Kevin Urban, PhD

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https://www.linkedin.com/in/drkrbn
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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

Professional Development / Continuing Education

- 2021: **Generative Adversarial Networks** (Coursera/DeepLearning.AI, Q1)
- 2020: **Intel Edge AI for IoT (2020)** (Udacity, Scholarship)
- 2020: **Intro to the Internet of Things (IoT) and Embedded Systems** (Coursera/UC-Irvine)
- 2019: **TensorFlow for AI, ML, and DL** (Coursera/DeepLearning.AI)
- 2019: **Graph Data Modeling with Neo4j** (In-Person Training + Certificate; March, NYC)
- 2019: **AI4 Healthcare** (In-pereson summit, tutorials; Nov,NYC)
- 2019: **Deep Learning in Healthcare** (In-person summit, tutorials; May, Boston)
- 2018: **Hyperparameter tuning, Regularization and Optimization** (Coursera/DeepLearning.AI)
- 2018: **Progressive Web Apps** (Udacity, Google Developer Scholarship)
- 2017: **Neural Networks and Deep Learning** (Coursera/DeepLearning.AI)
- 2017: **Deep Learning Nanodegree Foundation** (Udacity Nanodegree)

Work and Professional Research Experience

Cohen Veterans Bioscience (CVB) — **New York, NY • July 2018 – Present**

Director of Data Science — **July 2021 - Present**
Associate Director of Digital Health (Data Science Team) — **Jan 2020 - Jul 2021**
Associate Director of Digital Health (Early Signal Team) — **Jul 2019 - Jan 2020**
Senior Data Scientist (Early Signal Team) — **July 2018 - Jun 2019**

WWE (World Wrestling Entertainment) — **Stamford, CT • October 2016 – July 2018**
Data Scientist, Advanced Analytics Team
Lead on numerous business-driven analytics research and predictive modeling projects for WWE Network – an over-the-top (OTT) content distribution network (described as "Netflix for Wrestling") with nearly 2 million daily active users, resulting in 1-3 million new rows of viewership/behavioral data in an AWS Redshift database everyday

- **Customer Behavioral Models** **(Python, Sklearn, TensorFlow, Keras, AWS EC2/Redshift, SQL)**
  Development of automated reporting and interactive dashboard pipelines for regular distribution of live or recent subscriber and business health metrics to key WWE busines stakeholders across verticals, as well as at the executive level (Vince Mcmahon, Paul "Triple H" Levesque); this included the development of data processing and machine learning pipelines (preprocessing, feature selection, dimensionality reduction, model selection, etc) for the training and deployment of prediction and classification models (random forests, deep multilayer perceptrons, CNNs), which provided insights for downstream decision support. Behavioral targets include customer segmentation, churn, winback, and lifetime value.
- **Wrestler Recognition Network** **(Python, TensorFlow, Keras, AWS, EC2, GPU)**
  Development of wrestler image recognition algorithm (transfer learning, convolutional neural networks) that could be used to tag video and image content.
- **Seasonal Subscriber Analysis** **(R, Python, FFT)**
  Spectral analyses of customer churn/winback behaviors to enhance customer segmentation efforts, help advise email campaigns, and improve churn/winback forecasting
- **Revenue Attribution Across Content** **(R, tidyverse, SQL, Redshift)**
  Development of ensemble approach to revenue attribution models for WWE Network content driven by viewership behaviour at the customer level (analysis of over a billion rows of data in Redshift)

- **Miscellaneous Projects** **(R, tidyverse, SQL, Redshift, Tableau)**
  - Fusion of fan panel survey response data with customer accounts on the WWE Network to better **quantify the relationship between subjective responses and objective viewership data**
  - **Sentiment analysis** of customer cancellation surveys and social media content to uncover resolvable issues and inform on how to better serve our customer base
  - Design of **interactive dashboards in Tableau** to help interested parties explore our data assets

Data Scientist, Content Analytics Team

Lead on researching and developing multiple data engineering and automation efforts to establish consistent and efficient data collection across WWE's digital assets, including a variety of YouTube channels, 100's Facebook Pages and Twitter accounts, and live streaming across multiple online platforms.

