

Bonny Y. Wang (Yue Wang)

Email: yuew7@andrew.cmu.edu
Website: <https://bonnywang.github.io/#/Academic>

Research Interests

Computational astrophysics, cosmology, large scale structures, galaxy formation, numerical simulation

Educations

Carnegie Mellon University, Pittsburgh, PA

Master of Entertainment Technology

Projected May 2025

The Cooper Union, New York, NY

Master of Engineering, Electrical Engineering (Computer Engineering Track)

2022 - 2023

Thesis: Exploring Cosmology and Cosmic Voids Using Graph Neural Networks and Symbolic Regression

Bachelor of Engineering, Electrical Engineering (Computer Engineering Track)

2018 - 2022

Publications

Cosmology from one galaxy in a void?

Published in *The Astrophysical Journal Letters*

JULY 2024

[Bonny Y. Wang](#), Alice Pisani

- Compared the constraining power on the cosmological parameter Ω_m between random galaxies and void galaxies; showed void galaxies may have a cleaner connection to cosmology

Machine-learning cosmology from void properties

Published in *The Astrophysical Journal*

SEP 2023

[Bonny Y. Wang](#), Alice Pisani, Francisco Villaescusa-Navarro, Benjamin D. Wandelt

- Researched three properties of cosmic voids: ellipticity, density contrast, and radius; Trained two different types of machine learning models to constrain the values of three cosmological parameters (Ω_m , σ_8 , and n_s)

Confined tumbling state as the origin of the excess of slowly rotating asteroids

Accepted by *Nature Astronomy*

SEP 2024

Wen-Han Zhou, Patrick Michel, Marco Delbo, Wenchao Wang, [Bonny Y. Wang](#), Josef Durech, Josef Hanu

- Worked on the identification of the gap in the Gaia asteroid data by a semi-supervised machine-learning method to facilitate the results from the main theoretical model of the paper

Introducing the DREAMS Project: DaRk mattEr and Astrophysics with Machine learning and Simulations

Submitted to *The Astrophysical Journal*

SEP 2023

Jonah C. Rose, Paul Torrey, Francisco Villaescusa-Navarro, Mariangela Lisanti, ... [Bonny Y. Wang](#), et al.

- Core team member of [the DREAMS project](#); working on warm dark matter prediction with machine learning

In Preparation:

LISA massive black hole mergers prediction from the ASTRID Simulation

[Bonny Y. Wang](#), William Chen, Nianyi Chen, Yihao Zhou, Tiziana Di Matteo, Rupert Croft

Cluster dynamic mass correction with set-based neural networks

[Bonny Y. Wang](#), Leander Thiele

Warm dark matter mass inference from halo information

Belén Costanza, [Bonny Y. Wang](#), Francisco Villaescusa-Navarro

Research Experiences

The McWilliams Center for Cosmology & Astrophysics | PITTSBURGH, US

FEB 2024 - PRESENT

Research Assistant

- Analyze binary black hole merger population at low redshifts ($z = 0.5$ to 2) from the ASTRID simulation; perform the eccentricity analysis of black hole merger orbits; generate gravitational waves signal from the

- mergers for LISA predictions
- Develop pipelines for faster data post-processing with multiprocessing and MPI

Kavli Institute for the Physics and Mathematics of the Universe | KASHIWA, JAPAN JUN 2024 - AUG 2024

Visiting Researcher

- Used deep sets to perform corrections between galaxy clusters' dynamic mass and virial mass from the M- σ relationship; continued this project with Leander Thiele for ultimate application for observation
- Held an Astro Visualization workshop at the Center for Data-Driven Discovery at IPMU
- Participated in weekly women's lunch to discuss gender diversity issues in STEM fields

The Center for Computational Astrophysics, The Flatiron Institute | NEW YORK, US SEP 2022 - MAR 2024

Guest Researcher

- Researched using modern machine learning techniques to facilitate research in cosmic voids under the supervision of Dr. Alice Pisani
- Designed 3D void data visualizations to facilitate scientific communication
- Co-mentored an undergraduate student from the Cooper Union on a student project about constraining cosmology with cosmic voids using machine learning

2023 Vatican Observatory Summer School | VATICAN CITY JUN 2023

Selected Participant

- Applied daily lecture content in lab exercises to further study data science tools (including PCA, self-organizing maps, CNN, and other statistical / machine learning methods) for astronomical survey
- Researched inferring warm dark matter mass using galaxy properties in individual halos with the DREAMS dataset using graph neural networks, normalizing flow, and symbolic regression

Teaching Experiences

Entertainment Technology Center - Carnegie Mellon University | PITTSBURGH, US SEP 2024 -

