

Zachary Hafen-Saavedra

PhD, Theoretical and Computational Astrophysics

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Experience

McCue Prize Postdoctoral Fellow

University of California, Irvine

July 2020 - Present

Irvine, CA

- Developed a [custom-built C++ backend](#) wrapped in a user-friendly Python frontend to process and retrieve >200,000 scientific abstracts from the NASA astrophysics data system
- Employed [natural language processing](#) of scientific text to extract actionable quantitative trends
- Interfaced with [modern APIs](#) to select 10s of GB of data from >2 TB of remote data
- Led a [cross-discipline, international collaboration](#) to enable an analysis requiring expertise from observers, data analysts, and large- and small-scale simulators
- Led testing of a [Bayesian parameter estimation procedure](#) to identify viable datasets for value extraction
- Extended statistical software to [enable resampling](#) of multi-dimensional distributions
- [Modernized forward-modeling software](#) to draw on open source atomic spectra data
- Developed an analysis-management tool to [automate parameter exploration](#)
- Organized [a meeting of key galaxy-shape experts](#) to identify target measurements and simulations

GK-12 Graduate Fellow

Northwestern University

June 2014 - July 2020

Evanston, IL

- Created [quantitative visualizations](#), educational [explanatory visualizations](#), and award-winning [artistic visualizations](#) to communicate core messages
- Processed [tens of TB of >20-dimensional data](#) using high-performance-computing resources to reduce to <100 GB of highly-interpretable data
- Employed modern software development best practices (unit testing, version control, etc.) to [maintain a broad suite of essential software](#)
- Utilized and modified a C simulation code to generate [>100,000-CPU-hour simulations](#) of entire galaxies
- Developed [public code for time-dependent analysis](#) of fluid simulations to isolate driving behavior
- Developed software to [analyze mapped data](#), including jagged and sparse array handling, multiple save formats, numpy and pandas utilities, and easy utilization of item attributes
- Utilized and modified viz software to create [interactive 3D visualizations](#) of complex interactions between merging and orbiting galaxies
- Led one of Chicago's first [data-science education initiatives](#) for high-school students to bring opportunities to >100 students primarily from underrepresented-in-STEM backgrounds
- Collaborated with a multidisciplinary range of scientists to publish (to date) [35 papers, 6 as a lead author](#)

Skills

Techniques: data analysis (time-series, sparse, big data, data cleaning), natural language processing, code testing (unit, integration, functional, CI), simulations, frequentist/Bayesian statistics, multiscale/hierarchical modeling, analysis pipeline development, forward modeling/mock data, technical writing

Soft skills: technical leadership and management, public speaking, mentoring (technical, professional)

Tools: Python (numpy, pandas, scikit, matplotlib), C/C++, Unix/Bash, parallel computing, git, nltk

Education

Northwestern University

PhD, MS, Physics and Astronomy

Specialization: Theoretical and Computational Astrophysics

May 2020

Evanston, IL

University of Northern Colorado

BS, Physics, Math emphasis

May 2014

Greeley, CO