- **YouTube Assets (Python, Google Client API, YouTube Data API, YouTube Reporting API, Redshift, SQL, Selenium, Hive, Presto, Tableau)**
  - **Research into and documentation** of several YouTube APIs (Google Client, YouTube Data, YouTube Analytics, YouTube Reporting), establishing that 3rd party services were capturing only a fraction of the available content and viewership data from our YouTube assets.
  - **Persuasion for buy-in from leadership**: 3rd party consultants responsible for the collection/warehousing of our YouTube assets argued they were already collecting everything possible; thanks to my research and documentation, key decision makers supported my plan to revamp the YouTube data pipeline.
  - **Development and deployment** of an automated YouTube data collection and warehousing pipeline over a variety of WWE-owned channels, increasing the daily volume of valuable YouTube more than tenfold, resulting in significant cost savings by obviating need for 3rd party consultants
  - **Design and development** of a variety of live Tableau dashboards and automated emails to the appropriate stakeholders.
  - **Shorter Time to Insight**: YouTube takes its viewership metrics (e.g., number of view, likes, etc) very seriously and has many algorithms in place to detect and correct for fraudulent sources (robots, automated page refreshes, etc). In this spirit, there is a 3-day lag on any officially published data. However, our marketers, advertisers, and other leadership want insights and intuition on content performance immediately. By using Selenium for webscraping, I was able to extract "unofficial" YouTube viewership data with no lag – especially important on the day a video is live or published. This is something the data vendor was not getting for WWE.
  - **Hive/Presto vs Redshift**: Worked with data engineering team on a Hive/Presto solution on top of S3 to lessen our dependence on Redshift, which is more expensive, especially for the amount of data we were ingesting
- **Facebook/Instagram Assets** **(Python, Facebook Graph API, Selenium, Redshift, SQL)**
  - My success evaluating and re-engineering our YouTube data pipeline motivated us to take a look at other services provided by 3rd party vendors starting with Facebook (WWE owns and manages 100's of Facebook Pages, several dozen Instagram accounts, as well as several Facebook exclusive web series that air live weekly)
  - Researched and documented various Facebook APIs and technologies, including the various web-based data portals, GraphQL, and the Facebook Graph API.
  - By learning how to use the Graph API, I was able to query, pull, and storing all Page, Post, and Video Insights on a daily basis, which required flattening JSON files into a tabular form amenable to SQL queries in Hive or Redshift
  - By comparing my daily pull with our vendors, I identified that the vendors were only providing a limited subset of the Page , Post, and Video Insights in our daily Facebook load (and no Instagram data)
  - I also learned how track live videos at a high frequency, thus providing data for live videos on our various Facebook Pages, as well as live webisodes streaming on Facebook Watch – data the vendors were not able to provide
- **Multi-Platform Real-Time Dashboard for Live Events (Python, YouTube APIs, Facebook Graph API, Selenium, Redshift, SQL)**
  - Lessons learned from YouTube and Facebook pipeline development motivated the development of a live Tableau dashboard that could be published within minutes of any live airing of a "kickoff show" (aired on YouTube, Facebook, Twitter, the WWE Website, and the WWE Network) before a main wrestling event (aired only the WWE Network)
  - This required an immediate, automated capture of viewership metrics across all platforms the event aired live on, replacing a highly manual process performed by several employees over multiple departments, resulting in a 12-24 hour latency
  - Required the automation of headless web browsers (using Selenium, Chrome, BeautifulSoup, and Cron) to scrape JavaScript-heavy Twitter and WWE websites
- **R Packages for Automated Reporting** **(R, tidyverse, Redshift, SQL)**
  Developed R packages that the team could use to automate various reporting responsibilities

NJIT Center for Solar-Terrestrial Research **Newark, NJ • January 2012 – May 2016**

