

Zach Hafen-Saavedra

PhD, Computational & Theoretical Astrophysics

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Summary

[\[click here for a work sample\]](#)

Always-growing scientist with over 10 years of experience analyzing relational data in Python. I lead solution development and draw on my extensive science-communication experience to deliver audience-tailored products. Seeking positions in data science and related fields.

Skills

Techniques: data analysis (inc. cleaning, visualization, time-series), machine learning (inc. NLP), Bayesian statistics, containerization, dashboarding, code testing/CI, GIS (inc. image registration), computer vision

Interpersonal skills: technical leadership and management, storytelling, mentoring

Tools: Python (inc. numpy, pandas, matplotlib, scikit-learn, pytorch, nltk), C/C++, PostgreSQL (inc. PostGIS), NoSQL, Docker, BI (Cognos BI, Streamlit), parallel computing, GDAL, OpenCV, git, Windows/Mac/Unix

Experience

Far Horizons Data Scientist

Adler Planetarium

September 2023 - Present

Chicago, IL

- As a museum resident expert, worked with youth engagement staff to [effectively communicate complex concepts](#), including providing deep-impact education to 20+ high-school students and 4 interns.
- Developed an [automated ETL and image-registration pipeline using Python and shell scripting](#), dramatically increasing the georeferencing speed from 4 manual images/hour to 5000 images/hour.
- Applied [computer-vision feature matching](#) techniques to precisely georeference aerial images, constraining the position to within 10 pixels, down from 1000 pixels.
- Streamlined pipeline accessibility by [containerizing with Docker](#) and creating a well-documented intuitive UI, reducing the training requirement to under 10 minutes for non-experts.
- Utilized CodeBuild to [deploy a Docker-containerized pipeline on AWS](#) and host the artifacts on S3, giving users easy access to the output PostgreSQL DB.
- Produced a [high-quality night map of Indianapolis](#) to assess the effects of light pollution on urban wildlife.
- Directed the adoption of [Agile project management](#), facilitating majority-community-driven development.
- Trained a [convolutional neural network to interpret cat vocalizations](#), achieving 90% validation accuracy and earning a merit of distinction in the Erdos Institute Data Science program.

Business Data Analyst

Northwestern University, Center for Interdisc. Explor. and Research in Astrophysics

June 2023 - September 2023

Evanston, IL

- Created a [web-based BI dashboard using Streamlit](#), enabling business staff to analyze data and present updated, tailored visualizations to stakeholders.
- Adopted a low-dependency shell-scripting+Python solution stack tailored to organization resources, [guaranteeing operational continuity and maintainability](#) of solutions.
- [Updated reporting to use enterprise Cognos BI](#), restoring access to crucial financial information.
- Automated data extraction from PDFs and visualized key insights, [guiding leadership in forming data-driven action plans](#) for improving diversity, equity, and inclusion.

McCue Prize Postdoctoral Fellow in Cosmology

University of California–Irvine, Department of Physics and Astronomy

July 2020 - June 2023

Irvine, CA

- Developed a Python-frontend, C++-backend code to evaluate metrics derived from NLP document embeddings, and [presented at AI4Science](#) on a metric correlating with a 150% increase in citations.
- [Automated data retrieval from NASA APIs](#), extracting metadata for more than a million papers.

- Utilized scikit-learn and PyTorch to construct an [ensemble voting model for paper impact](#), with a citation count validation RMSE 2/3 of the baseline error.
- Orchestrated a [mock data challenge spanning nine international institutions](#), quantifying the domain of validity for stastical models of intergalactic gas.
- Interfaced mock data [software with an open-source spectra database](#), decreasing uncertainty by half.
- [Organized a workshop](#) of twenty leading galaxy-formation experts, popularizing a new paradigm for the formation of our Milky Way.
- Used national [supercomputers to process 20+ TB of relational data](#), pinpointing causal phenomena behind our galaxy's disk-like structure.
- Built a [combined framework of black hole, star cluster, and galaxy simulations](#) to predict the origin of anomalous gravitational waves detected by LIGO.

National Science Foundation Graduate Fellow in K-12 Education

Northwestern University, Department of Physics and Astronomy

June 2014 - July 2020

Evanston, IL

- Employed software-development best practices such as [version control, code review, testing, and CI](#) to develop 13+ open-source packages and contribute to 6 more.
- Crafted [award-winning visualizations displayed throughout Chicago](#), effectively communicating complex scientific results to the public.
- Partnered with schools to [pioneer a high-school data science program](#), reaching over 100 underrepresented students and paving the way for future work on data literacy.
- Performed [time-series decision-tree classification](#) to predict the cosmic origins of the atoms we are made of, suggesting an extragalactic origin for 1/3 of our solar system.
- Modified C code and ran 100,000+ CPU-hour simulations to increase the statistical power and realism of theoretical estimates, generating [data used by 30+ researchers](#).
- Founded the Physics Graduate Student Council to improve student life, retention, and recruitment, tied to [a nearly 200% increase in recruitment](#).
- Collaborated with 100+ researchers, leading to [36 published papers, 7 as lead author](#).

Education

The Erdős Institute

Data Science Certificate

2023

Irvine, CA

Northwestern University

PhD, MS, Physics and Astronomy

Specialization: Astrophysical Data Analysis

2020

Evanston, IL

University of Northern Colorado

BS, Mathematical Physics

2014

Greeley, CO

Core Values

- [Growth](#), to keep changing and growing
- [Accuracy](#), to be accurate in my opinions and beliefs
- [Rationality](#), to be guided by reason and logic
- [Purpose](#), to have meaning and direction in my life
- [Passion](#), to have deep feelings about ideas, activities, or people
- [Openness](#), to be open to new experiences, ideas, and options
- [Compassion](#), to feel and act on concern for others
- [Honesty](#), to be honest and truthful
- [Responsibility](#), to make and carry out responsible decisions
- [Faithfulness](#), to be in loyal and true relationships