

# Jaeden Bardati

(ASTRO)PHYSICS PHD STUDENT · NSERC GRADUATE FELLOW

California Institute of Technology  
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## 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 (numpy, matplotlib, seaborn, scipy, pandas, scikit-learn, pytorch, tensorflow, opencv, h5py)

**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, vorbin, statmorph, ppXF, Kinemetry

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

## Selected Awards & Scholarships

2025-2028	Postgraduate Scholarship - Doctoral (PGS-D), Natural Sciences and Engineering Research Council of Canada (NSERC)
2025	Canada Graduate Scholarship - Doctoral (CGS-D; declined), NSERC
2024	Hummel-Gray Award, Caltech Y
2023	Perimeter Scholars International Scholarship (declined), Perimeter Institute
2021-2023	3x awarded Undergraduate Student Research Award (USRA), 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 (highest achievement), Bishop's University
2023	The David Savage Prize in Physics and Mathematics (highest achievement), 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 (merit scholarship), 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 (merit scholarship), Bishop's University
2020	Highest Achievement in Physics, Champlain College

## 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] Horlville, P., Ruan, J. J., Eracleous, M., **Bardati, J.**, Runnoe, J. C., Haggard, D. (2025). Predicting Potential Host Galaxies of Supermassive Black Hole Binaries Based on Stellar Kinematics in Archival IFU Surveys. Submitted to *ApJ*. arXiv: 2504.21145.
- [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. Accepted for publication in the *Open Journal of Astrophysics*. arXiv:2502.05268.
- [4] **Bardati, J.**, Ruan, J. J., Haggard, D., Tremmel, M., & Horlville, 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

### 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"*