Jon Zink, Ph.D

Basic Information

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Professional Experience

California Institute of Technology
NASA Hubble Postdoctoral Fellow **September, 2021 - Present**

- Extracted exoplanet population trend with 99.99% confidence by accounting for sample biases/reliability, revealing the non-uniform distribution of planets within the Milky Way: see NASA press release.
- Executed k-means clustering analysis to group planet classes and resolve a physically-driven partition, reducing the measurement uncertainty of existing methods by 22%.
- Resolved a 30-year-old planetary formation mystery by identifying an intra-system correlation in giant planet systems using Bayesian hierarchical modeling.
- Developed Gaussian process regression methodology for robust time-series correlated-noise removal, improving planetary signal recovery by 9X and adopted by 12 independent research groups.
- Lead and coordinated team of 16 scientists to perform quality control tasks; deliver science products; and produce peer-reviewed publications.

University of California, Los Angeles
Graduate Researcher **September, 2016 - June, 2021**

- Developed Python algorithm able to search highly contaminated time-series data and identify planet signals with 94% reliability, resulting in the discovery of 372 planets: see Forbes & Newsweek press.
- Implemented random forest regression to characterize $\sim 200,000$ stars, from training set of $\sim 25,000$ well characterized stars, resulting in a 48% accuracy improvement of existing methods.
- Validated 60 planet signal by cross-correlating their position with a Milky-way density map, resulting in a 0.1% false-positive likelihood.
- Executed memory intensive simulation 12X faster than previous researchers by applying parallel code structure to open-source code.
- Derived Poisson point-process expansion, addressing sample bias issues attributed to the planet detection sequence, via order statistics, improving the accuracy of system architecture models by 36%.
- Produced novel likelihood function for forward model comparison, using the Anderson-Darling EDF and a modified Poisson PDF, enabling the algorithm to converge 10X faster than existing methods.

Software Development

- Produced open-source Python package able to parse exoplanet signals from statistical fluctuations in time-series data, used by 27 independent research groups: see EDIunplugged on Github.
- Developed forward modeling software in Python and R (ExoMult), addresses intra-system correlations and sample biases, reducing the uncertainty of previous Earth-analog occurrence calculations by 63%.
- Contributed to open source Python software through bug fixes and feature additions: see KPF pipeline on GitHub.

Skills

Machine Learning: Random Forest, SVM, PCA, Clustering, Deep Learning, and Survival Analysis
Statistical Methods: Bayesian Analysis, Time-Series Analysis, Hypothesis Testing, Error Analysis, Monte Carlo Methods, Forward Modeling, EDF Testing, and Order Statistics
Software and Computing: Open Source Contributor, Python, R, C++, Java, SQL, HTML, PyMC, TensorFlow, Scikit-learn, and Object-Oriented Coding

Education

University of California, Los Angeles

- Ph.D, Astrophysics, 2021
- B.S., Astrophysics, 2014