Bryan Brzycki
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Education

University of California: Berkeley — Berkeley, CA
Ph.D. Student, Astronomy. — August 2018 — Present

Harvard University — Cambridge, MA
A.B. in Astrophysics and Physics. GPA: 3.75/4.0. — August 2014 — May 2018
Scored 41 on the 2016 Putnam Competition.
Awarded NSF REU and Massachusetts Space Grant to conduct astrophysics research. — Summer 2017

Troy High School — Fullerton, CA
Valedictorian. GPA: 4.82/5 (Weighted). — August 2010 — May 2014
Qualified for USAMO twice, placed within the top 40 the second time.
Placed 3rd, 5th, 6th in Astronomy at Science Olympiad Nationals, and 1st in all Regional and State Competitions.
Honorable Mention at the International Olympiad on Astronomy and Astrophysics (IOAA).

Research Experience

UC Berkeley Astronomy Department / Breakthrough Listen — Berkeley, CA
Graduate Student Researcher — June 2018 – Present

- Using machine learning, specifically convolutional neural networks (CNN), to search for technosignatures in radio telescope observations.
- Wrote a Python package to create synthetic signals with specific properties that have not been observed before for use as training data for a machine learning classifier (https://github.com/bbrzycki/setigen).
- Developed a basic pipeline using a CNN that classifies images from observational data depending on what kinds of signals they contain.
- Working on developing a novel pipeline to use object detection algorithms to identify and localize signal paths within a noisy image.

Harvard-Smithsonian Center for Astrophysics — Cambridge, MA
Research Intern — September 2017 – Present

- Quantified the energy contribution from magnetic fields in magnetohydrodynamic simulations of galaxy cluster mergers.
- Compared a suite of simulations with and without magnetic fields to analyze their impact on quantities of interest to X-ray observers, such as gas motion and entropy.
- Wrote and presented my research as my senior thesis project (May 2018). Currently writing a paper based on my research for submission to an astrophysics journal.

Maria Mitchell Observatory REU — Nantucket, MA
Research Intern — June 2017 – January 2018

- Used computer simulations, Python, and a suite of analysis tools to research the evolution of gas surrounding spiral galaxies.
- Worked with Blue Waters, the supercomputer at the University of Illinois at Urbana-Champaign, for the simulations and the subsequent analysis.
- Developed synthetic observational data products similar to those produced from actual observations.
- Analyze potential shortcomings of the simulation machinery, such as limited resolution or unphysical galactic structure.
- Presented poster on research at the 231st AAS meeting in January 2018

Harvard-Smithsonian Center for Astrophysics — Cambridge, MA
Research Intern — June 2016 – December 2016

- Derived theoretical constraints for pulsars in an Ultraluminous X-ray source (ULX), focusing on constraining the range of possible orbital and pulse periods, using physics and mathematical tools from Fourier analysis.
- Constructed simulations of pulsar light curve data using Python.
- Analyzed a set of the brightest known ULX sources for pulsations, using archived X-ray photon data from the XMM-Newton telescope to construct light curves and power spectra.
- Wrote a research proposal for funding through the Harvard College Research Program.

Caltech: Theoretical Astrophysics Including Relativity and Cosmology (TAPIR) — Pasadena, CA
Research Intern — June – August 2013

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- Enhanced code intended to optimize gravitational wave extraction from a black hole collision simulation.
- Collected data from multiple simulations using the optimized code to analyze which parameters produced the most accurate gravitational wave extrapolations (to those using the precise but longer, computationally expensive simulation code).

California State University Fullerton Math Department Fullerton, CA
Researcher August 2012 – May 2014

- Worked on three unique math research projects, two concerning non-Euclidean geometry and the last using a combinatorial approach to prove a relationship between Fibonacci and Lucas numbers.
- Published a paper on taxicab geometry and presented a poster at the 2013 Spring Regional MAA meeting.
- Coauthored another paper on non-Euclidean geometry and presented a short talk at the fall MAA SoCal/ Nevada Section meeting.
- Published a proposed geometry problem in the American Mathematical Monthly journal.

Summer Science Program Socorro, NM
Researcher / Program Participant June 2012 – July 2012

- Wrote Python code to calculate the orbital parameters for a near-Earth asteroid based on Gauss' method.
- Observed asteroid and analyzed exposures using a professional telescope and software, such as MaximDL.

Leadership and Teaching

USA Astronomy and Astrophysics Olympiad Foundation Fall 2013 – Present
Founder, CEO and Treasurer

- Organized the first US team for the IOAA, an international astronomy competition for high school students.
- Established the USA Astronomy and Astrophysics Olympiad Foundation to write and run national astronomy competitions to select a team of 5 students to compete at the IOAA.
- Entered partnership with the American Association of Variable Star Observers (AAVSO) for assistance with outreach and funding.
- Arranged for the first USAAAO summer training camp in 2016, a weeklong program at MIT for the 5 team members.

UC Berkeley Astronomy Department Fall 2018 – Present
Graduate Student Instructor

- Serving as a graduate student instructor for C10: Introduction to General Astronomy.
- Teaching two sections weekly, with office hours and homework help.
- Writing lesson plans and section quizzes.

Harvard University Math Department Fall 2015 – Spring 2018
Course Assistant

- Served as a course assistant for both Math 21a: Multivariable Calculus and Math 21b: Linear Algebra and Differential Equations.
- Assisted students during class time and during office hours every week.
- Advised teaching fellows on individual student progress and observations from grading and office hours.

Maria Mitchell Association Summer 2017
Observatory Guide

- Helped run public open nights, using the 24-in telescope to observe deep sky objects and teaching the public about astronomy
- Gave tours of the observatory and its history during the daytime

Publications

Bryan Brzycki, On a geometric locus in taxicab geometry,
Forum Geometricorum, 14 (2014) 117–121.

B. Brzycki, M. Giesler, K. Gomez, L.H. Odom and B. D. Suceavâ. A ladder of curvatures for hypersurfaces in Euclidean ambient space, Houston Math. J. 40 (2014), 1347–1356.

Skills & Interests

Languages: Python (fluent), Java (some experience), C++ (limited experience)
Interests: Music production, singing, poker.