Kevin Urban, PhD

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Objective

To obtain a data scientist role at MediaMath.

Profile

Highly-motivated, innovative individual with experience in data product development and transparent visualization of varied, high-dimensional data sets. Creative, analytic problem solver equipped with an intuition for trends and patterns in complex data sets, and insight into the underlying mathematical structure. Strategic and focused, interested in rapid research-to-product development. 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.

Education

Ph.D., Applied Physics   New Jersey Institute of Technology & Rutgers University, Newark, NJ
   Dissertation: The Hydromagnetic Structure of the Polar Cap and Its Interaction with the Solar Wind
M.S., Applied Physics (Minor: Applied Mathematics)   New Jersey Institute of Technology & Rutgers University, Newark, NJ
   Thesis: Synoptic Variability of a CIR-Driven Open-Closed Boundary During Solar Minimum
B.S., Applied Physics (Minor: Applied Mathematics)   New Jersey Institute of Technology & Rutgers University, Newark, NJ

Computing Skills

Programming / Tools: R, MatLab, Python, Interactive Data Language [IDL], UNIX, Bash (Shell Scripting), JavaScript, SQL, LaTeX, Vim, Fortran, Spark, Hive, MongoDB (shell, pymongo, rmongodb), Java, C/C++, Tableau

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, Data Analyst

- Through the combination of data/observationally-driven research and deep physical understanding of magnetohydrodynamics, explained decades-old problem that prevented proper understanding of the geomagnetic field's complex structure in Earth's polar regions [link]. The research involved stochastic analysis; development of novel visualization and analysis techniques [link]; collection, harmonization, and normalization of 100's of data sets [link] distributed across the Earth and solar system to model and understand the linear/nonlinear drivers of complex, physical systems.
- The product development included statistical and physical model selection, new interpretations of results commonly understood as anomalies found in the empirical spatial distribution, hypothesis testing, and development of dynamic correlation metrics which verified time-varying causal relationships [link], thus verifying the contrary hypothesis to previous understanding of the subject matter.

Department of Mathematical Sciences, NJIT   Newark, NJ • 2008 − 2012
Research Scientist, Mathematical Modeler

- Extensively modeled, analyzed, and visualized several representations of granular fluid systems in MatLab and R

- Investigated sources of chaos in a dimensionally-reduced parameter space of a discrete-dynamical system (e.g., via Poincare map simulations in R [link])
- Led effort in understanding and controlling the propagation of numerical errors, which otherwise prevent proper quantitative analysis and visualization of the underlying dynamical system
- Co-authored four peer-reviewed papers numerically modeling, visualizing, and analyzing granular fluid systems
- Led research project on applications of fractional calculus and co-authored peer-reviewed publication
- Explored real-world applications of advanced mathematical disciplines such as dynamical systems, topological analysis, manifold theory, abstract algebra, stochastic calculus

Department of Physics and Astronomy, Siena College   **Loudonville, NY ● August 2011 – January 2012**
Research Scientist, Contractor
- Led project continuing the development of automated space weather nowcasting by leveraging time series, spectral, regression, and classification techniques on real-time data from geospatially-distributed network of instrumentation

NASA/CalTech Jet Propulsion Laboratory   **Pasadena, CA ● Summer 2011**
Intern, Trajectory Optimization / Design
- Collaborated with a 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**
Contractor (2010-2011)
- Published peer-reviewed paper documenting proof-of-concept and lessons learned proof-of-concept [link]
Research Assistant (2008-10)
- Led project demonstrating the feasibility of a real-time detection/classification scheme in maintaining surveillance on local, regional, and global-scale geomagnetic events of interest.
- Analyzed multi-channel instrument data from a spatially-distributed network of automated observatories in Antarctica.
- Developed data metrics and associated classification scheme for events of interest in the data sets.
- In-depth experience visualizing and analyzing data in R, MatLab, and IDL
- In-depth experience in various data analysis techniques, such as digital signal processing, time series analysis, spectral analysis, statistical methods, modeling, and regression.
- Hardware-software interfacing of instrumentation for data collection
- Published Master's thesis