Research Scientist

- Fusion and harmonization of multi-modal datasets, including data deriving from: ground-based, globally-distributed instrument networks; high-altitude satellites, such as NOAA's DMSP fleet and NASA's Van Allen Probes; and interplanetary spacecraft, such as NASA's Advanced Composition Expolorer (ACE)
- Development of a data processing and modeling pipeline driven by solar wind inputs recorded upstream (sunward) of Earth by ACE which is able to forecast geomagnetic activity and solar wind energy deposits observable in Earth's deep polar cap region with an hour lead time
- Proposal and design of an innovative remote-sensing technique that essentially inverts the modeling pipeline described above, instead taking the geomagnetic data sensed by a ground-based magnetometer located in the deep polar cap to drive a predictive model capable of continuously nowcasting state parameters of the concurrent solar wind flowing adjacent to the magnetosphere in near-Earth space. Considering the strength and persistence of the observed relationship, if necessary, I argue that a dedicated deep polar cap observatory can alleviate the need for new fleets of in-situ spacecraft
- Mapping of and insight into the complex structure of the geomagnetic field in Earth's polar regions suggests a revisitation of underappreciated geomagnetic coordinate systems and often ignored prospect of subterranean ground currents in the polar cap structuring and contributing to the polar cap hydromagnetic energy distributions
- Development of unique visualization and analysis techniques to aid in studying the hydromagnetic structure of the high-latitude polar cap and depict its evolution in response to variations in near-Earth space weather conditions.
- Miscellaneous, ad hoc data analysis efforts as a member of the RBSPICE instrument team for NASA's Van Allen Probes mission
- Software packages developed in Bash, R, MatLab, and IDL to enable efficient, streamlined analyses and reporting for a range of ongoing projects
- First-author publication following defense of PhD dissertation

NASA/CalTech Jet Propulsion Laboratory **Pasadena, CA • Summer 2011**

Intern

- Collaboration with a team of engineers and scientists in the development and study of a mission design concept for the journey to and study of the Jovian Trojan asteroids
- Identification and prioritization of targeted science goals
- Real-time consideration and optimization of resources via concurrent engineering systems and principles, e.g., trade-offs within the science-engineering-financial parameter space (subsystem design constraints, trajectory optimizations, cost-benefit analyses of scientific priorities, timeline requirements, budget forecasting, etc)
- Project management techniques, such as Gannt charts, traceability matrices, technology readiness levels, best-case and threshold-case scenarios (i.e., desired mission specifications versus minimum requirements)
- Co-authorship of a formal proposal and presentation of our mission design to the NASA review board
- Co-authorship of peer-reviewed manuscript documenting lessons learned and feasibility considerations

Independent Research Consultant **Clifton, NJ • August 2010 - January 2012**

- Procurement of contracts from NJIT's Physics Department and Siena College's Department of Physics and Astronomy
- Continued development of automated, real-time models of geomagnetic activity and solar wind events using distributed networks of magnetometers
- Peer-reviewed publication documenting progress and lessons learned proof-of-concept [link]

NJIT Department of Mathematical Sciences **Newark, NJ • 2008 – 2012**

Research Scientist, Mathematical Modeling

- Guided exploration into the applications of advanced mathematical disciplines, such as dynamical systems, topology, differentiable manifolds, abstract algebra, and group theory.
- Derivation, numerical simulation, and visualization of dynamical system model representations of granular fluid systems
- Projection of high-dimensional dynamical models into reduced parameter spaces to aid in the investigation, numerical simulation, and visualization of chaotic regimes and sources of instability in such systems (e.g., via Poincare maps)
- Remedial investigation into the propagation of numerical errors in simulated dynamical models, which obfuscate the underlying dynamical model and, ultimately, prevent a faithful visualizion the system dynamics
- Co-authorship of four peer-reviewed papers on dynamical systems models of granular fluids, including one that explores potential applications of an esoteric field of mathematics known as fractional calculus
- All numerical models and visualizations developed in R and MatLab
- All visualizations presented as time sequences of 1D, 2D, and/or 3D model representations (i.e., movies); publication figures resulted from select snapshots.

