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# Michael Ray

Portfolio: [MathtoData.com](https://mathtodata.com)  
[github.com/michaelray1](https://github.com/michaelray1)  
[linkedin.com/in/michael-ray3](https://linkedin.com/in/michael-ray3)

## 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

## TECHNICAL EXPERIENCE

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

- Developed data pipeline using NumPy and Matplotlib to standardize data format and pre-processing of data which improved reproducibility of scientific results and reduced time-to-analysis.
- Built Python analysis tools for in-taking cleaned astrophysical simulation data and visualizing it, leading to physical insights which will be presented in my forthcoming master's thesis.

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

- Used Python, Mathematica, and pencil/paper to perform calculations in quantum field theory (QFT)
- Coded an algorithm in Mathematica to compute a change-of-basis matrix to represent charge lattices in invariant form, leading to insights which were published in 2022 (<https://arxiv.org/abs/2204.09682>).
- Independently built a simulation in Python to gather data about charge lattices in QFT, a computation that was previously cumbersome and performed by hand, thus radically reducing the 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% depending on bin number.
- 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](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, eliminating rows with incorrect or missing data and using one-hot encoding to address categorical variables.
- Performed regression analysis using scikit-learn and TensorFlow to predict future used car prices, achieving consistent accuracy of price prediction within 25%.
- Analyzed effectiveness of decision trees, random forests, K-Nearest Neighbors, and neural network algorithms as applied to this data set to find that random forest models perform best as measured by mean absolute percentage error.

**Stock Price Prediction Using Neural Network** Jun 2020 - Oct 2021

- Built data pipeline using Python and RobinHood API to gather and clean stock market data, eliminating rows with missing or incorrect data and calculating new 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

<b>Tools and Languages</b>	Python (5 years) - {Numpy, Pandas, Matplotlib, TensorFlow, Scikit-learn}; Linux/Command Line (4 years); Mathematica (2 years); C++(6 months); Git/Github; Jupyter Notebooks; $\LaTeX$
<b>Quantitative Research</b>	Mathematical optimization; Mathematical Modeling; Monte-Carlo simulations

## AWARDS

NDSEG Fellowship (4% acceptance rate, declined to pursue career in data science)	2022
SBU Fellowship	2021-22
Joiner Fellowship	2020
UC Sophomore Achievement Award in Physics	2019
16 total merit-based scholarships during undergrad	2017-21
Dean's List (every semester at U. Cincinnati)	2017-21
Eagle Scout	2016