Thomas M. Behling

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Core Skills

- **Programming**
  - Considerable experience with research-focused Python in data-reduction, data visualization, and simulation modeling.
  - Experienced with more advanced programming modalities, including object-oriented programming, and use of the version-tracking software, Git.
  - Well versed in many common Python packages, including Numpy, Astropy, Matplotlib, Plotly, Open3D, Pandas, YT, and Scikit-Learn.
  - Experienced with other common statistical programming languages, including R and SAS.

- **Broad Academic Interests**
  - Well versed in a number of topics outside of pure astrophysics, including statistics, linear algebra, data science, and analytical computing.

- **High Performance Computing Experience**
  - Experience connecting remotely and working within the high performance computing systems of the Ohio Supercomputer Center and MSU ICER; this includes accessing and running SLURM jobs, creating and modifying custom scripts, and workflow automation in this context.

- **Strong Writing Skills**
  - Consistently clear, high quality writing in scientific topics.

- **Project Organization**
  - Experienced in organizing a project from initial concept to a cohesive plan of action, and implementing that plan with a group of peers to meet and exceed the established goals.

- **Collaborative Research**
  - Experienced in working within a group of peers to approach and divide up research tasks.
  - Experienced in sharing and collaborating on programming tasks within a research environment.

- **Numerical Turbulence Simulation**
  - Experienced in running and analyzing Athena++ turbulence simulations.
  - Experienced in analyzing energy transfer and flow within turbulence simulations.
  - Experienced with YT-based analysis and visualization of Athena++ output.

Research Projects

AthenaPK Turbulence Exploration - June 2024 to Present

Faculty Mentor: *Brian O'Shea, Ph.D.*

Worked alongside a faculty mentor to benchmark and analyze the output of Athena++ turbulence simulations. Ran and analyzed simulations using MSU HPCC systems, and constructed an automated workflow for batch analysis of simulation output. Created custom YT-based visualization and analysis scripts in Python.

Semi-Analytic Cosmological Simulation - May 2023 to Present

Faculty Mentor: *Eli Visbal, Ph.D.*

Worked as a paid research assistant on improving a semi-analytic cosmological simulation of the epoch of reionization. Made a number of improvements to the existing model including implementation of recombination, non-periodic boundary conditions, and density consideration, as well as created several custom metrics for measuring success of the model output.

YSOLab - September 2022 to Present

Faculty Mentor: *Tom Megeath, Ph.D.*

Worked with a group of undergraduate peers to gather, reduce, and plot light-curve data for variable protostars. Was a key contributor on the primary program used to autonomously perform these actions on a group of given sources, producing light-curves and individual tables containing infrared photometric data extracted for each source.

Gun Violence Archive Analysis - March 2023 to May 2024

Faculty Mentor: *David Lilley, Ph.D.*

Worked alongside a faculty mentor to create a custom Python web scraper to retrieve highly specific data for nearly 300,000 incident pages present on the Gun Violence Archive website. This data was then spatially merged with location information, extensively analyzed, and cross-checked with a variety of other datasets, including FBI Homicide data, Google Mobility data, and CDC Mortality data.

Cluster Research Pod - January 2023 to June 2024

Faculty Mentor: *Rupali Chandar, Ph.D.*

Worked with a group of undergraduate peers and a graduate mentor to classify and age-date clusters within several peculiar galaxies, with specific focus on IC4687. Worked to create a photometric pipeline to extract cluster positions and colors from newly taken James Webb Space Telescope images. Created various Python scripts to aid with reducing and collating data.

MSOE NSF REU - May 2022 to August 2022

Faculty Mentor: *Subha Kumpaty, Ph.D.*

Worked independently to design, create, and test a realistic brain proxy for calibrating MRI machines as part of an NSF REU program. Utilized CAD modeling, 3D printing, and agar-gel doping to recreate specific properties of the human brain within irregularly-shaped media. Worked with collaborators to obtain MRI images of proxy. Documented research in a final paper, a presentation to faculty, and an abstract presented at NCUR 2023.

Educational Background

BS (Honors) - Astrophysics, Minors in Math, Data Science (GPA: 3.884)
University of Toledo - August 2020 to May 2024

Courses: *Astrophysics, Astrophysical Observation, Electricity and Magnetism, Thermal Physics, Classical Mechanics, Quantum Mechanics, Linear Algebra, Statistical Methods, Statistical Theory, Theory of Probability, Data Science Methods, Programming, Statistical Computing, Computational Physics*

High School Diploma (GPA: 3.827)
Loveland High School - August 2016 to May 2020

Recognition & Awards

Toledo Excellence Scholarship
Awarded: *August 2020*

University of Toledo Dean's List
Awarded: *December 2020, May 2021, December 2021, May 2022, December 2022, May 2023, December 2023, May 2024*

Professional Background

Undergraduate Research Assistant

University of Toledo - May 2023 to August 2023

Worked full time alongside a faculty mentor to improve and tune a semi-analytic model of cosmological ionization during the epoch of reionization. Contributions include implementation of density consideration and non-periodic boundary conditions. Simulations were written in Cython, and run remotely using the Ohio Supercomputer Center. Work continued into the following semesters as a research project.

REU Summer Research Intern

Milwaukee School of Engineering - May 2022 to August 2022

Participated in a 10 week research program funded by the NSF. Worked to create a realistic brain proxy for calibrating MRI machines using CAD modeling, 3D printing, and agar gel doping. Research was documented in a final paper and formal presentation to faculty, and a poster was presented at NCUR 2023.

Fire Alarm Design Intern

Johnson Controls, West Chester Branch - June 2021 to August 2021

Worked full-time to create and modify fire alarm floor plan drawings using AutoCAD software with guidance from a mentor. Operated plotters and performed data entry tasks. Worked at an active jobsite for 7 weeks, assisting with wiring access card readers and verifying door programming and security access.

Fire Alarm Design Intern

Johnson Controls, West Chester Branch - June 2019 to August 2019

Worked full-time alongside a mentor to create and modify fire alarm floor plan drawings using AutoCAD software. Operated plotters and performed data entry tasks.

Courtesy Clerk

Kroger, Branch Hill Guinea - July 2018 to May 2019

Worked part-time in customer baggage assistance, performing various related tasks including janitorial duties as assigned.

References

Brian O'Shea, Ph.D. - Michigan State University
Email: *oshea@msu.edu*

Eli Visbal, Ph.D. - University of Toledo
Email: *elijah.visbal@utoledo.edu*

David Lilley, Ph.D. - University of Toledo
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