

Nick Kunz

Data Scientist

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Research Interests

Domains: Cyber-Physical Systems, Urban Informatics, Urban Mobility, Housing Affordability
Methods: Reinforcement Learning, Unsupervised Learning, Statistics, Geographic Information Systems (GIS)
Sources: Sensors & Devices, Synthetic Data, Open Data, Social Media, Demographics, Market & Economics

Education

Columbia University — New York, NY 2019
Master of Science, Urban Planning, Urban Analytics
Advisors: Lance Freeman, Kazuki Sakamoto

Harvard University — Cambridge, MA 2012
Non-Degree, Urban Planning
Advisor: Nick Hornig

Arizona State University — Tempe, AZ 2012
Bachelor of Science in Design (Hons.), *summa cum laude*, Housing & Urban Development
Advisors: Kevin Kellog, Michael Underhill, Trevor Barger

Research

Theses

N. Kunz, "Unsupervised Learning for Submarket Modeling: A Proxy for Neighborhood Change," M.S. Thesis, Grad. Sch. of Arch., Plan., and Pres. (GSAPP), Columbia Univ., New York, NY, 2019. [Online]. Available: Columbia Academic Commons. [\[Link\]](#)

N. Kunz, "Realizing Interactive Architecture: A Driver of the Knowledge Economy," B.S.D. (Hons.) Thesis, Barrett, The Hons. Col., Arizona State Univ., Tempe, AZ, 2012. [Online]. Available: Barrett, The Honors College Thesis/Creative Project Collection. [\[Link\]](#)

Industry

N. Kunz, "n-Dimensional Mapping by Normalized Value Approximation: Squad Immersive Virtual Trainer (SiVT) Safety Performance Metrics," Squad Performance Metrics (SPM), Integrated Visual Augmentation System (IVAS), Microsoft, Redmond, WA, 2021. Protected from public disclosure pursuant to: Trade Secrets Act 18 USC § 1905, 5 USC § 552(b)(4), and C3.2.1.4. of US Dept. of Defense Regulation 5400.7-R. DISTRIBUTION F.

N. Kunz, "Normalized n-Dimensional Inverse Euclidean Distance: Combining Independent Performance Metrics," Squad Performance Metrics (SPM), Integrated Visual Augmentation System (IVAS), Microsoft, Redmond, WA, 2021. Protected from public disclosure pursuant to: Trade Secrets Act 18 USC § 1905, 5 USC § 552(b)(4), and C3.2.1.4. of US Dept. of Defense Regulation 5400.7-R. DISTRIBUTION F.


N. Kunz, "Minimum-Weighted Mean Variability: Within Group Performance Metrics," Squad Performance Metrics (SPM), Integrated Visual Augmentation System (IVAS), Microsoft, Redmond, WA, 2020. Protected from public disclosure pursuant to: Trade Secrets Act 18 USC § 1905, 5 USC § 552(b)(4), and C3.2.1.4. of US Dept. of Defense Regulation 5400.7-R. DISTRIBUTION F.

N. Kunz, "An Exploratory Data Analysis of the Gavin Cup: Brining Readiness & Performance Metrics Into Focus," Squad Performance Metrics (SPM), Integrated Visual Augmentation System (IVAS), Microsoft, Redmond, WA, 2020. Protected from public disclosure pursuant to: Trade Secrets Act 18 USC § 1905, 5 USC § 552(b)(4), and C3.2.1.4. of US Dept. of Defense Regulation 5400.7-R. DISTRIBUTION F.

Industry Experience

Microsoft — Redmond, WA Data Scientist <i>Integrated Visual Augmentation System (IVAS)</i> [Link]	2020 - 2021
Pacific Prospecting Group — Seattle, WA Data Scientist <i>Computational Finance & Engineering</i> [Link]	2017 - 2019
Brawner & Company — Snoqualmie, WA Development Analyst <i>Real Estate Development & Finance</i> [Link]	2016 - 2017
bcWORKSHOP — Dallas, TX Design Fellow <i>Architecture, Planning & Policy</i> [Link]	2013 - 2014
n Creative Studios — Phoenix, AZ Design Consultant <i>Real Estate Development</i>	2011 - 2012

Software Packages

PUPHL: Proximal Policy Optimization Utilizing Pseudo-Huber Loss  Github [Link]	2021
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A modified Proximal Policy Optimization (PPO) policy gradient algorithm. Applies Pseudo-Huber Loss to the critic loss function in place of traditional Mean Squared Error (MSE). Adds additional critic loss function constraint δ in an effort to further reduce variance to PPO and future policy gradient methods. *Currently in development.*

SMOBN: Synthetic Minority Over-Sampling Technique for Regression with Gaussian Noise  Github [Link]  PyPI [Link]  Kaggle [Link]  Stack Exchange [Link]  Stack Overflow [Link]	2020
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A novel pre-processing algorithm designed to address imbalanced data for regression problems. Conducts over-sampling with traditional interpolation, as well as with the introduction of Gaussian noise. Selects between the two over-sampling techniques by the KNN distances underlying a given observation.

NestedHyperBoost: Nested Cross-Validation for Bayesian Optimized Gradient Boosting  Github [Link]  PyPI [Link]	2020
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Unifies Nested K-Fold Cross-Validation, Bayesian Hyperparameter Optimization, and Gradient Boosting. Designed for rapid prototyping on small to mid-sized data sets. Quickly obtains high quality prediction results by abstracting away tedious hyperparameter tuning and implementation details in favor of usability and implementation speed.

