Curriculum Vitae
Brandon Pries, B.S.
Graduate Research Assistant, School of Physics, Georgia Institute of Technology
November 21, 2024

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Brandon Pries

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Education

Georgia Institute of Technology (Georgia Tech), Atlanta, GA August 22, 2022 – Present

GPA 3.8/4.0; Major GPA 3.8/4.0

Doctor of Philosophy, Physics, College of Sciences Expected December 2027

- Galaxies, cosmology, high-energy astrophysics
- Classical/quantum/statistical mechanics, electromagnetism, computational physics

Doctoral Minor in Higher Education

- Learner-centered teaching, metacognition, student motivation/engagement, active learning

Dissertation Topic: *Formation and Evolution of Direct Collapse Black Holes as Supermassive Black Hole Seeds*

- Advisor: John H. Wise
- Thesis Committee: David Ballantyne, Tamara Bogdanović, Surabhi Sachdev

Michigan State University (MSU), East Lansing, MI August 29, 2018 – May 7, 2022

GPA 3.965/4.0; Major GPA 4.0/4.0
Honors College

Bachelor of Science, Astrophysics, College of Natural Science (with High Honors) May 7, 2022

- Exoplanets, telescopes, stars, galaxies
- Thermodynamics, classical/quantum/statistical mechanics, electromagnetism, computational physics

Minor in Mathematics

- Calculus, linear/abstract algebra, number theory, analysis, ordinary/partial differential equations

Minor in Computational Mathematics, Science, and Engineering (CMSE)

- Computational modeling, parallelization, high performance computing (HPC), GPU acceleration, Python, C++, Bash, Linux, SLURM, Git/GitHub

Minor in Data Science

- Probability/statistics, hypothesis testing, sampling, model development/fitting/selection, R, SQL

Undergraduate Thesis: *Indirect Search for Dark Matter via Neutrinos from WIMP Annihilation with IceCube* (May 4, 2022)

- Advisors/Mentors: Tyce "Ty" DeYoung, Mehr U. Nisa

Professional Appointments

Graduate Research Assistant (GRA), Georgia Tech	May 2024 – Present
Graduate Teaching Assistant (GTA), Georgia Tech	August 2022 – May 2024
Research Assistant, MSU	May 2022 – Present
Undergraduate Learning Assistant (ULA), MSU	January 2021 – May 2021; August 2021 – May 2022
Undergraduate Research Assistant, MSU	May 2019 – August 2019; May 2020 – May 2022
Professorial Assistant (PA), Honors College, MSU	August 2018 – May 2019; August 2019 – May 2020

Honors, Scholarships, and Awards

Outstanding Online Head TA of the Year, Georgia Tech — April 17, 2024
- $500 award

Online Head TA of the Year, School of Physics, Georgia Tech — March 7, 2024

Thomas H. Osgood Award, Department of Physics and Astronomy, MSU — April 28, 2022
- Outstanding Undergraduate Senior

Outstanding ULA Award, Department of Physics and Astronomy, MSU — April 22, 2021; April 28, 2022
- Upper-Level Physics/Astronomy Course

Author list, IceCube Collaboration — October 8, 2020 – Present

Dean's List, MSU — Fall 2018 – Spring 2022

Honors College, MSU — Fall 2018 – Spring 2022

Professorial Assistantship (PA), MSU — Fall 2018 – Spring 2019; Fall 2019 – Spring 2020
- Undergraduate research scholarship, ∼$8,700

Research Experience

Wise group, Georgia Tech — August 2023 – Present

- Direct Collapse Black Hole (DCBH) Classification
  Advisors/Mentors: John H. Wise (Faculty)
  1. Predicting formation of DCBHs in dark matter halos using support vector machines (SVMs)
  2. Optimizing SVM hyperparameters using grid-search algorithm
  3. Measuring importance of predictive features for classification of DCBH-hosting halos

Li group, Georgia Tech — December 2022 – May 2023

- Black Hole Binary (BHB) Evolution
  Advisors/Mentors: Gongjie Li (Faculty)
  1. Simulated evolution of black hole binary systems around active galactic nuclei (AGNs)

