

# Jaeden Bardati

GRADUATE STUDENT · PHYSICS & ASTRONOMY

*California Institute of Technology*

*1200 E California Blvd*

*TAPIR 350-17*

*Pasadena, CA 91125*

✉ jbardati@caltech.edu | 🏠 jaedenbardati.github.io | 📷 JaedenBardati | 🌐 jaeden-bardati

## Education

### California Institute of Technology

*Pasadena CA, United States*

#### PHD PHYSICS

*2023 - Present*

- General Relativity I & II, Quantum Field Theory I-III, Mathematical Methods, Applications of Physics, etc.
- Certificate of Interest in University Teaching
- Advisor: Philip F. Hopkins

### Bishop's University

*Sherbrooke QC, Canada*

#### BSc PHYSICS HONOURS (WITH DISTINCTION)

*2020 - 2023*

- Minor in Mathematics; One course shy of Minor in Computer Science; GPA: 4.0/4.0.
- Honours Thesis: "Signatures Of Massive Black Hole Mergers In Their Host Galaxy Morphologies"
- Advisor: John J. Ruan

## Technical Skills

**Python:** 10+ years experience (including using numpy, matplotlib, scipy, pandas, scikit-learn, etc.)

**High Performance Computing:** Used several million CPU-hours on Compute Canada Cedar and TACC Frontera

**Fluid dynamics and radiative transfer codes:** SKIRT, Powderday (Hyperion + FSPS), Dedalus

**Astronomical analysis software & tools:** astropy, photutils, pynbody, tangos, yt, h5py, vorbin, statmorph, ppXF, Kinemetry

**Other languages & tools:** C/C++, Java, MIPS Assembly, Bash, Batch, HTML, CSS, Javascript, LaTeX, Git

## Awards & Scholarships

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| 2024      | Hummel-Gray Award, Caltech Y  |
| 2023      | Perimeter Scholars International Scholarship (declined), Perimeter Institute  |
| 2021-2023 | 3x awarded Undergraduate Student Research Award (USRA), Natural Sciences and Engineering Research Council of Canada (NSERC) |
| 2021-2023 | 3x awarded Supplément au bourse de 1er cycle du CRSNG, Fonds de Recherche du Québec Nature et technologies (FRQNT)          |
| 2023      | The University Prize in Physics and Astronomy, Bishop's University  |
| 2023      | The David Savage Prize in Physics and Mathematics, Bishop's University  |
| 2022-2023 | American Biltrite (Canada) Ltd Scholarship (merit scholarship), Bishop's University   |
| 2022-2023 | Florence May Foreman Scholarship (merit scholarship), Bishop's University   |
| 2022      | The Undergraduate Prize in Physics and Astronomy (highest achievement), Bishop's University                                 |
| 2021-2022 | Bourse d'Écellence Hydro-Québec (scholarship for "academic excellence and leadership qualities"), Bishop's University       |
| 2021      | The Faculty Prize in Physics (highest achievement), Bishop's University   |
| 2020-2023 | Academic Honour Roll (every year), Bishop's University  |
| 2020-2021 | H. Greville Smith Memorial Scholarship (entrance merit scholarship), Bishop's University                                    |
| 2020      | Highest Achievement in Physics, Champlain College   |
| 2020      | Academic Excellence Award, Champlain College  |

## Publications

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### PUBLICATIONS

- [7] **Bardati, J.**, & Hopkins, P. F. (2025). Anisotropic Infrared AGN Emission from High-Redshift Simulation Spanning Dust Sublimation to Galactic Scales. *In prep.*
- [6] Horlaville, P. et al., including **Bardati, J.** (2025). Identifying the Potential Host Galaxies of Upcoming Supermassive Black Hole Binary Gravitational Wave Detections. *In prep.*
- [5] Hopkins, P. F. et al., including **Bardati, J.** (2025). Zooming In On The Multi-Phase Structure of Magnetically-Dominated Quasar Disks: Radiation From Torus to ISCO Across Accretion Rates. Submitted to the *Open Journal of Astrophysics*. arXiv:2502.05268.
- [4] **Bardati, J.**, Ruan, J. J., Haggard, D., Tremmel, M., & Horlaville, P. (2024). Signatures of Massive Black Hole Merger Host Galaxies from Cosmological Simulations II: Unique Stellar Kinematics in Integral Field Unit Spectroscopy. *The Astrophysical Journal*, 977(2), 265
- [3] **Bardati, J.**, Ruan, J. J., Haggard, D., & Tremmel, M. (2024). Signatures of Massive Black Hole Merger Host Galaxies from Cosmological Simulations I: Unique Galaxy Morphologies in Imaging. *The Astrophysical Journal*, 961(1), 34
- [2] Ruan, J., **Bardati, J.**, Haggard, D., & Tremmel, M. (2024). Signatures of Massive Black Hole Merger Host Galaxies from Cosmological Simulations: Unique Stellar Kinematics in Spatially-Resolved Spectroscopy. *American Astronomical Society Meeting Abstracts*, 56(2), Article 456.11
- [1] **Bardati, J.**, Ruan, J. J., Haggard, D., & Tremmel, M. (2023). Host Galaxy Morphological Signatures of Massive Black Hole Mergers. *American Astronomical Society Meeting Abstracts*, 55(2), Article 268.17

