India R. Jackson

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UAT Keywords: Space Weather (2037) || Astronomy Image Processing (2306) || Open-source software (1866)

Education

Ph.D. Astrophysics, Georgia State University, May 2024
Research Topic: Heliophysics; Statistics; Machine Learning; Cloud Computing
Academic Advisor: P. Martens

M.S. Computer Science, Georgia State University, May 2024
Research Topic: Software Engineering; Cloud Computing
Academic Advisor: B. Aydin

M.S. Physics, Georgia State University, August 2023
Academic Advisor: P. Martens

M.S. Mathematics, Georgia State University, May 2013
Academic Advisor: G. Quin

B.S. Mathematics, Georgia State University, December 2010
Academic Advisor: Draga Vidakovic

Research Experience

NSF Atmospheric and Geospace Sciences Postdoctoral Fellow

Georgia State University (Host Institution)   January 2025 – Present
Independently awarded $202,000 by the National Science Foundation to conduct research on AI/ML applications in heliophysics and space weather forecasting. Responsible for designing and executing research, managing travel, conference participation, and producing publications. Leading the development of an open-source AI/ML pipeline to analyze solar image data for enhanced space weather predictions.

Frontier Development Lab   **Mountain View, CA**
Summer Postdoctoral Fellow   June 2024 – October 2024
FDL-X Heliolab is a prestigious summer program, focusing on the application of physics-informed machine learning to heliophysics. Responsibilities include collaborating with top-tier academic and commercial AI partners to enhance predictive models for space weather phenomena. The program involves an intensive 8-week research sprint, culminating in a Technical Showcase, demonstrating advancements in geoeffectiveness continuous learning. Engaged in full-time research with global experts, contributing to groundbreaking developments in AI and space science.

NASA Heliophysics Mission Design School   **Jet Propulsion Lab, CA**
Intern   Feb 2024 – April 2024
NASA Heliophysics Mission Design School is a 3-month long career development experience for postdocs, doctoral students, and junior faculty with their Ph.D. Participants learn the process of developing a hypothesis-driven robotic space mission in a concurrent engineering environment while getting an in-depth, first-hand look at mission design, life cycle, costs, schedule, and trade-offs inherent in each.

NASA Internship   **Goddard Space Flight Center, MD**

HelioAnalytics Intern   June 2023 – August 2023

Integrated machine learning with heliophysics using the Computer Vision Annotation Tool for coronal mass ejection annotation. Translating these annotations from COCO to YOLO format, I enhanced Yolov7's capabilities and gained insights from parameter comparisons to human annotations using Python.

NASA Internship   **Johnson Space Center, TX**

Statistics Intern   June 2019 – August 2019

Construction of an extensive SEP event database, essential for validating ISEP models, involved conducting a thorough analysis to identify statistical relationships among solar flares, CMEs, and SEP events, specifically within the framework of solar cycle 24. The overarching objective was to engineer an efficient algorithm capable of pinpointing potential flare and CME candidates, streamlining the process of database generation across multiple solar cycles.

Georgia State University   **GSU, Atlanta, GA**

Research Assistant   August 2017 – May 2024

Under a NASA grant through GSU, I employ survival analysis techniques to predict the time to detection of solar energetic particles. Additionally, I leverage advanced machine learning methodologies to bolster predictive accuracy for complex solar datasets. As part of this project, we are developing a cloud-based research analysis environment on AWS, which includes scalable computational resources and the migration of a substantial amount of heliophysics research data (approximately petabytes) to the cloud.

Funding

Publications & Works

Jackson, I. & Martens, P. (**under review**). Advancing Solar Energetic Particle Event Prediction through Survival Analysis and Cloud Computing. II. Survival Trees and Random Survival Forests. *The Astrophysical Journal Supplement*.

Jackson, I., Martens, P., & Berkay, A. (**under review**). Helio-Lite: Advancing Heliophysics Research with an Open-Source, Cost-Effective, Scalable Cloud Framework Derived from HelioCloud. https://github.com/indiajacksonphd/Helio-lite

Jha, B. K., Pandey, C., Issan, O., Jackson, I., Heyns, M., Mukundan, R., Upendran, V., Ferdousi, B., Tigas, P., Saleem, H., & Lavin, A. (2024). Geo-Cloak: Operational machine learning tool for global geomagnetic field perturbation forecasting. *2024 American Geophysical Union (AGU)*.