Center for Solar-Terrestrial Research, NJIT   **Newark, NJ ● January – August 2008**
Intern
- Developed software to interface instrument sensors with an analog-to-digital converter
- Collected and managed digitized instrument data
- Created real-time visualization software (MatLab) for continuous data display at local museum in Jenny Jump State Park

NASA Goddard Space Flight Center   **Greentbelt, MD ● June – August 2007**
Intern, Observational Cosmology Laboratory
- Developed software implementing a Stokes parameter analysis to run on simulation data for the proposed Absolute Spectrum Polarimeter [ASP] — an instrument designed to detect B-mode gravitational waves, which would provide evidence for Einstein's theory of general relativity and cosmological inflationary theory
- Worked with multiple programming languages, including MatLab, Bash (shell scripting), and IDL

NASA Goddard Space Flight Center   **Greentbelt, MD ● June – August 2006**
Intern, Heliophysics Division
- Worked extensively in the UNIX programming environment, learning and developing Python, HTML, CSS, JavaScript, and PHP code
- Developed web content for the International Heliphysical Year [IHY]

Peer-Reviewed Papers

- 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.

- The hydromagnetic structure of the polar cap and its interaction with the solar wind. PhD Dissertation. New Jersey Institute of Technology / Rutgers University, Department of Physics, 2016.
- Analysis, simulation, and visualization of 1D tapping via reduced dynamical models [link]. Physica D: Nonlinear Phenomena, Vol. 273, 2014.
- 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.
- Dynamical systems model and discrete element simulations of a tapped granular column [link]. Powders and Grains 2013: Proceedings of the 7th International Conference on Micromechanics of Granular Media. Vol. 1542. No. 1. AIP Publishing, 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.
- Tapping dynamics for a column of particles and beyond [link]. Journal of Mechanics of Materials and Structures, Vol. 6, No. 1-4, 2011.
- Synoptic Variability of a CIR-driven Open-closed Boundary During Solar Minimum. Master's Thesis. New Jersey Institute of Technology / Rutgers University, Department of Physics, 2010.
- Integrability analysis of regular and fractional Blackmore-Samulyak-Rosato fields [link]. Condensed Matter Physics, Vol. 13, No. 4, 2010.

Invited Presentations

2015

- Urban, K., A. J. Gerrard, L. J. Lanzerotti, and A. T. Weatherwax, "Quantifying Solar Wind-Polar Cap Interactions," *American Geophysical Union Fall Meeting*, San Francisco, CA. Dec 14-18, 2015.
- K. Urban, "Sailing the Seas of the Solar Wind," *Meeting of the North Jersey Astronomical Group*, Montclair State University, Montclair, NJ. Nov. 11, 2015.
- Urban, K., A. J. Gerrard, L. J. Lanzerotti, and A. T. Weatherwax, "Solar Wind-Polar Cap Open Field Interactions [link]," Coupling, Energetics, and Dynamics of Atmospheric Regions [CEDAR], 2015 Meeting, Seattle, WA
- Urban, K., "AGO Fluxgate Data: Extracting value from an imperfect time series [link]," Air Force Research Laboratory, Albuquerque, NM

2011

- K. Sayanagi, J. Balcerski, B. Carande, R. Diaz-Silva, S. Diniega A. Fraeman, S. Guzewich, J. Hudson, A. Nahm, S. Potter, M. Route, K. Urban, S. Vasisht, B. Benneke, S. Gil, R. Livi, B. Williams, "Trojan ASteroid Tour, Exploration, and Rendezvous: TASTER Mission," *Jet Propulsion Laboratory*, Pasadena, CA. August 2011.

2008

- Urban, K., and A. Gerrard, "Geomagnetic Research at Jenny Jump: the Magnetic Forecast," *Meeting of the United Astronomy Clubs of New Jersey*, Jenny Jump State Forest, NJ. July 19, 2008.

