Kaila Nathaniel, Ph.D.

Rochester, NY 14607 (Open to relocation)

GitHub: spacekaila
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Google Scholar: mzLZSRIAAAAJ

Skills

Technical: Python (Pandas, NumPy, scikit-learn, Matplotlib), SQL, Git, Unix, LaTeX
Applied: Statistics, Bayesian inference, uncertainty estimation, model fitting, machine learning, NLP, retrieval-augmented generation (RAG), vector databases, data visualization, software development, technical writing
Management: Project management, collaboration, mentoring, workshop organization

Professional Experience

GRADUATE RESEARCH ASSISTANT *2022–2025* — *Rochester Institute of Technology (RIT)*

- Developed an open source Monte Carlo **Python framework for statistical modeling** (software repo).
- Designed and implemented modular **data processing pipelines** for synthetic populations of 900K+ objects with comprehensive validation frameworks to reduce incidence rates of missing and incorrect data.
- Reduced computational runtime by 80% through **algorithmic optimization, vectorization, and object-oriented refactoring**.
- Built **automated data visualization** suite for generating publication-ready figures and videos from simulation outputs, reducing manual analysis time and enabling rapid iteration of models across multi-dimensional parameter space.
- Organized and led 6 person **hack week** to prepare code for production.
- Presented data-driven insights at 9 conferences/seminar series for technical and non-technical stakeholders, translating complex analytical findings into clear, actionable narratives.

GRADUATE RESEARCH ASSISTANT *2019–2022* — *University of Bonn*

- Developed custom Monte Carlo population synthesis Python algorithm using **3D interpolation and Gaussian mixture models**, generating synthetic datasets of 600K+ objects.
- Designed **statistical comparison framework** using kernel density estimates to validate model outputs against real world data to fine-tune the model.
- Wrote peer-reviewed publication with international collaboration.

Projects

- Built a **retrieval-augmented generation (RAG)**-powered recommender system (software repo) that recommends knitting patterns from **natural language queries** by **embedding and retrieving** pattern data metadata from the Ravelry pattern database. Designed **data ingestion and validation pipelines** with data deduplication and incremental updates to a vector database. Used an LLM to generate personalized, explainable recommendations.
- Developed Python-based **statistical filtering and classification pipeline** to process and analyze high-dimensional datasets of 10M+ records. Performed multi-dimensional parameter space analysis to identify rare events, patterns, and relationships. Built **predictive models** using Monte-Carlo simulations and delay-time distribution modeling. Created **comprehensive data visualizations** to communicate findings. Collaborated with international team of researchers in fast-paced, deadline driven environment, resulting in peer-reviewed publication.

Education

PhD, Astrophysical Sciences and Technology *Dec. 2025* — *Rochester Institute of Technology (RIT)*
Dissertation: Massive Stars Behaving Badly: Exceptional Interactions And Their Remnants

MSc, Astrophysics *May 2025* — *University of Bonn*
Dissertation: Spindown and Envelope Inflation of Massive Stars in the Milky Way

BS, Physics *May 2019* — *Virginia Tech*