Jackson, I., & Martens, P. (2024). *Survival Solar Energetic Particle (SSEP) Dataset*. Harvard Dataverse. https://doi.org/10.7910/DVN/GXY9MZ

Jackson, I., & Martens, P. (2024). Advancing solar energetic particle event prediction through survival analysis and cloud computing. I. Kaplan–Meier estimation and Cox

proportional hazards modeling. *The Astrophysical Journal Supplement Series, 272*(2), 37. https://doi.org/10.3847/1538-4365/ad3fba

Nina Abramzon, Mary K. Chessey, Ximena Cid, Beth Cunningham, Jessica Esquivel, Hume A. Feldman, Alina Gearba-Sell, India Jackson, Yasemin Kalender, Caitlin Kepple, Anne F. Kornahrens, Sandra Liss, Stephanie Lyons, Arlene Maclin, Laura McCullough, Dana Molloy, Artemis Spyrou, Sarah Sublett, Stephanie M. Williams, Sherry Yennello; Celebrating the successes of women physicists over the past 50 years in the United States. AIP Conf. Proc. 17 November 2023; 3040 (1):050042. https://doi.org/10.1063/5.0175795

Thomas, B. A., Alzate, N., Kirk, M. S., & Jackson, I. (2023). Advancing heliophysics data analysis through machine learning: Utilizing YOLOv7 for automated cataloging of SOHO/LASCO C2 images (Art. no. NG13B-0614). *2023 American Geophysical Union (AGU)*. https://ui.adsabs.harvard.edu/abs/2023AGUFMNG13B0614T/abstract

Jackson, I., & Whitman, K. (2019). Building a database of SEP events informed by statistical relationships between flares, CMEs, and SEPs (Art. no. 237). https://ui.adsabs.harvard.edu/abs/2019shin.confE.237J/abstract

Professional Development

Culturally Inclusive Planetary Engagement Workshop   Atlanta, GA

Scientist   November 2024

A three-day workshop conducted by the Planetary ReaCH team where participants engage with local educators to discuss and model effective strategies for engaging Black and Latinx communities in planetary science and conduct hands-on activities during a co-designed public engagement event. Participants share their expertise self-reflect, and learn and grow together, as they practice planetary science engagement through a culturally inclusive lens.

HelioLab Research Horizons Workshop   Mountain View, CA

Heliophysics/AI Practitioner   October 2024

An invite-only two-day meeting at Google's PartnerPlex in Mountain View, CA hosted by FDL-X community, NASA, and Google Cloud to explore the current and future research potential of Artificial Intelligence for Heliolab and NASA space science. This event is designed as a truly interdisciplinary opportunity exploring state-of-the-art AI for space science.

Living With A Star Institute   UCAR, Boulder, CO
Summer Scholar   June 2018 – July 2018
Summer program through UCAR focusing on specialized labs for heliophysics. Students delved into a diverse range of topics, acquiring knowledge and expertise in subjects such as stellar and solar winds, dynamo theory, explosive events like CMEs, flares, and substorms, coronae, heliospheres, and astrospheres, evolution on short and long time scales, living with stars and societal relevance, artificial intelligence for space exploration, the magnetic fields of the Sun and planets, ionospheres and magnetospheres of Earth and other planets, planetary magnetospheres, and the long-term evolution of the geospace climate.

Boulder Space Weather Program   **NCAR, HAO, Boulder, CO**

Summer Scholar   July 2018 – August 2018

Summer program through NCAR and HAO focusing on intensive study in three core areas: the solar-terrestrial system, space weather effects and consequences, and space weather modeling and forecasting, culminating in a capstone project.

Seminars, Colloquia, & Talks

Jackson, I (2024). "Geo-Cloak: Operational Machine Learning Tool for Global Geomagnetic Field Perturbation Forecasting". Department of Physics & Astronomy, Agnes Scott College.

Jackson, I (2024). "Geo-Cloak: Operational Machine Learning Tool for Global Geomagnetic Field Perturbation Forecasting". BlackInAstro.