IceCube Collaboration, MSU September 2018 – Present

- Neutrinos from Dark Matter Annihilation
  Advisors/Mentors: Tyce "Ty" DeYoung (Faculty), Mehr U. Nisa (Postdoc → Faculty)
  1. Processing 7 years of IceCube data to use with neutrino spectra from dark matter annihilation
  2. Generating custom probability distribution functions (PDFs) to calculate IceCube sensitivities to annihilation spectra
  3. Tracking progress with analysis Wikipedia page and analysis GitHub repository
- Recurrent Neural Network (RNN) Event Reconstruction
  Advisors/Mentors: Tyce "Ty" DeYoung (Faculty), Claudio Kopper (Faculty), Brian Clark (Postdoc)
  1. Reconstructed neutrino events using RNNs for orders-of-magnitude increase in reconstruction speed
  2. Gathered and processed approximately 2 million neutrino events as data for use in RNN research
  3. Tracked progress with analysis GitHub repository
- Convolutional Neural Network (CNN) Event Reconstruction
  Advisors/Mentors: Tyce "Ty" DeYoung (Faculty), Claudio Kopper (Faculty), Jessie Micallef (Graduate Student)
  1. Optimized structure of CNNs using grid-search algorithm
  2. Explored effects of 5 different loss functions on CNN regression problems for event reconstruction
  3. Investigated methods for multivariate regression with CNNs

Research Supervision and Mentorship

Elizabeth Mone, undergraduate student, Georgia Tech Spring 2024 – Present

- Statistical analysis of DCBH-hosting halos
- Feature importance for classification of DCBH-hosting halos
- Decision trees for classification of DCBH-hosting halos

Publications

Manuscripts in Preparation

2. E. Mone, **B. Pries**, J. H. Wise, & S. Ferrans. "Important Halo Features for Direct Collapse Black Hole Formation in the Early Universe and Their Implications." *In prep.*
1. R. Abbasi et al. (IceCube Collaboration, incl. **B. Pries**). "Limits on GeV-scale WIMP Annihilation in Dwarf Spheroidals with IceCube DeepCore." *In prep.*

Dissertations and Theses

1. **B. Pries.** "Indirect Search for Dark Matter via Neutrinos from WIMP Annihilation with IceCube." *MSU Department of Physics and Astronomy (undergraduate thesis)*, May 4, 2022.

Presentations

Invited Seminar/Colloquia/Journal Club Presentations

1. **B. Pries** & N. Willey. "Recurrent Neural Networks as a Tool for IceCube-Upgrade Reconstructions." *Student Machine Learning Initiative, Brown University (virtual)*, October 5, 2021.

Contributed Conference Presentations

7. **B. Pries.** "Identifying Direct Collapse Black Hole Sites in Cosmological Simulations." *The Formation and Early Evolution of Supermassive Black Holes, Baltimore, MD*, November 20, 2024.
6. **B. Pries.** "Sensitivities to WIMP Annihilation Cross Sections with IceCube DeepCore." *American Physical Society (APS) April Meeting, Sacramento, CA (virtual)*, April 5, 2024.
5. **B. Pries.** "Sensitivities to Low-Mass WIMP Annihilation Cross Sections with IceCube Neutrinos." *American Physical Society (APS) April Meeting, Minneapolis, MN (virtual)*, April 24, 2023.
4. **B. Pries.** "Trials Improvements for Low-Mass WIMP Annihilation Search." *Spring 2023 IceCube Collaboration Meeting, Aachen, Germany (virtual)*, March 14, 2023.
3. **B. Pries.** "IceCube-Upgrade Reconstructions using Recurrent Neural Networks." *2021 APS Division of Particles and Fields (APS DPF) Meeting, Florida State University (virtual)*, July 14, 2021.
2. **B. Pries.** "Update on IceCube-Upgrade Reconstructions." *Spring 2021 IceCube Collaboration Meeting, Aachen, Germany (virtual)*, March 18, 2021.
1. **B. Pries.** "Recurrent Neural Networks for IceCube-Upgrade Reconstruction." *Fall 2020 IceCube Collaboration Meeting, Madison, WI (virtual)*, September 14, 2020.

Contributed Conference Posters

4. **B. Pries.** "Using Neutrinos to Search for WIMPs in Dwarf Galaxies." *University Undergraduate Research and Arts Forum (UURAF), MSU*, April 8, 2022.
3. **B. Pries.** "Searching for Dark Matter in Dwarf Galaxies Through Neutrino Production." *Mid-Michigan Symposium for Undergraduate Research Experiences (Mid-SURE), MSU (virtual)*, July 28, 2021.
2. **B. Pries.** "Recurrent Neural Networks for IceCube-Upgrade Reconstructions." *UURAF, MSU (virtual)*, April 15, 2021.
1. **B. Pries.** "Applications of Recurrent Neural Networks to the IceCube-Upgrade." *Mid-SURE, MSU (virtual)*, August 10, 2020.

Contributed Seminar/Colloquia/Journal Club Presentations

2. **B. Pries.** "Limits on WIMP Annihilation Cross Sections with IceCube Neutrinos." *Cosmic Coffee, Georgia Tech Center for Relativistic Astrophysics (CRA)*, October 11, 2023.
1. **B. Pries.** "IceCube Search for Low-Mass WIMP Annihilation in Dwarf Galaxies." *Astronomy Seminar, MSU Department of Physics and Astronomy*, April 20, 2022.

