

Jaeden Bardati

PHYSICS PHD STUDENT · NSERC GRADUATE FELLOW · CFAM CO-DIRECTOR

California Institute of Technology
1200 E California Blvd
TAPIR 350-17
Pasadena, CA 91125

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

Education

California Institute of Technology

Pasadena CA, United States

PHD PHYSICS

2023 - Present

- General Relativity I & II, Quantum Field Theory I-III, Computational Astrophysics, Astroinformatics, 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, transformers)

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++ (including OpenMP, Kokkos), Java, Assembly, Bash, HTML, CSS, Javascript, LaTeX, Git

Awards & Scholarships

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| 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 | Walter Burke Institute of Theoretical Physics Graduate Fellowship, Caltech |
| 2024 | Hummel-Gray Award, Caltech Y |
| 2023 | Joshua and Beth Friedman Foundation Fund Scholarship, Caltech |
| 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 |
| 2020-2021 | H. Greville Smith Memorial Scholarship (merit scholarship), Bishop's University |
| 2020 | Highest Achievement in Physics, Champlain College |

Publications

- [7] **Bardati, J.**, Hopkins, P. F. & Richards, G. T. (2025). Early Stages of Dusty Tori: The First Infrared Spectra from a Highly Multiscale Quasar Simulation. *Submitted to ApJ*.
- [6] Horlavage, 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., Su K., Murray N., Steinwandel, U. P., Kaaz N., Ponnada S. B., **Bardati, J.**, et al. 2025. Zooming In On The Multi-Phase Structure of Magnetically-Dominated Quasar Disks: Radiation From Torus to ISCO Across Accretion Rates. *The Open Journal of Astrophysics* 8 (April). DOI: 10.33232/001c.137296.
- [4] **Bardati, J.**, Ruan, J. J., Haggard, D., Tremmel, M., & Horlavage, 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	Ph 2c: Waves, Quantum Mechanics, and Statistical Physics , Head TA	Caltech
Winter 2025	Ph 21: Computational Physics II , Teaching Assistant	Caltech
Fall 2024	Ph 20: Computational Physics I , Teaching Assistant	Caltech
Spring 2024	Ph 1c: Classical Mechanics & Electromagnetism (2 groups), Head TA	Caltech
Winter 2024	Ph 1b: Classical Mechanics & Electromagnetism , Teaching Assistant	Caltech
Winter 2023	MAT 82: Enriched Calculus Laboratory II , Teaching Assistant	Bishop's University
Fall 2022	PHY 113: Introduction to Astronomy , Marker	Bishop's University
Fall 2022	PHY 101: Statistical Methods in Experimental Science , Marker	Bishop's University
Fall 2022	MAT 81: Enriched Calculus Laboratory I (2 groups), Teaching Assistant	Bishop's University

MENTORING - RESEARCH

Summer 2025	Jasper Thorne-Lyman , University of Michigan Undergraduate	Caltech
Summer 2025	Anabelle Eisner , Caltech Undergraduate	Caltech FSRI Program
Summer 2025	Frank Gomez-Montalvo , Caltech Undergraduate	Caltech FSRI Program
Summer 2025	Isabella Torres , Caltech Undergraduate	Caltech FSRI Program
Summer 2025	Angel Guerra , Caltech Undergraduate	Caltech FSRI Program

MENTORING - ACADEMIC

2024-2025	Shai Toledano , UMich Undergraduate	Caltech CAPP Program
2024-2025	Varun Pritmani , Hunter College Undergraduate	Caltech CAPP Program
2024-2025	Lihang Zhou , Caltech Graduate Student	Caltech PMA Mentorship
2024-2025	Max Kogan , UCSC Undergraduate	AAS DDA Mentorship
2023-2024	Adrian Lam , UCLA Undergraduate	AAS DDA Mentorship

TUTORING MATH AND SCIENCE SINCE 2019 ACROSS 6 UNIQUE PROGRAMS (SEE WEBSITE FOR DETAILS)

Presentations

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.

Outreach & Professional Development

ACADEMIC COMMUNITY SERVICE

2025-Present	Caltech Future Faculty and Mentors (CFAM) Co-Director , Oversees and facilitates the Certificate of Interest in University Teaching program, plans and leads workshops, seminars and discussion groups on effective teaching for TAs and postdocs, plans and facilitates the Caltech First-Year TA Training.	Caltech
Sept 2024	PMA Department TA Training Conference , Co-Lead and Facilitator	Caltech
Apr 2024	California Science & Engineering Fair , Category Award Judge	California, USA
Mar 2024	Orange County Science & Engineering Fair , ISEF Selection Judge	California, USA
2021-2023	Astronomy, Mathematics and Physics Society (AMPS) , Co-founder and Physics & Astronomy Representative (elected co-lead position).	Bishop's University
2021-2022	Student Accessibility & Accommodation Services , Peer Note-Taker	Bishop's University
2019-2020	Cougar Ambassador , Helped new students integrate into the college.	Champlain College

OTHER TRAINING & WORKSHOPS

May-Jul 2022	Perimeter Scholars International - Students' Training Accelerator for Research in Theory (PSI START) , Waterloo, ON, Canada 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
Feb 2022	DAWN Winter School , Copenhagen, Denmark One-week school aiming to address practical knowledge in astrophysics for graduate students, from both observational and theoretical perspectives.	Cosmic Dawn Center

MEDIA COVERAGE

2025. Canadian News Corporation (CBC): U.S. science funding uncertainty reshapes grad school choices for Canadians

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. 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"*