Astronomy Researcher

EMMA BABULA

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Skills

- SQL
- Python (Pandas, NumPy, SciPy, MatPlotLib, AstroPy)
- Tableau
- Excel (Conditional Formatting, Pivot Tables)
- Photometric Analysis
- PSF Fitting
- Periodogram and Time-Series Analysis
- Microsoft Power BI/Power Query

Education

BACHELOR OF ARTS IN ASTRONOMY – Lehigh University – Bethlehem, PA   May 2025
Major: Astronomy; Minor: Biology

Work Experience

RESEARCH ASSISTANT– Lehigh University, Department of Physics – Bethlehem, PA   August 2023 – April 2025

- Conducted photometric analysis of Centaur objects using Python and astronomical datasets from ATLAS, ZTF and SAAO.
- Determined rotational periods and surface properties through lightcurve generation and Lomb-Scargle periodograms.
- Investigated signs of cometary activity using PSF analysis and shift-and-stack techniques on stacked FITS images.
- Assisted with remote observations at the South African Astronomical Observatory (SAAO), helping coordinate data collection.
- Presented research findings in posters at the 245th American Astronomical Society Meeting and the 56th Lunar and Planetary Science Conference.

Projects

ROTATIONAL AND COMETARY ANALYSIS OF CENTAURS – Research Project – Lehigh University   Aug 2023 – May 2025

- Analyzed **time-series** photometry of Centaurs using **Python** to study rotation periods and physical properties
- Applied **periodogram analysis** and **PSF fitting** to detect variability and possible cometary activity
- Visualized light curves with **pandas** and **matplotlib**; results presented at AAS and LPSC conferences

CLEANING 10 YEARS OF ASTEROID VESTA DATA – Personal Project – Bethlehem, PA   April 2025

- Processed 10 years of observational and photometric data on asteroid Vesta using **SQL**.
- Identified and removed inconsistencies, missing values, and duplicate entries to prepare for scientific analysis.
- Structured the dataset for future **time-series analysis** and visualization tools.
- Documented cleaning procedures for reproducibility and long-term usability.

EXOPLANET DISCOVERY ANALYSIS – Personal Project – Bethlehem, PA   May 2025

- Analyzed discovery trends of exoplanets using public datasets from NASA's Exoplanet Archive.
- Built **Tableau** dashboard to visualize distributions by discovery method, detection year, and stellar parameters.
- Cleaned and transformed raw data using **Excel** for compatibility with interactive dashboard.

SMARTPHONE SALES DATA CLEANING AND VISUALIZATION – Personal Project – Bethlehem, PA   April 2025

- Cleaned public smartphone sales data using **Python** (Pandas), changing data types and creating new calculated columns.
- Built an interactive **Tableau** dashboard to visualize trends in revenue, pricing by storage, discount patterns, and user preferences.
- Implemented a currency toggle feature to allow real-time comparison between INR and USD.

INTERNATIONAL POPULATION ANALYSIS AND VISUALIZATION – Personal Project – Bethlehem, PA   May 2025

- Cleaned and standardized global population data from multiple countries using **Power Query**.
- Built interactive visualizations in **Power BI** to explore trends in population size, regional distribution, and life expectancy.
- Performed **time series analysis** to highlight growth trends and identify population changes across decades