Teaching Experience

Head Teaching Assistant (Head TA), Georgia Tech Summer 2023 – Spring 2024

PHYS 2211 – Intro Physics I, Dr. Emily Alicea-Muñoz (1273 students) Spring 2024

24 Graduate Teaching Assistants (GTAs), 31 Undergraduate Teaching Assistants (UTAs)

- Answering student questions in online forum and via email
- Holding office hours once a week to assist students with coursework by answering questions and working through problems
- Writing answer keys to exams
- Communicating with instructors regarding exam content and formatting to revise exam drafts
- Assisting GTAs in proctoring and grading exams
- Proctoring and grading final exams
- Meeting with Course Coordinator once a week to prepare for weekly meeting with TAs
- Leading weekly meetings with other GTAs and UTAs to discuss lab and exam content
- Assisting in homework debugging

PHYS 2211 – Intro Physics I, Dr. Emily Alicea-Muñoz (1137 students) Fall 2023

22 GTAs, 32 UTAs

PHYS 2211 – Intro Physics I, Dr. Andrew "Andy" Scherbakov (378 students) Summer 2023

18 GTAs

- Answered student questions in online forum and via email
- Held office hours once a week to assist students with coursework by answering questions and working through problems
- Wrote answer keys to exams
- Communicated with instructor regarding exam content and formatting to revise exam drafts
- Created exam rubrics
- Proctored 4 exams for students with accommodations
- Assisted GTAs in proctoring and grading exams
- Met with instructor once a week to prepare for weekly meeting with GTAs
- Led weekly meetings with other GTAs to discuss lab and exam content

Graduate Teaching Assistant (GTA), Georgia Tech Fall 2022 – Spring 2023

PHYS 2211 – Intro Physics I, Dr. Edwin "Ed" Greco (57 students) Spring 2023

UTAs: Jiaying "Isobel" Deng, Amberlyn "Amber" Diehl

- Responsible for 2 lab sections with a focus on matter, interactions, and simulations
- Led lab instruction by answering questions and guiding problem solving
- Proctored and graded 3 exams
- Attended weekly meetings with Head GTA to discuss lab and exam content

PHYS 2211 – Intro Physics I, Dr. Emily Alicea-Muñoz (53 students) Fall 2022
UTAs: Khushi Patel, William "Will" Wood

Undergraduate Learning Assistant (ULA), MSU Spring 2021; Fall 2021 – Spring 2022

AST 208 – Planets and Telescopes, Dr. Joseph "Joey" Rodriguez (39 students) Spring 2022

- Graded homework assignments and provided constructive criticism
- Held office hours once a week to assist students with coursework by answering questions and working through problems
- Assisted in astronomy lab instruction by answering questions and guiding problem solving

AST 207 – The Science of Astronomy, Dr. Gerard "Mark" Voit (66 students) Fall 2021

- Graded in-class assignments and provided constructive criticism
- Held office hours once a week to assist students with coursework by answering questions and working through problems
- Assisted in in-class instruction by answering questions and guiding problem solving
- Proctored 4 exams and graded 3 exams

AST 208 – Planets and Telescopes, Dr. Joseph "Joey" Rodriguez (30 students) Spring 2021

Outreach, Service, and Involvement

Published Astrobites

9. **B. Pries** (ed. W. Golay). "Big Black Holes in Little Galaxies." *Astrobites*, November 8, 2024.
8. **B. Pries** (ed. A. Anderson). "Heavy Metal: Actinides from Compact Object Mergers." *Astrobites*, November 2, 2024.
7. **B. Pries** (ed. C. Slaughter). "Weight Gain: Growing Little Black Holes in the Early Universe." *Astrobites*, September 24, 2024.
6. **B. Pries** (ed. A. Sinha). "New Species of Dwarf Galaxy in the Galaxy Cluster Ecosystem?" *Astrobites*, September 10, 2024.
5. **B. Pries** (ed. S. Grayson). "A Universal Accounting Problem: Tension in Reionization Estimates." *Astrobites*, August 17, 2024.
4. **B. Pries** (ed. V. Bonidie). "Blowout: AGNs Quenching Star Formation in Dwarf Galaxies." *Astrobites*, June 6, 2024.
3. Astrobites Collaboration (incl. **B. Pries**, ed. M. Vincent). "2024 Album of the Year: A Total Eclipse of the Sun." *Astrobites*, April 11, 2024.
2. **B. Pries** (ed. A. Masegian). "Ultra-Faint Dwarf Galaxies: Not as Small as We Thought?" *Astrobites*, April 1, 2024.
1. **B. Pries** (ed. E. Clarke & N. Korhonen Cuestas). "Detecting Ghostly Neutrinos that Skim Earth's Crust." *Astrobites*, February 8, 2024.