PRESENT

Lead Tech Teaching Assistant

- Coordinate a team of 13 teaching assistants as the technical leader with two other head teaching assistants to prepare and deliver the ETC Building Virtual Worlds course for 74 grad students
- Organize the end-of-year festival for showcasing student's work to over 200 guests
- Lead weekly group discussions, conduct workshops on game programming, and hold regular office hours to support students

Coding Girls | SHANGHAI, CHINA AUG 2019

Programming Teacher, ML Speaker

- Taught 12 female attendees basic Python; gave a speech about machine learning

Aid Education, Liang Zhai | SHANGHAI, CHINA JUN - JULY 2018

Volunteer Teacher

- Taught 11 fifth-grade students math and art on a daily basis
- Conduct research about cultural preservation in Liang Zhai, where over 10 minor ethnicity groups reside

Other Experiences

The Cooper Union Satellite Launch Initiative | NEW YORK, US SEP 2022 - MAY 2023

Co-founder, Board Member, Payload Subleader

- Proposed Cooper Instrument payload mission; present weekly to team members on the research materials for potential CubeSat payload missions
- Initiated and organized Double Asteroid Redirection Test (DART) mission watch party

Origin Space | BEIJING, CHINA JUN 2021 - AUG 2021

Game Development Intern

- Created SpacePersona, a personality game related to space mining
- Designed satellite data web interface and collaborated on the front-end development
- Initiated a collaboration between rct AI and Origin Space; led a discussion about using AI solutions for games in space industries

PhotonLab | SHANGHAI, CHINA

JUN 2019 - AUG 2019

Software Engineer Intern

- Developed the Android app for controlling the smart lighting system; downloaded by 700+ users with 4.5 stars overall review
- Built the back-end database for both iOS and Android App with Firebase

TEDxNingbo | NINGBO, CHINA

JUN 2016 - JAN 2020

Co-curator, Host, Tech Advisor, Translator

- Co-curated and hosted TEDxNingbo 2016, 2017 annual conference and TEDxYouth@Ningbo conference
- Recruited 10+ speakers from the tech field; developed ideas for promoting conferences and onsite interactions; translated daily documents and speakers' lectures between Chinese and English; led Youth Geek Adventure for the youth conference

Outreach

Scientific Visualization | Technical Artist

AUG 2021 - PRESENT

- Create and share methods of visualizations for astronomical research
- Works have been mentioned by [Scientific American Magazine](#) and shown on video walls around The Flatiron Institute at 162 5th Avenue in New York City
- Working on an immersive experience with cosmological simulation data from ASTRID on a 270-degree curved screen

Educational VR Experience for NASA's VIPER Mission | Co-Producer, Programmer

JAN 2024 - MAY 2024

- Completed the prototype game of the VIPER water-ice exploration journey for the Moonshot Museum
- Helped Moonshot Museum secure the NASA grant for STEM education

Awards & Grants

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| • 2024 IPMU Visitor's Travel and Lodging Fund (~6K) | • 2018-2022 Cooper Union Innovator Scholarship (8K) |
| • 2024 NSF ACCESS Allocation for <i>Advanced Visualization for the Astrid Simulation Data</i> (Principal Investigator) | • 2021 rct AI GameHack Top Prize (~2K) |
| • 2023 -2024 CMU ETC Travel Fund (2.5K) | • 2017 IBM Student Innovation Lab |
| • 2023 Vatican Observatory Summer School 75% Fund for Travel and Lodging (~3.5K) | • 2017 HACKxFDU First Place (~1K) |
| • 2022 - 2023 Cooper Union Merit Grad Scholarship (~14K) | • 2017 Hack.init() First Place (~1K) |
| • 2018 - 2022 Cooper Union Half-Tuition Scholarship (~90K) | • 2017 China Robotics Challenge Rookie All Star Award |
| | • 2016 TEDxNingbo Future Shock Award |
| | • 2016 Space Settlement Design Competition China (SSDCC) Runner-Up Prize |

Talks and Posters

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| 1st Science Understanding through Data Science Conference Poster Presenter | AUG 2024 |
| The University of Tokyo Lunch Talk Seminar Talk presenter | JUL 2024 |
| Kavli Institute for the Physics and Mathematics of the Universe Lunch Talk Talk presenter | JUN 2024 |
| COSMO21 2024 Conference Poster Presenter | JUN 2024 |
| The 2023 Conference on Machine Learning in Astronomical Surveys Talk presenter | DEC 2023 |
| Vatican Observatory VOSS 2023 Student Presentation Series Talk presenter | JUN 2023 |
| 2023 Cosmic Connection Conference Poster presenter | MAY 2023 |
| Cooper Union End of Year Show Student presenter | MAY 2023 |
| Spring 2023 Cooper Union Research Seminar Talk contributor | APR 2023 |