## Teaching Experience

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### TEACHING ASSISTANT

Spring 2025	<b>Ph 2c: Waves, Quantum Mechanics, and Statistical Physics</b> , Head TA	Caltech
Winter 2025	<b>Ph 21: Computational Physics II</b> , Teaching Assistant	Caltech
Fall 2024	<b>Ph 20: Computational Physics I</b> , Teaching Assistant	Caltech
Spring 2024	<b>Ph 1c: Classical Mechanics &amp; Electromagnetism</b> (2 groups), Head TA	Caltech
Winter 2024	<b>Ph 1b: Classical Mechanics &amp; Electromagnetism</b> , Teaching Assistant	Caltech
Winter 2023	<b>MAT 82: Enriched Calculus Laboratory II</b> , Teaching Assistant	Bishop's University
Fall 2022	<b>PHY 113: Introduction to Astronomy</b> , Marker	Bishop's University
Fall 2022	<b>PHY 101: Statistical Methods in Experimental Science</b> , Marker	Bishop's University
Fall 2022	<b>MAT 81: Enriched Calculus Laboratory I</b> (2 groups), Teaching Assistant	Bishop's University

### TUTORING

2023-Present	<b>Caltech Y-Tutor</b> , University Tutor	Online
2023-Present	<b>Rise Tutor</b> , High School Tutor	Caltech
2022-2023	<b>Math Help Center</b> , University Tutor	Bishop's University
2020-2023	<b>Nimbus Learning Platform</b> , Private Tutor	Bishop's University
2020-2021	<b>R.D.W. Howson Enrichment Centre</b> , Mathematics Tutor	Bishop's College School
2019-2020	<b>Math and Physics Workshop</b> , College Tutor	Champlain College

### MENTORING

2024-2025	<b>Shai Toledano</b> , Undergraduate Student, University of Michigan	Caltech CAPP Program
2024-2025	<b>Varun Pritmani</b> , Undergraduate Student, Hunter College	Caltech CAPP Program
2024-2025	<b>Lihang Zhou</b> , Graduate Student, Caltech	Caltech PMA Mentorship
2024-2025	<b>Max Kogan</b> , Undergraduate Student, UCSC	AAS DDA Mentorship
2023-2024	<b>Adrian Lam</b> , Undergraduate Student, UCLA	AAS DDA Mentorship

## Presentations

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April 2024. *Signatures of Massive Black Hole Merger Host Galaxies in Morphology and Stellar Kinematics*. Contributed talk: Massive Black Holes in First Billion Years, Kinsale, Co. Cork, Ireland.

June 2023. *Host Galaxy Morphological Indicators of MBH Mergers*. Invited talk: LISA MMA-WP telecon.

Apr 2023. *Signatures of MBHs in their Host Galaxy Morphologies*. Honours thesis talk: Bishop's University.

Mar 2023. *MBH Mergers and Their Host Galaxies: Multi-Messenger Prospects*. Seminar talk: Bishop's University.

Mar 2023. *How Do We Find Supermassive Black Hole Mergers?* 3-min thesis: Bishop's University.

Jan 2023. *Host Galaxy Morphological Signatures of Massive Black Hole Mergers*. Poster: AAS Meeting 241, Seattle, WA.

Aug 2022. *Host Galaxy Morphological Signatures of MBH Mergers*. Contributed talk: LISA Canada 2022 Workshop.

Jul 2022. *Department Paper Presentation*. Physics & Astronomy Department Talk: Bishop's University.

## Outreach & Professional Development

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### SERVICE & VOLUNTEERING

Sept 2024	<b>Caltech First-Year Teaching assistant Conference Facilitator</b> , Co-led and planned the Caltech physics, mathematics and astronomy department TA conference, training over 50 new graduate students.	Caltech
Apr 2024	<b>California Science &amp; Engineering Fair</b> , Category Award Judge	California, USA
Mar 2024	<b>Orange County Science &amp; Engineering Fair</b> , ISEF Selection Judge	Orange County, CA
2021-2023	<b>Astronomy, Mathematics and Physics Society (AMPS)</b> , Co-founder and Physics & Astronomy Representative (elected co-lead position).	Bishop's University
2021-2022	<b>Student Accessibility &amp; Accommodation Services</b> , Peer Note-Taker	Bishop's University
2019-2020	<b>Cougar Ambassador</b> , Helped new students integrate into the college.	Champlain College

### OTHER TRAINING & WORKSHOPS

	<b>Perimeter Scholars International - Students' Training Accelerator for Research in Theory (PSI START)</b> , Waterloo, ON, Canada	
May-Jul 2022	Selective ten-week online school consisting of 4 courses in quantum information, path integral quantum mechanics, numerical methods, and symmetry mathematics, including a small project in general relativity. One of ten worldwide to be offered a summer research internship (declined).	Perimeter Institute
	<b>DAWN Winter School</b> , Copenhagen, Denmark	
Feb 2022	One-week school aiming to address practical knowledge in astrophysics for graduate students, from both observational and theoretical perspectives.	Cosmic Dawn Center

### MEDIA COVERAGE

2024. BU Research Spotlights: *Signatures of Massive Black Hole Merger Host Galaxies from Cosmological Simulations*

2023. Sherbrooke Record: *Bishop's grad accepted to PhD physics program at Caltech*

2023. BU Research Spotlights: *Jaeden Bardati, Bishop Graduate 2023: Accepted in the PhD Physics Program at Caltech*

2023. Bishop's University Blog: *Training the Physicists of Tomorrow*

2023. Centre de Recherche en Astrophysique du Québec Calendar: *Mergers of galaxies hosting supermassive black holes*

2022. BU Research Spotlights: *Undergraduate Student Accepted in Prestigious International Summer Training Program*

2021. Sherbrooke Record: *"This is going to be a big thing"*