Astrobite Editing

5. C. Meldorf (ed. **B. Pries**). "Live Fast, Die Young, Bad Gals Do It Well." *Astrobites*, October 23, 2024.
4. S. Panjkov (ed. **B. Pries**). "Are Giant Stars Stealing Lithium from Their Neighbours?" *Astrobites*, October 17, 2024.
3. N. Korhonen Cuestas (ed. **B. Pries**). "Under (Ram) Pressure! Stripping Galaxies Of Their Gas." *Astrobites*, August 6, 2024.
2. L. Rowland (ed. **B. Pries**). "The photocopied "sunburst" from the early Universe." *Astrobites*, April 17, 2024.
1. C. Slaughter (ed. **B. Pries** & K. Rockliffe). "Small but Mighty: Disk Chemistry in an M-Dwarf System." *Astrobites*, February 19, 2024.

Outreach Presentations

3. **B. Pries.** "Constraining WIMP Annihilation Rates via Neutrinos." *Astronomy Club, MSU (virtual)*, March 20, 2023.
2. **B. Pries.** "Detecting Neutrinos from WIMPs." *Society of Physics Students (SPS), MSU*, October 21, 2021.
1. **B. Pries.** "Recurrent Neural Networks for Low-Energy Neutrino Interaction Reconstruction." *SPS, MSU (virtual)*, October 8, 2020.

Media Appearances

1. Quoted in "Astronomers really like the South Pole, but why?" *Popular Science*, September 5, 2024.

Community Service and Involvement

Moderator, Georgia High School Regional Science Bowl — February 3, 2024
- Read questions for 8 matches

Writer, Astrobites — January 5, 2024 – Present
- Summarizing astronomy research papers into bite-sized articles for undergraduate audiences
- Writing 9 articles per year
- Editing/reviewing 9 articles per year

University Service and Involvement

Georgia Tech

Member, Graduate Association of Physicists (GAP) — Fall 2022 – Present
- Panelist, Graduate School Applications panel — October 12, 2022; October 30, 2024

Invited panelist, Celebrating Distance Teaching and Learning Symposium — October 29, 2024

MSU

Mentor, Stellar Mentorship Program — Fall 2021 – Spring 2022

Mentees: Owen James, Aditya "Kal" Kalakuntla

- Met with 2 astronomy underclassmen mentees at least once monthly
- Provided advice related to classes, undergraduate research, degree pathways, and navigating the astrophysics major

Mentee, Stellar Mentorship Program — Fall 2021 – Spring 2022

Mentor: Jack Schulte (Graduate Student)

- Met with astronomy graduate student mentor at least once monthly
- Discussed senior year experiences, graduate school, and graduate school applications

Vice President, Astronomy Club — Fall 2021 – Spring 2022

- Contacted astronomy faculty as potential speakers for club meetings
- Collaborated with MSU Observatory Interim Director (Dr. Rodriguez) to plan Astronomy Club tour of the observatory facilities for approximately 20 students
- Coordinated with President on running biweekly meetings with approximately 20 attendees
- Helped plan and run semiannual Fall/Spring BBQ with approximately 60 attendees (joint with SPS)

Member, Astronomy Club — Fall 2018 – Spring 2022

Member, SPS — Fall 2018 – Spring 2022

- Panelist, Graduate School Applications panel — March 23, 2022

Professional Societies and Affiliations

Astrobites Collaboration — January 5, 2024 – Present
- Editorial Committee — August 22, 2024 – Present
- Education Committee — August 22, 2024 – Present

Society for Collegiate Leadership and Advancement (SCLA) — December 19, 2023 – Present

Center for Teaching and Learning (CTL), Georgia Tech — January 31, 2023 – Present
- Tech to Teaching Program — January 31, 2023 – Present

Center for Relativistic Astrophysics (CRA), Georgia Tech — August 22, 2022 – Present

American Astronomical Society (AAS) — April 1, 2022 – Present

National Society of Leadership and Success (NSLS) — October 29, 2021 – Present
- Foundations of Leadership Certificate 2 — April 18, 2022
- Foundations of Leadership Certificate 1 — December 9, 2021

American Physical Society (APS) — May 10, 2021 – Present

Sigma Pi Sigma ($\Sigma\Pi\Sigma$) National Honor Society — April 15, 2021 – Present

Golden Key National Honor Society — November 4, 2019 – Present

Phi Sigma Theta ($\Phi\Sigma\Theta$) National Honor Society — February 18, 2019 – Present

National Society of Collegiate Scholars (NSCS) — February 10, 2019 – Present

IceCube Collaboration — August 29, 2018 – Present

Physics and Astronomy Department, MSU — August 29, 2018 – Present

Languages

- English – native
- Spanish – B1/intermediate/limited working proficiency