Other Presentations

2014

- Urban, K., A. J. Gerrard, L. J. Lanzerotti, A. T. Weatherwax, "Locating the Open-Closed Boundary During the Passage of a Corotating Interaction Region [link]," American Geophysical Union [AGU] Fall Meeting, San Francisco, CA. December 15-19, 2014.
- Gerrard, A., L. Lanzerotti, J. Manweiler, J. Bortnik, and K. Urban, "Modulation of Ring Current He-Ions by Bounce-Resonant ULF Waves [link]," American Geophysical Union [AGU] Fall Meeting, San Francisco, CA. December 15-19, 2014.
- Urban, K., A. Gerrard, L. Lanzerotti, and A. Weatherwax, "The Fluxgate Open-Closed Boundary," *Geospace Environment Modelling [GEM] "Mini-GEM" Workshop*, San Francisco, CA. December 14, 2014.
- Urban, K. D., A. J. Gerrard, A. T. Weatherwax, L. J. Lanzerotti, and A. Ridley, "Observations of the open-closed boundary during the passage of a corotating interaction region," *2014 SCAR Biennial Meeting*, Auckland, New Zealand. August 23 - September 3, 2014.
- Urban, K., A. Gerrard, and L. Lanzerotti, "Open-Closed Boundary Reconstruction: Cooperative Space-borne and Ground-based Methods," *Geospace Environment Modeling [GEM] Summer Workshop*, Portsmouth, VA. June 15-20, 2014.

- Urban, K., A. J. Gerrard, and L. J. Lanzerotti, "Ground-based ULF observations associated with Zebra Stripe Events [link]," *Van Allen Probe Science Working Group – RBSPICE Team Meeting*, March 11, 2014.

2013

- Urban, K., A. J. Gerrard, L. J. Lanzerotti, and D. G. Mitchell, "Solar wind-driven ULF activity in Earths inner radiation belt: Effects on trapped electrons [link]," *American Geophysical Union Fall Meeting*, San Francisco, CA. December 9-13, 2013.
- Urban, K., A. Gerrard, and L. Lanzerotti, "Ground and spaceborne perspectives of ULF activity in Earth's radiation belts," *Geospace Environment Modeling [GEM] Summer Workshop*, Snowmass, CO. June 16-21, 2013.
- Blackmore, D., A. Rosato, X. Tricoche, K. Urban, H. Wu, and L. Zou, "Analysis of a dynamical systems model for granular flow," *SIAM Conf. on Applications of Dynamical Systems*, Snowbird Resort, Utah. May 18-23, 2013.

2012

- Urban, K., and A. J. Gerrard, "Particle precipitation regimes of the polar cap in the midst of deep geomagnetic quiescence: perspectives from the AGO magnetometer network [link]," *American Geophysical Union Fall Meeting*, San Francisco, December 3-7, 2012.
- Teti, A., A. Gerrard, J. Olsztyn, Y. Bhattacharya, G. Jeffer, K. Urban, L. Lanzerotti, and A. Weatherwax, "Ground Sites: Mapping of Solar Wind KHI Periodicities and the Subsequent Generation of Compressional/Breathing Pc5 Modes [link]," *American Geophysical Union Fall Meeting*, San Francisco, December 3-7, 2012.
- Nahm, A., S. Potter, KS Sayanagi, S. Diniega, S. Gil, J. Balcerski, B. Carande, R. Diaz-Silva, A. Fraeman, J. Hudson, S. Guzewich, R. Livi, M. Route, K. Urban, S. Vasisht, B. Williams, C. Budney, and L. Lowes, "TASTER: Trojan ASteroid Tour, Exploration, and Rendezvous, a JPL Planetary Science Summer School Mission Design Exercise [link]," *Lunar and Planetary Science Conference*. Vol. 43. 2012.

