Daniel Foreman-Mackey

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Sagan Postdoctoral Fellow, Astronomy Department, University of Washington

Education

PhD 2015, Department of Physics, New York University. Advisor: Hogg

MSc 2010, Department of Physics, Queen's University, Canada. Advisor: Widrow

BSc 2008, Department of Physics, McGill University, Canada.

Positions

Sagan Postdoctoral Fellow, University of Washington, 2015–present.

Honors

Kavli Fellow, 2015.

Sagan Postdoctoral Fellowship, 2015–present.

James Arthur Graduate Fellowship, 2014.

Horizon Fellowship in the Natural & Physical Sciences, 2012.

Henry M. MacCracken Fellowship, 2010.

NSERC Undergraduate Summer Research Award, 2007.

Grants

K2 Guest Observer – Cycle 3 (PI: Penny), *Free-Floating and Bound Planet Mass Measurements with K2: Ground- and Space-Based Photometry, Event Detection and Modeling*, $84,000, 2016–2017

K2 Guest Observer – Cycle 3 (PI: Hogg), *Ultra-precise photometry in crowded fields: A self-calibration approach*, $100,000, 2016–2017

XSEDE (PI: Foreman-Mackey), *A systematic search for transiting exoplanets using K2*, 100,000 CPU hours, 2015–2016

Refereed publications

Montet, B. T., Morton, T. D., **Foreman-Mackey, D.**, *et al.*, 2015, *Stellar and Planetary Properties of K2 Campaign 1 Candidates and Validation of 18 Systems, Including a Planet Receiving Earth-like Insolation*, ApJ, **809**, 25 (arXiv:1503.07866)

Ambikasaran, S., **Foreman-Mackey, D.**, Greengard, L., Hogg, D. W., & O'Neil, M., 2015, *Fast Direct Methods for Gaussian Processes*, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, **PP**, 99 (arXiv:1403.6015)

Weisz, D. R., Johnson, L. C., **Foreman-Mackey, D.**, *et al.*, 2015, *The High-Mass Stellar Initial Mass Function in M31 Clusters*, ApJ, **806**, 198 (arXiv:1502.06621)

Bernhard Schölkopf, B., Hogg, D. W., Wang, D., **Foreman-Mackey, D.**, Janzing, D., Simon-Gabriel, C.-J., & Peters, J., 2015, *Removing systematic errors for exoplanet search via latent causes*, Proceedings of The 32nd International Conference on Machine Learning, **W&CP 37**, 2218 (arXiv:1505.03036)

Foreman-Mackey, D., Montet, B. T., Hogg, D. W., Morton, T. D., Wang, D., & Schölkopf, B., 2015, *A systematic search for transiting planets in the K2 data*, ApJ, **806**, 215 (arXiv:1502.04715)

Barclay, T., Quintana, E. V., Adams, F. C., *et al.*, 2015, *The Five Planets in the*

Kepler-296 Binary System All Orbit the Primary: A Statistical and Analytical Analysis, ApJ, **809**, 7 (arXiv:1505.01845)

Angus, R., Aigrain, S., **Foreman-Mackey, D.**, & McQuillen, A., 2015, *Calibrating gyrochronology using Kepler asteroseismic targets*, MNRAS, **450**, 1787 (arXiv:1502.06965)

Barclay, T., Endl, M., Huber, D., **Foreman-Mackey, D.**, *et al.*, 2014, *Radial Velocity Observations and Light Curve Noise Modeling Confirm That Kepler-91b is a Giant Planet Orbiting a Giant Star*, ApJ, **800**, 46 (arXiv:1408.3149)

Foreman-Mackey, D., Hogg, D. W., & Morton, T. D., 2014, *Exoplanet population inference and the abundance of Earth analogs from noisy, incomplete catalogs* ApJ, **795**, 64 (arXiv:1406.3020)

Dawson, R. I., Johnson, J. A., Fabrycky, D. C., **Foreman-Mackey, D.**, *et al.*, 2014, *Large Eccentricity, Low Mutual Inclination: The Three-dimensional Architecture of a Hierarchical System of Giant Planets* ApJ, **791**, 89 (arXiv:1405.5229)

Dorman, C. E., Widrow, L. M., Guhathakurta, P., Seth, A. C., **Foreman-Mackey, D.**, *et al.*, 2013, *A New Approach to Detailed Structural Decomposition from the SPLASH and PHAT Surveys: Kicked-up Disk Stars in the Andromeda Galaxy?*, ApJ, **779**, 103 (arXiv:1310.4179)

