Brian Thomas Cook

Department of Physics and Astronomy
University of North Carolina at Chapel Hill
120 E Cameron Ave
Chapel Hill, NC 27514

Email: btcook@unc.edu
Homepage: https://briantcook.github.io/

Education

Leiden University   *2020*
Astronomy MSc, specialization in Astronomy Research
Thesis: "Star Cluster Phase Mixing in a Milky Way-like Background Potential."

Georgia Institute of Technology   *2018*
Physics MS

University of Michigan, Ann Arbor   *2017*
Physics BS with Honors, Astronomy & Astrophysics BS
Thesis: "The Wave Turbulence Approach to Gravitational Collapse in anti-de Sitter Space."

Publications

2.) **B. T. Cook**, D. F. Woods, J. D. Ruprecht, J. Varey, R. Mastandrea, K. de Soto, J. F. Harburg, U. Rebbapragada, and A. A. Mahabal, "Tracing Milky Way substructure with an RR Lyrae hierarchical clustering forest", Monthly Notices of the Royal Astronomical Society 513, 2 (2022).

1.) **B. T. Cook**, J. J. Tobin, M. F. Skrutskie, and M. J. Nelson: "Time variability in the bipolar scattered light nebula of L1527 IRS: a possible warped inner disk", Astronomy & Astrophysics 626, A51 (2019).

Work Experience

Graduate Research Assistant, UNC Department of Physics and Astronomy: Project manager and co-developer of `CHC`, a new implementation of the $O(N)$ self-consistent field method being developed to simulate globular clusters where external effects (e.g., the Galactic tidal field) and relaxation are taken into account. (*August 2023 - present.*)

Data Scientist, Entertainment Data Oracle, Inc.: Made several improvements to EDO's automated content recognition software (e.g., implemented the capability to more accurately compare ad airings on two different networks with different brightness settings). Created an unsupervised clustering routine to deliver reports on small creative differences (e.g., a car manufacturer's ad campaign with different lease terms at the end of each ad airing). Created a model trained on 1620 hours of content that can identify commercial and programming blocks, which in turn has the capability to reduce manual review by more than 50%. (*September 2021 - August 2023.*)

Graduate Teaching Assistant, Georgia Tech School of Physics: Served as TA for introductory physics courses designed for undergraduate engineering and biological science majors. These assignments involved helping students with analytic problems, collecting data in a variety of contexts, and writing VPython source code. (*August 2017 - August 2018, August 2020 - May 2021.*)

Summer Research Program Intern, Applied Space Systems Group, MIT Lincoln Laboratory: Utilized a hierarchical clustering algorithm to discern structures comprised of RR Lyrae variable stars in the Milky Way's stellar halo. Contributed a random forest classification element to an optical image data analysis pipeline as part of an existing collaboration with scientists at the Jet Propulsion Laboratory and Caltech. (*June - August 2019.*)

Undergraduate Student Instructor, Michigan Math and Science Scholars: Led Python tutorials for a two week cosmology course for high school students. Lectured on stellar astrophysics and relativity. (*July 2016, July 2017.*)

Grader and Laboratory Assistant, U of M Physics Department: Graded problem sets and exams for two introductory physics courses. Helped develop a lab section for Physics 390, a course that introduces Michigan undergraduates to modern physics. (*May 2015 - April 2017.*)

Miscellaneous Projects and Experience

Independent Research: Identifying open clusters and ultrafaint dwarf galaxies (UFDs) in the *Gaia* DR3 database of RR Lyrae variables. Collaborating with Vasily Belokurov. (*April 2022 - present.*)

Special Problems: Created an AMUSE simulation of the Lower Centaurus Crux and used MCMC sampling to determine the time-dependent suitability of a parametrized density model. Advised by Gongjie Li. (*August - October 2020.*)

Master's Research Project, Leiden Observatory: Designed a set of AMUSE simulations and built statistical analysis tools to quantitatively analyze the tidal disruption of Milky Way open clusters. Advised by Simon Portegies Zwart. (*September 2019 - June 2020.*)

First Research Project, Leiden Observatory: Built a Python-based EAGLE cosmological simulations post-processing pipeline and wrote "Predictions for the Circumgalactic Medium of Low-mass, Star-forming Galaxies", a report in which I describe my subsequent findings. Advised by Nastasha Wijers and Joop Schaye. (*September 2018 - July 2019.*)

Special Problems: Explored the efficacy of using the Lattice Boltzmann Method to simulate turbulent fluid flows across a network of GPUs. Advised by Roman Grigoriev. (*January - August 2018.*)

Honors Thesis Research: Re-derived a kinetic equation describing the evolution of a scalar field in Anti-de Sitter space, and began developing a Cython script to solve the highly nonlinear ODE. Advised by Leopoldo Pando Zayas. (*August 2016 - April 2017.*)

Independent Research: Analyzed near-IR images of the L1527 IRS protostar and used Monte Carlo-based radiative transfer modelling to demonstrate that anomalies in the inner disk could explain the scattered light nebula's variability. Advised by John Tobin. (*January - June 2016.*)

Introduction to Astronomical Research: Simulated hot Jupiter migration in protoplanetary disks using the FARGO3D N-body solver. Advised by Lee Hartmann and Jaehan Bae. (*September - December 2015.*)

Presentations

Talks

Master's Colloquium, Leiden Observatory, 2020.
Cosmic Coffee, Center for Relativistic Astrophysics, Georgia Tech, 2019.
Group 97 Technical Seminar, Space Systems and Technology Division, MITLL, 2019.
SPS Student Talks, U of M Physics Department, 2016.

Poster Presentations

U of M Undergraduate Astronomy Poster Session, 2017.
229th AAS Meeting, 2017.

Computing Skills

Computing Languages

Proficient: Python, C/C++.
Some experience: SQL/ADQL, Ruby, Mathematica.

Codebases and Miscellaneous Computing Tools

CMC-COSMIC, AMUSE, EAGLE, Sailfish, HO-CHUNK, FARGO3D, MESA.
Linux, Bash/Zsh scripting, Conda environments, AWS EC2 instances, Sagemaker Studio, Git.

Honors and Awards

President's Fellowship, Georgia Tech. "President's Fellowships are offered annually to a select number of highly qualified U.S. nationals or permanent residents who intend to pursue doctoral degrees."
Sigma Pi Sigma, U of M chapter. "Election to Sigma Pi Sigma is earned by outstanding academic achievement and involvement in the physics community at the University of Michigan."
LSA Honors, U of M College of Literature, Science, and the Arts. Awarded to students who are admitted to the LSA Honors Program, complete the course requirements, and write a senior thesis.

Outreach, Service

Volunteer, Leiden Science Buddy program, 2019-2020.
"How Are Galaxies Formed? An Explainer.", The Prompt Magazine, 2019.
Volunteer, COSMO-16 Conference, 2016.
Volunteer, SPS outreach event at Burns Park Elementary School, 2016.

Last updated: August 26, 2023