Bryan Brzycki

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EDUCATION

University of California, Berkeley — Berkeley, CA
- PhD in Astrophysics 2024, MA in Astrophysics 2020 — *August 2018 — May 2024*

Harvard University — Cambridge, MA
- AB in Astrophysics and Physics, *cum laude* in field — *August 2014 — May 2018*

RESEARCH EXPERIENCE

University of California, Berkeley / Berkeley SETI Research Center — Berkeley, CA
Graduate Student Researcher — *June 2018 — Sep 2024*
- Proposed novel signal detection method for extracting and characterizing the temporal intensity modulation of narrowband radio signals to determine the presence of ISM scintillation, a stochastic astrophysical effect with predicted statistical properties
- Designed and conducted observing campaign and signal search across over 230 TB (>24 hr) of data towards the Galactic center, choosing sky directions with the highest chance of capturing scintillation using galaxy models and Monte Carlo sampling
- Used theoretical predictions to simulate the effects of ISM scintillation on radio intensities using stationary autoregressive processes and derived statistical features that indicate the presence of such modulation in real signals
- Estimated likelihoods of the presence of scintillation in detected narrowband signals by using kernel density estimation (KDE) on summary statistics of simulated signal datasets
- Created Setigen, an open-source Python library for creating synthetic radio signals and injecting them into observational data, with comprehensive documentation and testing, which has been widely adopted in the SETI field and cited in 7 papers since 2022
- Trained convolutional neural networks (CNNs) to localize frequency-drifting radio signals within spectrograms of radio telescope observations, speeding up computation over a factor of 20x compared to non-ML methods at the cost of some accuracy
- Presented research at the AAS conference, Breakthrough Listen advisory board meetings, invited seminars, and interviews for web articles and local news (KRON4)

Integral Ad Science — New York, NY
Data Science Intern — *June — August 2019*
- Explored anomaly detection and unsupervised learning methods on ad impression data collected from streaming media services as part of the ad fraud detection team
- Proposed and experimented with a method for chaining together feature engineering, dimensionality reduction, and anomaly detection to identify the features that contribute most to anomalous classifications with highly sparse data
- Presented a survey of anomaly detection algorithms to the data science team, focusing on interpretability and robustness in machine learning (ML) algorithms
- Created an NLP proof-of-concept using BERT to assess brand risk via contextual understanding on a dataset of website plaintexts

Harvard-Smithsonian Center for Astrophysics — Cambridge, MA
Undergraduate Student Researcher — *September 2017 — September 2019*
- Used a set of 18 fluid dynamics simulations stored on a remote cluster to estimate the energy stored in magnetic fields and turbulent gas in galaxy cluster collisions

SELECTED PROJECTS

Setigen — *August 2018 — Present*
Python library for generating and injecting synthetic narrowband radio signals in observational data
- Developed synthesis suites for signal generation directly to time-frequency spectrograms as well as to raw antenna voltages
- Created synthetic observation datasets for supervised ML experiments and injection-recovery tests for signal detection pipelines
- Assisted research scientists and undergraduate summer interns with projects utilizing Setigen

Blossom — *February 2018 — Present*
Python library for simulating the evolution of organism populations
- Wrote a simulation package to initialize “organism” populations and propagate actions of individual organisms over time
- Created a local browser dashboard visualization in Python to track simulation progress

SKILLS & INTERESTS

Experienced with: Python, NumPy, Pandas, SciPy, Matplotlib, Git
Familiar with: Keras, scikit-learn, PyMC, Tensorflow, SQL, AWS
Organizations: co-founded the USAAAO, dedicated to selecting and sending the USA team to the IOAA competition
Interests: sports (including niche leagues and making predictions), music production, film, fragrance making

HONORS, AWARDS, & PUBLICATIONS

- Scored 41 on the Putnam Competition in 2016
- Qualified for USAMO in 2012 and 2013; placed within the top 40 in 2013
- Honorable Mention at the International Olympiad on Astronomy and Astrophysics (IOAA) in 2014
- Published 5 peer-reviewed papers as first author and co-authored over 15 astrophysics publications (Google Scholar)