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Michael Ray

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EDUCATION

Master of Arts in Physics, *Stony Brook University* Aug 2021 - Aug 2022
Bachelor of Science in Physics and Mathematics (double major), *University of Cincinnati* Aug 2017 - May 2021
- GPA: 3.98/4.0
- Physics thesis: https://michaelray1.github.io/assets/Senior_capstone_physics.pdf
- Mathematics thesis: https://michaelray1.github.io/assets/Math_Capstone_FD.pdf

EXPERIENCE

Graduate Research Assistant May 2021 — Present
Stony Brook University, supervised by Dr. Rosalba Perna *Stony Brook, NY*

- Developed data pipeline using Python (NumPy) to standardize transformation of input and output radiation flux into various quantities of interest (optical depth, luminosity, etc), improving reproducibility of results and reducing time-to-analysis.
- Current project: Analyzing and visualizing simulations of absorption of high-energy light by high density media to quantify the contribution of gamma-ray bursts to spectra of active galactic nuclei.

Graduate Teaching Assistant August 2021 — May 2022
Stony Brook University *Stony Brook, NY*

- Individually taught and mentored over 100 undergraduate students in an intermediate level astronomy course.
- Taught weekly recitation, wrote and graded weekly quizzes, graded homework and exams.

Research Assistant Mar 2020 — Aug 2021
University of Cincinnati, supervised by Dr. Philip Argyres *Cincinnati, OH*

- Used novel approach to calculate the polarization of charge lattices of SU(N) quantum field theories, showing that these lattices are not necessarily principally polarized and leading to a publication in April 2022 (<https://arxiv.org/abs/2204.09682>).
- Coded an algorithm in Mathematica to compute a change-of-basis matrix to represent charge lattices in symplectic form, allowing for efficient experimentation in finding invariant factors of charge lattice polarization.
- Built an algorithm in Python (NumPy) to calculate the number of inequivalent bases of charge lattices, a computation that was previously cumbersome and performed by hand, thus radically reducing time spent on manual calculations.

Research Assistant Jan 2018 — Mar 2020
University of Cincinnati, supervised by Dr. Colin Bischoff *Cincinnati, OH*

- Independently built and maintained an algorithm in Python (NumPy, HealPy) to optimally filter out noise and foreground signals from astronomical data, leading to a logbook posting on the CMB-S4 collaboration internal website and a poster presentation.
- Reduced the variance in Monte-Carlo simulations, leading to error reduction on physical measurements of between 3% and 8%.
- Poster: <https://journals.uc.edu/index.php/Undergradshowcase/article/view/4117/3124>
Logbook Posting: https://cmb-s4.uchicago.edu/wiki/index.php/PureB_by_Messenger_Method

PERSONAL PROJECTS

Used Car Price Prediction April 2022

- Developed data pipeline in Python (NumPy, Pandas) to clean data set for optimal performance of machine learning models.
- Performed regression analysis with scikit-learn and TensorFlow, consistently predicting used car prices to within 25%.

Stock Price Prediction Using Neural Network Jun 2020 – Oct 2021

- Built data pipeline using Python (NumPy, RobinHood API) to gather and clean stock market data, eliminating rows with missing or incorrect data and calculating various statistics to add to each stock's available data.
- Performed classification analysis using neural network implemented with TensorFlow to predict whether stock prices will go up by a certain percentage in a given time period, achieving 92% accuracy when tested on S&P 500 stocks.

SKILLS

Tools and Languages	Python (5 years, expert-level knowledge) - {Numpy, Pandas, Matplotlib, TensorFlow, Keras, Scikit-learn}; Linux/Command Line; Git/Github; Jupyter Notebooks; \LaTeX ; Mathematica; C++; SQL
Quantitative Research	Mathematical optimization; Mathematical Modeling; Monte-Carlo simulations; Numerical Methods

AWARDS

NDSEG Fellowship (4% acceptance rate, declined to pursue career in data engineering)	2022
Stony Brook Graduate Fellowship	2021-22
Joiner Fellowship	2020
16 total merit-based scholarships during undergrad	2017-21
Dean's List (every semester at U. Cincinnati)	2017-21
Eagle Scout	2016