

Kevin Urban, PhD

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Profile

Highly-motivated, innovative individual with extensive experience in empirical research, data product development, and transparent visualization of varied, high-dimensional data sets. Creative, analytic problem solver with an intuition for trends and patterns in complex data, and insight into the underlying mathematical structure. Self-motivated, collaborative personality with the understanding that a cross-functional, open-minded work environment and combined skill sets result in efficient delivery of high-value, dependable data products. Effective written and verbal communicator.

Computing Skills

Programming / Tools:

R, Python, MatLab, IDL, UNIX, Bash, JavaScript, SQL, SQLite, LaTeX, Vim, Fortran, Spark, Hive, MongoDB, Java, C/C++, Excel

Analytics:

Structured Data (e.g., uni/multi-variate time series, geospatial, model/simulation output, genomics data)

Unstructured Data (e.g., image analysis, text mining / scrubbing web pages)

Sensor/Instrument Data Sets (e.g., mining and analysis of vectorial time series data from 100's of globally-distributed geomagnetic sensors)

Data Pre-Processing (detection and removal/remedy of outliers, clipped or out-of-range values, missing values; data structuring, normalization, and/or transformations)

Probability & Statistics (e.g., sample statistics, inference, model identification, hypothesis testing, resampling, bootstrapping, confidence intervals, conditioning, error analysis, statistical modeling)

Supervised Machine Learning (e.g., regression, classification, clustering, prediction)

Unsupervised Machine Learning (e.g., PCA, SVD, hierarchical clustering, dimensionality reduction)

Time Series Analysis (spectral analysis, digital signal processing, ARIMA, GARCH, prediction / forecasting, non-parametric methods)

Anomaly Detection (e.g., kernel density methods, event detection, pattern recognition)

Statistical / Numerical Modeling (model selection, linear/nonlinear models, dynamical systems, differential/difference equations, numerical stability, eigenvalues, Runge-Kutta methods)

Work and Professional Research Experience

Department of Physics, NJIT, Newark, NJ (January 2012 – May 2016)

Research Scientist, Ph.D. Candidate. Advisors: Andrew Gerrard, Louis Lanzerotti, Denis Blackmore

- Led multiple data-driven research projects, providing new insights into decades-old problems, and resulting in several first-author research papers
- Devised prediction scheme to forecast the evolution of hydromagnetic energy in the deep polar cap
- Developed remote-sensing technique using ground-based data sets to infer/predict parameters in near-Earth space
- Results and development included: innovative visualizations; robust, non-parametric analysis of time series / geospatial data; data collection and normalization from global-scale networks of instruments/sensors; analysis of linear/nonlinear drivers of complex systems; development of software packages for efficient, streamlined analysis

Department of Mathematical Sciences, NJIT, Newark, NJ (2008 – 2012)

Research Scientist, Professor Denis Blackmore

- Modeled, analyzed, and visualized granular fluid systems in MatLab and R, resulting in 4 peer-reviewed publications
- Investigated sources of chaos in dimensionally-reduced, discrete dynamical systems
- Drove project on applications of fractional calculus, resulting in publication
- Determined how to control numerical errors in stiff model
- Explored real-world applications of disciplines such as dynamical systems, topological analysis, manifold theory, abstract algebra, stochastic calculus

NASA/CalTech Jet Propulsion Laboratory, Pasadena, CA (Summer 2011)

Intern, Trajectory Optimization / Design

- Collaborated with a cross-functional team of engineers and scientists to develop a full-fledged spacecraft mission to the Trojan asteroids of Jupiter (from establishing and prioritizing science goals, to optimizing the science-engineering-financial parameter space, to the written proposal and presenting our mission design to the NASA review board)
- Gained an appreciation of rapid product development via concurrent engineering, and an understanding of the intricate interplay between the various engineering system designs, science goals, timeline requirements, and budget constraints.
- Published peer-reviewed paper documenting lessons learned

Department of Physics, NJIT Newark, NJ (August 2008 - August 2011)

Independent Research Scientist (2010-2011)

Research Assistant (2008-2010)

- Led project demonstrating feasibility of real-time classification, prediction, and reconstruction of space weather conditions and geomagnetic structures by leveraging multiple, vectorial data streams from a spatially distributed network of instruments (sensors), resulting in a master's thesis and peer-reviewed publication
- Product development included: analysis and visualization of random field (geospatial), multivariate time series data (R, MatLab, IDL); implementation of techniques from time series and spectral analysis, statistics, and regression; hardware-software interfacing; data collection

NASA Goddard Space Flight Center, Greenbelt, MD (June – August 2007)

Intern, Observational Cosmology Laboratory

- Worked with members of the data analysis team for the Absolute Spectrum Polarimeter [ASP], an instrument designed to detect signatures of B-mode gravitational waves (considered to be "smoking gun" evidence for Einstein's theory of general relativity and cosmological inflationary theory)
- Developed software to model data collection and analysis in preparation for future availability of instrument data
- Worked with several programming languages, including MatLab, Bash, and IDL

NASA Goddard Space Flight Center, Greenbelt, MD (June – August 2006)

Intern, Heliophysics Division

- Developed web content and gained experience in Python, HTML, CSS, JavaScript, PHP, and working in the UNIX command line environment

Selected Peer-Reviewed Publications

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- Penetration of solar wind hydromagnetic energy deep into the polar cap: remote detection and forecasting. Geophysical Research Letters, Submitted, 2016.
 - Rethinking the polar cap: eccentric-dipole structuring of ULF power at the highest corrected geomagnetic latitudes. Journal of Geophysical Research, In Press, 2016.
 - Mission to the Trojan Asteroids: lessons learned during a JPL Planetary Science Summer School mission design exercise [\[link\]](#), Planetary and Space Science, Vol. 76, 2013.
 - Quiet-time observations of the open-closed boundary prior to the CIR-induced storm of August 9, 2008 [\[link\]](#). Space Weather, Vol. 9, S11001, 2011.

Education

Ph.D., Physics: New Jersey Institute of Technology & Rutgers University, Newark, NJ. May 2016. **Dissertation:** The Hydromagnetic Structure of the Polar Cap and Its Interaction with the Solar Wind

M.S., Applied Physics (Minor: Applied Math): NJIT & Rutgers University, Newark, NJ. August 2010. **Thesis:** Synoptic Variability of a CIR-Driven Open-Closed Boundary During Solar Minimum

B.S., Applied Physics (Minor: Applied Math): NJIT & Rutgers University, Newark, NJ. May 2008.