IllustrisTNG100*** | SHAO | Research Assistant  
Jul 2021 - Feb 2022

Advisor: Ling Zhu, Researcher at Shanghai Academic Observatory

- Investigated kinematics, age and metallicity distributions for galaxies and clusters in *IllustrisTNG100*
- Studied the mass-dependent relation between the galaxy infall time and merger time with merger tree and stellar assembly histories for galaxies in *IllustrisTNG100*

**Galaxy Chemical Evolution through Yields Analysis in *NuPyCEE*** | WHU | Research Assistant Feb 2021 - May 2022

Advisors: Xilong Fan, Professor at Center of Astrophysics, School of Physics and Technology, WHU;

Eda Gjergo, Postdoc at Center of Astrophysics, School of Physics and Technology, WHU

- Ran GCE simulation *NuPyCEE* for the Milky Way and analyzed the effect of different stellar yields on the simulation
- Proposed a new statistical method for characterizing the comparison of data with theoretical prescriptions from the results of GCE simulation
- Categorized sixteen stellar yields tables into three stellar yields groups according to their physical background
- Accomplished extensive overview and comparison of sixteen collected current stellar yields tables for the first time
- Obtained abundance ratios in the Milky Way and nearby dwarf galaxies for both the *GalCEM* simulation and for this project

**Conference Presentation Talk:** **ISM Physics and Chemistry Seminar**

**Title:** Galactic stellar abundance scatter investigated through yield analysis in galaxy chemical evolution

Yichang, Hubei Province, China

Aug 2022

**Gravitational Lensing Calculation in Kiselev Black Hole Spacetime** | WHU | Research Assistant Jul 2020 - Apr 2022

Advisor: Junji Jia, Associate Professor at Center of Astrophysics, School of Physics and Technology, WHU

- Calculated the deflection angle and total flight time of weak gravitational lensing with a perturbative method
- Solved the lensing equations in the Kiselev black hole spacetime with a perturbative method to obtain impact parameters, apparent angle, magnification and time delay
- Analyzed parameters ( $\alpha$ ,  $\omega$ ) dependence in Kiselev black hole spacetime on deflection angle, apparent angle, magnification and time delay

## SELECTED PROJECT EXPERIENCES

**Unsinkable Disk** | WHU | Team Leader

Contest: China Undergraduate Physics Tournament

Feb 2022 - Mar 2022

- Built a hydrodynamical model for hydraulic jump and studied how the height and radius of hydraulic jump affect the pressure gradient force

**Power Profile of a Cyclist** | WHU | Team Programmer

Contest: Mathematical Contest in Modeling/Interdisciplinary Contest in Modeling

18<sup>th</sup> - 22<sup>th</sup>, Feb 2022

- Built parametrized power output equations and power profile for various types of cyclists
- Proposed and solved the decision optimization model via Monte Carlo to provide suggestions to cyclists, specifically for the real race in Tokyo, Flanders and for the simulated race

**Saxon Bowl** | WHU | Team Leader

Contest: China Undergraduate Physics Tournament

Jan 2020 - Jul 2020

- Built a hydrodynamical model and studied how the mass, heights and diameters of Saxon Bowl influence falling time

## SELECTED HONORS AND AWARDS

Yu Gang - Song Xiao Scholarship of Wuhan University	45/30000	2022
First-class Scholarship of Wuhan University	Top 5%	2022
MCM&ICM Finalist Award	Top 2%	2022
National Astronomical Observatories Scholarship	3/600	2021
Second-class Scholarship of Wuhan University	Top 10%	2021/2020

## **LEADERSHIP AND ACTIVITIES**

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**Student Union** | School of Physics and Technology, WHU | Vice Minister in Secretary Department      Sep 2019 - Sep 2021

➤ Took charge of Student Union Training for different departments and was awarded excellent ministry

**Enrollment Office** | WHU | Admissions Assistant      Jul 2020 - Aug 2021

➤ Led a team in the enrollment and worked with teachers in the WHU Enrollment Office to assist in enrollment

## **SKILLS**

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Programming Languages & Software: Python (Extensively), Mathematica (Extensively), Matlab and LaTeX

Language: Mandarin (native), English (TOEFL 103)

Simulation Packages: *IllustrisTNG*, *EAGLE*, *NuPyCEE* and *SatGen*