Joseph A'Hearn, PhD

Data Scientist

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SUMMARY

- Self-driven data scientist with expertise in modeling and numerical simulations of dynamical systems as evidenced by 2 peer-reviewed first-author scientific publications (and another recently submitted for publication).
- Problem-solving skills and extensive experience in scientific programming using Python, resulting in the completion of 9 programming-related projects.
- Strong oral and written communication skills with an ability for data storytelling in both analytical and concise formats, as evidenced by 48 successful presentations and talks, including an award-winning poster.

EXPERIENCE

Data Science Expertise

Gained as a Research Assistant in Physics at University of Idaho in Moscow, ID
& as a virtual Summer Research Intern at NASA Jet Propulsion Laboratory

- Built models in Python using advanced mathematical tools such as differentiation, integration, Fourier analysis, Gaussian elimination, and least-squares optimization for regression models to assess system stability and aid mission planning through 12 projects.
- Developed algorithms for optimization, regression, and classification problems to propel innovative ideas and test hypotheses, leading to the publication of 3 peer-reviewed scientific papers, including 2 first-author papers.
- Presented results, including 5 novel discoveries, to the scientific community using data storytelling techniques through 2 invited talks and 14 conference presentations.

Data Analysis Expertise

Gained as a Research/Teaching Assistant in Physics at University of Idaho
& as a Teacher at Memoria Press Online Academy, Kepler Education, and Legion of Christ College of Humanities in Cheshire, CT

- Used data visualization techniques in Matplotlib and Excel to communicate scientific insights effectively in 14 courses taught in quantitative disciplines and in 28 presentations for scientific-minded audiences.
- Tracked and analyzed grades to make data-driven decisions for 200+ students in 17 total courses taught.
- Communicated effectively with students, parents, and staff to inform decision-making for course completion with a 97% success rate.

PROJECTS

Ice Giant Ring Seismology
- Compared various methods of differentiation and integration, as well as fitting polynomial and logistic functions for interior properties, and implemented a combination of finite difference and nudge methods to provide the most physical solution.
- Implemented an algorithm in Python to predict the locations of various types of resonance.
- Developed an algorithm using Python libraries for cross-correlation analysis between brightness residuals and resonance location predictions.

Orbital Evolution Analysis in the 4-Body Problem
- Implemented an iterative algorithm to quickly converge on a solution for geometric orbital element calculation.
- Developed an algorithm using Python libraries to calculate and plot a least-squares sinusoidal fitting function, take a Fourier transform, and generate heat maps to visualize amplitude dependence in two types of orbital resonance.
- Analyzed and categorized changes during close encounters in quantities typically assumed to be constant to show that results were inconsistent with the initial hypothesis.

Stability Analysis for Co-orbital Systems
- Implemented an algorithm using Gaussian elimination with pivots to provide a ratio solution for anti-symmetric matrices.
- Developed a regression function to demarcate stable from unstable systems, calculated instability timescales, and verified these predictions using multi-body numerical simulations with Mercury6 code.
- Provided simulation summary plots including paths in a co-rotating frame, calculated using trigonometric functions, to allow for visual understanding of orbital evolution.

EDUCATION

Ph.D. in Physics, *University of Idaho*, Moscow, ID, *with a focus in Astrophysics & Planetary Science*   May 2022

TECHNICAL SKILLS

- Python (NumPy, SciPy, Matplotlib, Pandas, Scikit-learn, BeautifulSoup, Jupyter Notebook)
- C++
- Matlab
- Mathematica
- SQL
- Git
- $\LaTeX$
- Terminal
- Data Analysis
- Data Visualization
- Regression Analysis
- Forecasting
- Spreadsheets
- Statistics
- Machine Learning
- Calculus
- Differential Equations
- Linear Algebra
- Numerical Methods
- Microsoft Office (Excel, Word, PowerPoint, Publisher)
- iMovie
- WordPress

LANGUAGES

- English (native)
- Spanish (fluent)
- Italian (proficient)
- Latin (advanced)
- Classical/Koiné Greek (advanced)

AFFILIATIONS & HOBBIES

- Mission Youth volunteer dedicated to poverty alleviation in Mexico
- American Geophysical Union, American Astronomical Society, Society of Catholic Scientists, Cheeky Scientist Association
- Chess enthusiast with a passion for baseball