Yan Xiang Lai

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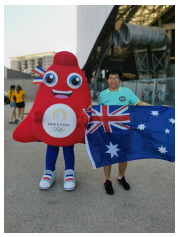

Education

Doctor of Philosophy (PhD) *July 2021 – June 2025 (estimated)*

University of Queensland (UQ) *Brisbane, Australia*

- **PhD thesis title**: Using the motions of galaxies to probe fundamental physics.
- **Advisors**: Dr. Cullan Howlett and Prof. Tamara Davis.
- **Key Results**:
  - Combining analytical covariance matrix, data compression, and Taylor series emulator for the first time to show they could return unbiased constraints with significantly shorter computational time.
  - Developed the crucial galaxy power spectrum pipeline for the Dark Energy Spectroscopic Instrument (DESI) survey for the Year-1 Full-Modelling analysis.
  - Developed an improved method to test General Relativity with the largest (at the time of publication) peculiar velocity survey. This method significantly reduces systematic error compared to previous approaches. Currently leading a DESI project to apply this method to DESI data.
  - Led three first-author papers (two more first-author papers are planned to be published before the end of PhD) and one second-author paper.

Bachelor of Advanced Science (First Class Honours) *2017 – 2020*

University of Queensland *Brisbane, Australia*

- **Honours thesis title**: Can peculiar velocity surveys eliminate cosmic variance?
- **Advisors**: Dr. Cullan Howlett and Prof. Tamara Davis.
- **Key results**:
  - Crucial demonstration with observational data that combining the peculiar velocity and galaxy redshifts can overcome the sample variance limit in the local Universe.
  - Nominated for the national Bok prize for best astrophysics honours thesis (13 nominations across Australia in 2021).

Awards

- *Three-Minute Thesis* runner-up and people's choice winner for UQ School of Mathematics and Physics (**2×$125 AUD**, 2023)
- UQ School of Mathematics and Physics tutor award (**$50 AUD**, 2023, 16 recipients with over 50 nominations)
- Winner of the student challenge question ("How much carbon do online conferences save?") during the Astronomical Society of Australia Annual Science Meeting (**$500 AUD**, 2021)
- Graduate School Scholarship of The University of Queensland (**$35000 AUD per annum**, 2021)

Selected seminars and conference presentations

Summary: I gave fifteen presentations during my PhD. Four of them were within UQ or the DESI collaboration, three of them were posters, six of them were at national/international conferences, and two of them were outreach talks. The selected high-visibility talks are listed below:

- "A comparison between ShapeFit compression and Full-Modelling methods for DESI and Beyond" at the Astronomical Society of Australia Annual Science Meeting (Online, June 2024).
- "Validating the methods being used within DESI to constrain cosmological parameters from the power spectrum", 26th International Conference on Particle Physics and Cosmology (Madrid, Spain, September 2023).
- "Faster cosmological analysis with power spectrum without simulations", seminar at the University of Barcelona (Barcelona, Spain, September 2023).
- "Using peculiar velocity surveys to constrain the growth rate of structure with the wide-angle effect", VIII Essential Cosmology for the Next Generation (Playa del Carmen, Mexico, November 2022).

Outreach

I am passionate about communicating cutting-edge research with the general public. I have participated in various outreach events, such as telescope viewing with the general public and organizing work experience programs. Here are some selected activities:

- Astrophysics booth at the Laura Street Festival in 2024.
- Main organizer of the UQ Astronomy group work experience program in 2024. In 2024, we had a record high of nine high school students joining the program. My primary responsibility was designing the schedule, creating projects, and supervising the students.
- Collaborating with the local planetarium for telescope viewing for the general public in 2023.
- Solar telescope viewing of the total solar eclipse, April 2023, at UQ.
- "What does the motion of galaxies tell us about models of gravity?", outreach talk to the UQ stargazing club on August 2022.

Other roles and responsibilities

- Local Organizing Committee of the Cosmic Flows 2025 conference.
- Organizing the astrophysics group meeting at UQ from August 2024.
- Tutor of the introductory astrophysics course (PHYS2082) at UQ from 2022 to 2023.

Skills

I have extensive project experience with *Python* and *C*. I also use *GitHub* to store the codes for all of my projects. Lastly, I also use Bayesian statistics extensively for data analysis.

Publications

Summary: I have authored 11 refereed journal publications with 668 citations and h-index = 7, including 3 first-author publications with 17 citations (two more are planned to be published before the end of PhD) and 1 second-author publication with 9 citations. Please see the separate list of publications for more details or visit *Astrophysics Data System (ADS)*.

References

Name	Insitution	Contact detail
○ Dr. Cullan Howlett	University of Queensland	Email: c.howlett@uq.edu.au Phone: (+61) 420766717
○ Prof. Tamara Davis	University of Queensland	Email:tamarad@physics.uq.edu.au Phone: (+61) 432526989
○ Dr. Héctor Gil-Marín	Institut de Ciències del Cosmos de la Universitat de Barcelona	Email:hectorgil@icc.ub.edu Phone: (+34) 934031320