

APRIL Q. CHENG

✉ aqcheng@princeton.edu | 🏠 aqcheng.github.io | 📧 aqcheng | 🎓 April Qiu Cheng

Education

Princeton University

PHD STUDENT IN ASTROPHYSICS

Princeton, NJ

Sep 2025 -

Massachusetts Institute of Technology

B. S. IN PHYSICS, MINOR IN MATHEMATICS • GPA: 4.9/5.0

Cambridge, MA

Sep 2021 - May 2024

Relevant Coursework

Physics General Relativity, Quantum Field Theory, Astrophysics I-II (grad), Cosmology (grad)

Mathematics Differential Equations, Linear Algebra, Group Theory, Real Analysis, Complex Analysis, Probability and Statistics, Advanced Algorithms

Grants & Fellowships

2025	Hertz fellowship	Princeton
2024	Fulbright fellowship , Germany study/research	Albert Einstein Institute, Potsdam
2024	NSF Graduate Research Fellowship (<i>declined</i>)	
2024	Princeton President's fellowship (<10% of admitted students)	Princeton
2023	Astronaut Scholarship	MIT
2023	LIGO Summer Undergraduate Research Fellowship	Caltech

Honors

2024	MIT Barrett Prize
2024	Sigma Pi Sigma Physics and Astronomy Honor Society
2024	MIT Outstanding Undergraduate Research Student Award
2024	Attendee of 73rd Lindau Nobel Laureate Meeting
2018-20	International Olympiad on Astronomy and Astrophysics silver (x2), gold (x1)

Research

Interests: cosmology, gravitational wave astrophysics, compact stellar remnants, fast radio bursts, physics education

Optimizing the search for subpopulations with reversible-jump MCMC

Princeton, NJ

PRINCETON UNIVERSITY • ADVISOR: SYLVIA BISCOVEANU

Sep 2025 -

- Introduce a novel method to search for subpopulations within the binary black hole population in LIGO data using RJMCMC
- Show that RJMCMC optimizes the model complexity while introducing minimal prior biases compared to canonical strongly modelled approaches

A unified approach to dark siren cosmology in harmonic space

Potsdam, Germany

ALBERT EINSTEIN INSTITUTE • ADVISOR: JONATHAN GAIR

Aug 2024 -

- Derive a theoretical framework that unifies the canonical standard galaxy catalog and the cross-correlation methods of GW cosmology
- Formally analyze the error propagation of GW cross-correlations in harmonic space given its measurement process
- Perform the first rigorous, self-consistent cross-correlation of GWs with galaxies on synthetic catalogs with noise

Exploring biases in FRB cross-correlations with magnetohydrodynamical simulations

Cambridge, MA

MIT KAVLI INSTITUTE • ADVISORS: KIYO MASUI, SHION ELIZABETH ANDREW, HAOCHEN WANG

Aug 2023 - May 2025

- Develop an end-to-end computational framework to ray trace through magnetohydrodynamical simulations
- Using this framework, investigate selection effects and non-Gaussianities in the FRB DM–galaxy cross-correlation power spectrum

Using Mass-Spin Correlations to Probe the Tidal Spin-up of Binary Black Holes

Pasadena, CA

CALTECH LIGO SURF • ADVISORS: ALAN WEINSTEIN, JACOB GOLOMB

Jun 2023 - Aug 2023

- Fit the mass-spin correlations of the binary black-hole population with an astrophysically-motivated heuristic model
- Project the feasibility of detecting such a correlation with future detectors, including 3rd-generation detectors

Systematic Analysis of Astrophysical Models in Gravitational-wave Population Analyses

MIT LIGO • ADVISOR: SALVATORE VITALE

Cambridge, MA

Sep 2022 - Jul 2023

- With hierarchical Bayesian inference, infer the branching fractions between binary black-hole formation channels using gravitational-wave data
- Make future projections and investigate systematic biases of the inference using simulated data

Ray Tracing Axion-Photon Conversion in Neutron Star Magnetospheres

MIT CENTER FOR THEORETICAL PHYSICS • ADVISORS: TRACY SLATYER, JOSHUA FOSTER

Cambridge, MA

Feb 2022 - Aug 2022

- Develop an end-to-end ray tracing code of the conversion of QCD axions into photons in a neutron star magnetosphere

Understanding the Spread of Dark Matter in the Illustris TNG-100 Simulation

MIT KAVLI INSTITUTE • ADVISORS: MARK VOGELSBERGER, JOSH BORROW

Cambridge, MA

Sep 2021 - Dec 2021

- Investigate the anomalously large spread of dark matter particles in the TNG-100 simulation, tracing their trajectories through hash tables

Variability of Exoplanet Hosts as a Probe of Spin-disk Alignment

MIT DISRUPTIVE PLANETS • ADVISORS: JULIEN DE WIT, BEN RACKHAM

Remote

May 2020 - Sep 2020

- Analyzed 10,000+ TESS lightcurves to investigate planetary spin-disk alignment and stellar variability; helped operate the SPECULOOS-N telescope

Publications

2. April Qiu Cheng, Shion Elizabeth Andrew, Haochen Wang, and Kiyoshi Masui

Exploring selection biases in FRB dispersion-galaxy cross-correlations with magnetohydrodynamical simulations

ARXIV:2506.03258

1. April Qiu Cheng, Michael Zevin, and Salvatore Vitale

What You Don't Know Can Hurt You: Use and Abuse of Astrophysical Models in Gravitational-wave Population Analyses

ApJ 955.2, 127 (Oct. 2023) ARXIV:2307.03129 DOI:10.3847/1538-4357/ACED98

Presentations

Jul 2025 **GR Amaldi** — *A unified approach to dark siren cosmology in harmonic space*

Glasgow, United Kingdom

Aug 2023 **LIGO SURF final presentation** — *Probing the tidal spin-up of BBHs with mass-spin correlations*

Pasadena, CA

Jun 2023 **LIGO Rates and Populations** — *Use and abuse of astrophysical models in GW population inference*

Online

Apr 2023 **APS April** — *Constraining the Origins of Binary Black Hole Mergers with GWTC-3*

Minneapolis, MN

Community Service and Outreach

National Science Olympiad A-Team member (2020-)

Online

- Write and proctor Astronomy exams for various regional to national-level high school Science Olympiad tournaments (2020-)
- Helped write an astronomy textbook for high schoolers, contributing a chapter on celestial coordinates

MIT Physics Mentorship program (2023-24)

Cambridge, MA

- Mentored undergraduate students in special relativity and quantum physics

MIT Physics Values Committee (2023-24)

Cambridge, MA

- Discuss administrative changes and propose recommendations to the department to promote diversity, inclusion, and community well-being

MIT Undergraduate Women in Physics (2021-23)

Cambridge, MA

VICE PRESIDENT OF ADVOCACY, PUBLICITY CHAIR

- Manage the UWIP website, communicate with the Physics Values Committee, and help organize social and mentorship events

MIT Educational Studies Program

Cambridge, MA

- Taught a high school class on astronomy for Splash 2021, and relativity for Splash 2022

Skills and Interests

Computational	Python (numpy, pandas, scipy, cupy, astropy, healpy, matplotlib, Jupyter), C/C++, Linux, bash, LaTeX, Mathematica
Cluster Allocations	SDSC (2018-21), MIT Supercloud (2021), Caltech LDAS (2022-), subMIT (2023-), hypatia (CPU) and saraswati (GPU) (2024-)
Research interests	Cosmology, gravitational wave astrophysics, compact stellar remnants, fast radio bursts, physics education