NJIT Department of Physics **Newark, NJ • August 2008 - August 2010**

Research Assistant, Full Time

- Developed data processing and modeling pipelines for surveillance of the geomagnetic field in targeted regions (such as the southern polar cap) and globally
- Processing pipelines first ingest, QC, and harmonize sensor time series data from one or several multi-channel sensors (triaxial fluxgate magnetometer, 1 Hz), e.g., from a network of magnetometers distributed throughout Antarctica
- Processed data is fed into the appropriate analytical/algorithmic pipeline(s) composed of parallel and/or sequential submodules where each submodule applies a specified type (e.g., linear/nonlinear, parametric/nonparametric, deterministic/stochastic and/or learning/rules-based) of signal processing technique or transformation for purposes such as sensor fusion/integration, feature engineering/extraction, parameter estimation, and/or dimensionality reduction
- Trained and/or metric/rules-based models (e.g., event detection/classification) then leverage the transformed data representation(s) to comprehensively monitor, track, or further model polar cap structure, ionospheric currents, geomagnetic activity, and solar wind inputs
- The data processing, modeling, and visualization pipeline elements were implemented using R, MatLab, IDL, and/or Bash (depending on task and project).

Center for Solar-Terrestrial Research (CSTR), NJIT **Newark, NJ • January 2008 - August 2008**

Undergraduate Research Assistant (20 Hours/Week)

- Responsible for learning and applying basic principles of analog and digital sensors, analog-to-digital (ADC) converters, and digital signal processing
- Accountable for learning MatLab and developing software required to support new geomagnetic projects at CSTR
- Assembly and deployment of analog-to-digital data acquisition system for a triaxial fluxgate magnetometer installed at Jenny Jump State Forest, NJ, including the development of MatLab software used to passively and continuously collect, store, and manage the incoming time series data (1 Hz) on a local server at Jenny Jump, as well as a script for offloading the data nightly to a remote server at NJIT (using Bash, Cron, SFTP, etc)
- Associated development of data processing, analysis, and visualization pipelines for real-time, continuous display of local geomagnetic field activity on an installation at the Jenny Jump Observatory
- Public lectures on geomagnetism and space weather

NASA Goddard Space Flight Center **Greenbelt, MD • June – August 2007**

Intern, Observational Cosmology Laboratory

- The Absolute Spectrum Polarimeter [ASP] was a mission concept under study at GSFC's Observational Cosmology Lab with the goal of measuring the polarization of the Cosmic Microwave Background (CMB) via a polarizing Michelson interferometer sensitive enough to detect B-mode polarization, if it exists, which is theorized to hold a unique signature indicative of a primordial backdrop of gravitational waves predicted by inflationary theory.
- Responsible for reviewing the theory of general relativity and cosmological inflation theory, as well as conducting self-guided literature reviews into prior spacecraft missions and research programs dedicated to designing and operationalizing experimental/observational approaches to measuring associated phenomena, such as gravitational waves and anisotropies in the CMB, and detecting the presence of predicted data signatures.
- Implementation of a forward model that simulates the input expected by the ASP sensors (e.g., sky polarization maps modeling an anisotropic CMB), the corresponding sensor response data, and the anticipated data processing and transformation steps necessary for extracting the Stokes parameter representation of the CMB polarization (as a function of frequency and direction), while accounting for potential confounding sources of polarization (such as dust in the galactic foreground).
- Programming tools utilized in the development of this software included IDL, MatLab, Bash, and misc command line tools

NASA Goddard Space Flight Center **Greenbelt, MD • June 2006 - August 2006**

Intern, Heliophysics Division

- Responsible for learning the basics of Linux/Unix scripting tools, Python, HTML, CSS, JavaScript, and PHP
- Design of the "Space Weather Survival Guide" webpage for the International Heliophysical Year [IHY]

Selected Peer-Reviewed Publications

- Urban, K. D., A. J. Gerrard, L. J. Lanzerotti, and A. T. Weatherwax. Rethinking the polar cap: Eccentric-dipole structuring of ULF power at the highest corrected geomagnetic latitudes. Journal of Geophysical Research, Space Physics, Vol. 121, 2016.
- Urban, Kevin. 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.
- Blackmore, D., A. Rosato, X. Tricoche, K. D. Urban, and L. Zou, Analysis, simulation, and visualization of 1D tapping via reduced dynamical models. Physica D: Nonlinear Phenomena, Vol. 273, 2014.