Jackson, I (2024). "Geo-Cloak: Operational Machine Learning Tool for Global Geomagnetic Field Perturbation Forecasting". Department of Mathematics, Clark-Atlanta University.

Jackson, I. (2023). "Unlocking the Mysteries of Space Weather with Computer Vision, Geometry, and ML". AstroAI Group and Solar Stellar Group. Harvard-Smithsonian Center for Astrophysics Seminar (CfA).

Jackson, I. (2023). "Bridging the Gap: Advancing SEP Forecasting through Survival Analysis and Machine Learning in the Cloud". Harvard-Smithsonian Center for Astrophysics Seminar (CfA).

Thomas, B. & Jackson, I. (2023). "Advancing Heliophysics Data Analysis through Machine Learning: Utilizing Yolov7 for Automated Cataloging of SOHO/LASCO C2 Images". American Geophysical Union (AGU).

Jackson, I. & Whitman, K. (2019). Building a Database of SEP Events Informed by Statistical Relationships between Flares, CMEs, and SEPs. *Solar Heliospheric and INterplanetary Environment (SHINE 2019)*, 237.

Jackson, I. (2019). A Study of Statistical Relationships between Flares, CMEs, and their associated SEPs. National Aeronautics and Space Administration Johnson Space Center (NASA JSC).

Selected Teaching and Outreach Experience

Math Instructor, various - Clark-Atlanta University & Morris Brown College, 2023

Physics Lab Instructor, 1111, 1112, 2211, 2212 – GSU, 2018 – 2022

Astronomy Lab Instructor, 1111, 1112 – GSU, 2017 – 2018

Astronomer, Hard Labor Creek Observatory Public Night – GSU, 2017

Media Appearances

Guest Speaker on National Public Radio (NPR), Washington D.C., [12/17/2023]
Topic: Recent Solar Activity

Provided expert insights and analysis on the impact of the recent solar flares and their implications for technology and the environment. Engaged in a Q&A session, addressing queries from the host and listeners.

Guest Speaker on National Public Radio (NPR), Washington D.C., [05/11/2024]
Topic: Recent Solar Activity
Provided expert insights and analysis on the impact of the recent solar flares and their implications for technology and the environment. Engaged in a Q&A session, addressing queries from the host and listeners.

Awards/Honors

Georgia State University 40 under 40, Class of 2024

African American Women in Physics, Presidential Scholarship, 2020

Kappa Mu Epsilon, Atlanta Metropolitan State College, 2018

Boys & Girls Club of Metro Atlanta, Presidential Scholar, 2004

Professional Memberships

Member	American Geophysical Union	2017 – present
Member	American Astronomical Society	2017 – present
Member	African American Women in Physics	2017 – present

Computational Skills

Proficient in software engineering and development, utilizing both agile and plan-driven methodologies.

Skilled in software development across various domains, including web applications, mobile applications, video game development, and cloud-based solutions.

Experienced in programming languages such as Python, HTML5, JavaScript, C#, Node.js, and Vue.js.

Familiarity with a range of platforms and integrated development environments (IDEs), including Matlab, LaTeX, Eclipse, PyCharm, Unity, and proficiency in working with Large Language Models, such as OpenAI's GPT-3.

Proficient in real-time, dynamic pipelining, utilizing remote resources to optimize computational workflows.

Strong background in computer vision, machine learning, image processing, and data mining, enhancing problem-solving capabilities in data-driven applications and research.

References

Dr. Piet C. H. Martens Professor – Department of Physics & Astronomy, Georgia State
Email: martens@astro.gsu.edu

Dr. Brian Thomas Code 672 HDLR Project Scientist – NASA Goddard

Email: brian.a.thomas@nasa.gov

Dr. Kathyrn Whitman Space Radiation Research Scientist – NASA Johnson

Email: kathryn.whitman@nasa.gov

Dr. Mike Kirk Research Associate – Catholic University of America, NASA Goddard
Email: michael.s.kirk@nasa.gov

Dr. Berkay Aydin Assistant Professor – Department of Computer Science, Georgia State
University Email: baydin2@gsu.edu