2011

- Bhattacharya, Y., A. Gerrard, K. Urban, L. Lanzerotti, and A. Weatherwax, "Spectral investigation of PC5 oscillations in SWEPAM proton velocities from the ACE spacecraft," *CEDAR-GEM Joint Workshop*, Santa Fe, NM. June 26 - July 1, 2011.
- Urban, K., A. Gerrard, L. Lanzerotti, Y. Bhattacharya, A. Ridley, and A. Weatherwax, "Synoptic-scale magnetometer observations of the open-closed field line boundary [link]," *American Geophysical Union Fall Meeting*, San Francisco, CA. December 5-9, 2011.
- Bhattacharya, Y., A. Gerrard, K. Urban, L. Lanzerotti, and D. Thomson, "Solar p-mode frequency plasma waves in high speed solar wind streams [link]," *American Geophysical Union Fall Meeting*, San Francisco, CA. December 5-9, 2011.
- R. Diaz-silva, K. Sayanagi, S. Gil, S. Diniega, J. Balcerski, B. Benneke, B. Carande, A. Fraeman, J. Hudson, S. Guzewich, R. Livi, A. Nahm, S. Potter, M. Route, K. Urban, S. Vasisht, B. Williams, C. Budney, and L. Lowes, "TASTER: Trojan ASteroid Tour, Exploration and Rendezvous, a NASA Planetary Science Summer School Mission Design Exercise [link]," *American Geophysical Union Fall Meeting*, San Francisco, CA. December 5-9, 2011.
- Urban, K., Y. Bhattacharya, A. Gerrard, L. Lanzerotti, "ULF periodicities in the solar wind: drivers of magnetospheric ULF [link]," *ACE Science Team Meeting*, Applied Physics Laboratory, Johns Hopkins University, Laurel, MD. Nov 1-2, 2011.
- Bhattacharya, Y., K. Urban, A. Gerrard, L. Lanzerotti, A. Weatherwax, and K. Keika, "Synoptic variation of the OCB during CIR-driven events: issues with the Pc5 periodicities in the solar wind?," *Japan Geoscience Union Meeting*, Chiba, Japan. May 22-27, 2011.
- Bhattacharya, Y., K. Urban, A. Gerrard, L. Lanzerotti, and A. Weatherwax, "Synoptic variation of the OCB during CIR-driven events: issues with the Pc5 periodicities in the solar wind?," *PENGUIn-AGO Workshop*, Berkeley, CA. March 17-18, 2011.
- Urban, K., Bhattacharya, Y., A. Gerrard, L. Lanzerotti, "Quiet-time observations of the open-closed boundary prior to the CIR-induced storm of August 9, 2008," *2011 PENGUIn-AGO Workshop*, UC-Berkeley, Berkeley, CA. March 17-18, 2011.

2010

- Urban, K., A. J. Gerrard, A. Ridley, L. Lanzerotti, and A. Weatherwax, "Synoptic Observations of Open-Closed Boundary Variations at Solar Minimum," *Autonomous Polar Observing Systems Workshop*, Potomac, MD, September 30-October 1, 2010.

- Blackmore, D., A. Rosato, K. Urban, and X. Tricoche, "Tapping Dynamics of Granular Configurations: Theory and Applications," *Gordon Conference on Granular and Granular-Fluid Flow*, Colby College, Maine, June 20-25, 2010.

2008

- Urban, K., A. Gerrard, N. Hauser, R. Melville, and L. Lanzerotti, "The NJIT-UACNJ-PSU Collaborative: Magnetometer measurements from northwest New Jersey in collaboration with South Pole magnetometer measurements from the PENGUIn-AGO instrumentation [link]," *American Geophysical Union 2008 Fall Meeting*, San Francisco, CA. December 2008.

Relevant Coursework

Graduate: Real Analysis, Complex Analysis, Topology, Differentiable Manifolds, Applications of Abstract Algebra, Stochastic Calculus, Radio Astronomy, Stellar Magnetism, Physics of the Magnetosphere/Ionosphere System, Atmospheric Physics, Electrodynamics, Statistical Mechanics, Classical Mechanics, Quantum Mechanics, Quantum Electrodynamics

Undergraduate: Data Reduction, Probability/Statistics, Linear Algebra, Computer Science I-II (Java/C++), Abstract Algebra, Vector Calculus, Differential Equations, Advanced Calculus, Electromagnetism, Thermodynamics, Classical Mechanics, Observational Astronomy, Astronomy, Astrophysics I-II, Quantum Mechanics, Special Relativity, General Relativity

Extracurricular Computing for Data Analysis (R) [Coursera, R. Peng], Data Analysis (R) [Coursera, J. Leek], Bioinformatics Algorithms [Coursera, P. Pevzner], Machine Learning [Coursera, A. Ng], Operator Algebras and Conformal Field Theory [Summer School, U. Oregon], Concurrent Engineering [Planetary Science Summer School, Jet Propulsion Laboratory]