- Diniega, S., K. Sayanagi, J. Balcerski, B. Carande, R. Diaz-Silva, A. Fraeman, S. Guzewich, J. Hudson, A. Nahm, S. Potter, M. Route, K. D. Urban, S. Vasisht, B. Benneke, S. Gil, R. Livi, B. Williams, and C. Budney, L. Lowes. Mission to the Trojan Asteroids: Lessons learned during a JPL Planetary Science Summer School mission design exercise. Planetary and Space Science, Vol. 76, 2013.
- Rosato, A., D. Blackmore, X. M. Tricoche, K. D. Urban, and L. Zuo, Dynamical systems model and discrete element simulations of a tapped granular column. Powders and Grains 2013: Proceedings of the 7th International Conference on Micromechanics of Granular Media. Vol. 1542. No. 1. AIP Publishing, 2013.
- Urban, K. D., Y. Bhattacharya, A. J. Gerrard, A. Ridley, L. Lanzerotti, and A. Weatherwax. Quiet-time observations of the open-closed boundary prior to the CIR-induced storm of August 9, 2008. Space Weather, Vol. 9, S11001, 2011.
- Blackmore, D., A. Rosato, X. Tricoche, K. Urban, and V. Ratnaswamy. Tapping dynamics for a column of particles and beyond. Journal of Mechanics of Materials and Structures, Vol. 6, No. 1-4, 2011.
- Blackmore, D., K. Urban, and A. Rosato, Integrability analysis of regular and fractional Blackmore-Samulyak-Rosato fields. Condensed Matter Physics, Vol. 13, No. 4, 2010.
- Urban, Kevin. 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.

Course Work

- **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**: Big Data Analysis with Spark (EdX/BerkeleyX, 2016), Applied Machine Learning (EdX/Microsoft, 2016), Bioinformatics Algorithms (Coursera/UCSD, 2019, Data Analysis in R (Coursera/JohnsHopkins, 2013), Computing for Data Analysis in R (Coursera/JohnsHopkins, 2012)

Awards, Scholarships, Etc

- **Invited Presentation: Daily Monitoring of Parkinson's Disease: Signals of Motor Health and Sleep Hygiene**; MJFF Q4 Digital Health Working Group Meeting
- **Invited Presentation: Machine Learning and Signal Processing Approaches to the Verily Watch Dataset**; MJFF Q2 Digital Health Working Group Meeting
- **2021 CVB Award for "Best Keynote Speaker"**; "Wearables as a Case Study"
- **2021 CVB Recognition Award**; MJFF Wearables Program Delivery & Renewal
- **2020 CVB Recognition Award**; MJFF Project Delivery
- **2019 CVB Recognition Award**; "Out of the Box" Analytics for Risk Detection in CVN Partnership
- **2016 Hack for the Sea**; 1st Prize (with A.J. Teti); Cape Ann, MA.
  Description: Received 1st Prize for the conceptualization and prototyping of "HooknUp.Net," a fish-identification-and-social-media app envisioned to to help marine scientists track fish populations via crowd sourcing and deep-learning-based computer vision. Further description and details available upon request.
- **2012 Heliophysics Summer School (HSS): Heliophysics Exploration**; HSS Scholarship - NASA Living with a Star (LWS) and University Corporation for Atmospheric Research (UCAR); Boulder, CO.
- **2011 Planetary Science Summer School (PSSS): Spacecraft Mission Design using Concurrent Systems Engineering**; Scholarship - NASA Jet Propulsion Laboratory (JPL), California Institute of Technology (CalTech); Pasadena, CA.
- **2010 Summer School on Operator Algebras and Conformal Field Theory**; Summer Travel Grant/Scholarship - NJIT; Eugene, OR (University of Oregon).
- **2009 Field Work in Peru: Ground-Based LIDAR/Imagers for Lower-Atmospheric Weather Systems**; Summer Travel Grant - NJIT; Huancayo, Peru.
- **2008 Field Work at Jenny Jump State Forest (JJSF), NJ: Magnetometer Installation and Real-Time Geomagnetic Monitoring System**; 2008 Summer Research Grant - NJIT; Newark, NJ, and JJSF, NJ.