Weisz, D. R., *et al.*, 2013, *The Panchromatic Hubble Andromeda Treasury. IV. A Probabilistic Approach to Inferring the High-mass Stellar Initial Mass Function and Other Power-law Functions*, ApJ, **762**, 123 (arXiv:1211.6105)

Brewer, B. J., **Foreman-Mackey, D.**, & Hogg, D. W., 2013, *Probabilistic Catalogs for Crowded Stellar Fields*, AJ, **146**, 7 (arXiv:1211.5805)

Foreman-Mackey, D., Hogg, D. W., Lang, D., & Goodman, J., 2013, *emcee: The MCMC Hammer*, PASP, **125**, 306 (arXiv:1202.3665)

Unrefereed publications & white papers

Schölkopf, B., Hogg, D. W., Wang, D., **Foreman-Mackey, D.**, Janzing, D., Simon-Gabriel, C.-J., & Peters, J., 2015, *Modeling Confounding by Half-Sibling Regression*, submitted to PNAS

Wang, D., **Foreman-Mackey, D.**, Hogg, D. W., & Schölkopf, B., *Calibrating the pixel-level Kepler imaging data with a causal data-driven model*, 2015, submitted to PASP, arXiv:1508.01853

Foreman-Mackey, D., 2015, *An experiment in open science: exoplanet population inference*, detailed blog post

Angus, R., **Foreman-Mackey, D.**, & Johnson, J. A., 2015, *Systematics-insensitive periodic signal search with K2*, submitted to ApJ, arXiv:1505.07105

Foreman-Mackey, D., 2014, *Practical Mixture Models*, detailed blog post

Foreman-Mackey, D., 2014, *The Histogram*, detailed blog post

Montet, B. T., *et al.*, 2014, *Maximizing Kepler science return per telemetered pixel: Searching the habitable zones of the brightest stars*, arXiv:1309.0654

Hogg, D. W., *et al.*, 2014, *Maximizing Kepler science return per telemetered pixel: Detailed models of the focal plane in the two-wheel era*, arXiv:1309.0653

Invited talks & tutorials

Scalable Gaussian processes & the search for transiting exoplanets, 2015, Data Science at the LHC, CERN, Geneva.

Discovery & characterization of transiting exoplanets & their population, 2015, Colloquium, University of Washington.

Hierarchical inference for exoplanet population inference, 2015, IAU Symposium, Honolulu.

Data-driven models, 2015, Extreme precision radial velocities, Yale.

Population inference from noisy & incomplete catalogs, 2015, Local Group Astrostatistics, University of Michigan.

The search for single transits, 2015, Sagan Fellows Symposium, Caltech.

Inferring exoplanet populations from noisy, incomplete catalogs, 2015, TESS group meeting, MIT.

Inferring exoplanet populations from noisy, incomplete catalogs, 2015, Institute for Advanced Study, Princeton.

Licenses in the wild, 2015, AAS225, Seattle.

Time series analysis, Gaussian Processes, and the search for exo-Earths, 2014, PyData NYC conference, New York.

An astronomer's introduction to Gaussian processes, 2014, Astronomy Department, University of Texas, Austin.

Introduction to Gaussian Processes, probabilistic graphical models, and deep learning, 2014, Astro Hack Week, University of Washington.

Inferring exoplanet populations from noisy, incomplete catalogs, 2014, Physics Department, University of Delaware.

Hierarchical inference for astronomers, 2014, Strasbourg Observatory, France.

An astronomer's introduction to Gaussian processes, 2014, Bayesian Computing for Astronomical Data Analysis (Summer school at Penn State University).

An astronomer's introduction to Gaussian processes, 2014, Harvard–Smithsonian Center for Astrophysics.

Practical data analysis using MCMC, 2014, Astronomy Department, University of Hertfordshire.

Practical data analysis using MCMC, 2013, Astronomy Department, UCSC.

From pixels to aliens (Public Talk), 2013, Astronomy on Tap, NYC.

Data analysis using MCMC, 2013, Astronomy Department, Columbia University.

Data analysis using MCMC, 2013, Physics Department, Vanderbilt University.

Popular open-source software

emcee — MCMC sampling in Python. Popular in astronomy; the paper has 485 citations as of 2015-12-01. dfm.io/emcee

George — Blazingly fast Gaussian processes for regression. Implemented in C++ and Python bindings. Joint work with applied mathematicians at NYU. dfm.io/george

corner.py — Simple corner plots (or scatterplot matrices) in Python. github.com/dfm/corner.py