Anthony Burrow, Ph.D.

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Summary

Research scientist with a Ph.D. in Physics and a robust background in applying machine-learning concepts to complex datasets in astrophysics. Extensive work utilizing Python, C/C++, and more to develop software tools which have shown to be significant contributions to the scientific community. Experienced with the entire data science life cycle: identifying problems, data wrangling, and model deployment, evaluation, and maintenance.

Education

- **Ph.D. in Physics** (GPA: 3.92)
  July 2024, *University of Oklahoma*
  Dissertation on SHAREOK
- **Professional Certificate, Machine Learning**
  Ongoing, *IBM*
- **Professional Certificate, Data Science** (View)
  Aug. 2024, *IBM*
- **B.S. in Astrophysics** (GPA: 3.91)
  May 2017, *University of Oklahoma*

Technical Skills

Programming:
Python, SQL, C/C++, C#, Bash

Platforms:
Linux/UNIX, Windows

Technologies:
Git, JupyterLab, RStudio, LaTeX, Slurm

Experience with Python Libraries:
NumPy pandas scikit-learn matplotlib SciPy Astropy Tensorflow GPy

Data Science Skills:
Machine Learning Data Wrangling Statistics Data Analysis Data Visualization Model Evaluation
Regression Classification Parameter Optimization Cluster Analysis Dimensionality Reduction

Research Experience

- **Graduate Research Assistant** July 2019 – Present
  University of Oklahoma, Advised by Dr. Eddie Baron *Norman, OK*
  - **Develop Python software** to implement **machine-learning** techniques to **model** the behavior of supernovae.
  - Perform thorough **preprocessing**, **standardization**, and **feature engineering** of spectroscopic data.
  - Conduct detailed **statistical analyses**, resulting in two **publications** in a peer-reviewed journal (ApJ).
  - **Collaborate** with leading researchers from several other universities and facilities around the world (CSP, POISE).
  - **Present** results to peers and collaborators at meetings and conferences.
  - **Synthesize models** in a **supercomputing** environment with **Slurm** scripts using `PHOENIX` radiative transfer code.

  Products:
  - **Burrow, Anthony**, et al. (2024). *Extrapolation of Type Ia Supernova Spectra into the NIR Using PCA*. ApJ
  - **Burrow, Anthony**, et al. (2020). *Carnegie Supernova Project: Classification of Type Ia Supernovae*. ApJ
  - SNEx (Python): Spectrum **extrapolation** into near-infrared wavelengths using **principal component analysis**.
  - Spextractor (Python): Fast spectrum-smoothing using **Gaussian process regression**.
  - SNIaDCA (Python): Wrapper for probablistically **classifying** supernovae with **Gaussian mixture models**.
- **Undergraduate Research Assistant** June 2015 – May 2017
  University of Oklahoma, Advised by Dr. John Wisniewski *Norman, OK*
  - **Calibrated** observed data by removing multiple sources of noise from raw `FITS` images of stars using `IRAF`.
  - **Modeled** the observed light profile of stars on images using `IRAF` to calculate their brightness values.
  - Created Python and IDL scripts needed to **analyze data** and propagate errors derived from observations.
  - Conducted multiple remote **observations** at the Apache Point Observatory to obtain more raw data for analysis.
  - **Presented results** at the American Astronomical Society conference.