NestedHyperLine: Nested Cross-Validation for Bayesian Optimized Linear Regularization  Github [Link]  PyPI [Link]	2020
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Unifies Nested K-Fold Cross-Validation, Bayesian Hyperparameter Optimization, and Linear Regularization. Designed for rapid prototyping on small to mid-sized data sets. Quickly obtains high quality prediction results by abstracting away tedious hyperparameter tuning and implementation details in favor of usability and implementation speed.

CRASSMAT: Conditional Random Sampling Sparse Matrices  Github [Link]  CRAN [Link]	2019
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A novel matrix sampling algorithm designed to conditionally random sample sparse matrices. Useful for training and test set splitting prior to model fitting in cross-validation procedures and for estimating the predictive accuracy of imputation methods, such as Matrix Factorization, Non-Negative Matrix Factorization (NNMF), and Singular Value Decomposition (SVD).

Selected Projects

N. **Kunz**, S. Huang, and S. Osakata, "Cloudy Night: Activating Park Space by Illuminated Interactivity," Grad. Sch. of Arch., Plan., and Pres. (GSAPP), Columbia Univ., New York, NY, 2019. [Online]. Available:

 GSAPP [[Link](#)]  Github [[Link](#)]  Youtube [[Link](#)]  Faculty [[Link](#)]

N. **Kunz** and S. Bhele, "Signal or Noise? Qualified Opportunity Zone Affect on Development Activity in Queens," Grad. Sch. of Arch., Plan., and Pres. (GSAPP), Columbia Univ., New York, NY, 2019. [Online]. Available:

 GSAPP [[Link](#)]  Github [[Link](#)]  Issuu [[Link](#)]  Faculty [[Link](#)]

E. Hudgins and N. **Kunz**, "Planning for Extreme Settlements, McMurdo Station, Antarctica," Grad. Sch. of Arch., Plan., and Pres. (GSAPP), Columbia Univ., New York, NY, 2018. [Online]. Available:

 GSAPP [[Link](#)]  Issuu [[Link](#)]

J. Karasik, S. Lee, N. **Kunz**, et. al. "Negotiating Fragments (Restructuring Quarto Workshop), Genoa, Italy," Grad. Sch. of Arch., Plan., and Pres. (GSAPP), Columbia Univ., New York, NY, 2018. [Online]. Available:

 GSAPP [[Link](#)]  Youtube [[Link](#)]  Issuu [[Link](#)]  Issuu [[Link](#)]  Press [[Link](#)]


N. Kunz, "Proportionalities: A Decade of Housing Markets to Subway Stations in Manhattan from 2006 to 2016," Grad. Sch. of Arch., Plan., and Pres. (GSAPP), Columbia Univ., New York, NY, 2017. [Online]. Available:

 GSAPP [[Link](#)]  GSAPP [[Link](#)]  Issuu [[Link](#)]  Faculty [[Link](#)]


G. S. Coch, S. Nelsen, N. **Kunz**, "Seeking Refuge: The Geography of Migrant Deaths Along the US-MX Border," Grad. Sch. of Arch., Plan., and Pres. (GSAPP), Columbia Univ., New York, NY, 2017. [Online]. Available:

 GSAPP [[Link](#)]  Medium [[Link](#)]

N. Kunz, "Traditional Theory and the Historic Preservation of Singapore in the Period of the 1980's," Grad. Sch. of Arch., Plan., and Pres. (GSAPP), Columbia Univ., New York, NY, 2017. [Online]. Available:

 Issuu [[Link](#)]


N. Kunz, "Health & Wellness Alliance for Children: Children's Asthma, Healthy Physical Environments, Dallas County, Texas," bcWORKSHOP, Dallas, TX, 2014. [Online]. Available:

 Issuu [[Link](#)]


N. Kunz, "The Bexar Street Corridor: A Century in Development, Dallas, Texas," bcWORKSHOP, Dallas, TX, 2013. [Online]. Available:

 Issuu [[Link](#)]  Issuu [[Link](#)]  bc [[Link](#)]  Vimeo [[Link](#)]


N. Kunz, "Fenway-Kenmore Square: Comprehensive Planning & Finance, Cambridge, Massachusetts," Grad. Sch. of Design (GSD), Harvard Univ., Cambridge, MA, 2012. [Online]. Available:

 Issuu [[Link](#)]


N. Kunz, "Danelle Plaza: Complete Street Mobility Planning, Tempe, Arizona," Herberger Inst. for Des. and the Art., Arizona State Univ., Tempe, AZ, 2012. [Online]. Available:

 Issuu [[Link](#)]

N. Kunz, "Ascension: Multifamily Mixed-Use Real Estate Development Proposal, Tempe, Arizona," n Creative Studios, Phoenix, AZ, 2012. [Online]. Available:

 Issuu [[Link](#)]

N. Kunz, "Sui Residence: Second Story Architecture Development Proposal, Paradise Valley, Arizona," n Creative Studios, Phoenix, AZ, 2011. [Online]. Available:

 Issuu [[Link](#)]

Honors & Awards

Distinguished Alumni Award , Arizona State University — Tempe, AZ	2016
Eli Segal AmeriCorps Education Award , AmeriCorps — Dallas, TX	2014
Dingwall Foundation Scholarship , William Orr Dingwall Foundation — Washington, DC	2011 - 2012
Barrett, The Honors College Scholarship , Arizona State University — Tempe, AZ	2010 - 2012
AIERF Undergraduate Scholarship , Appraisal Institute — Chicago, IL	2010 - 2011
Herberger Institute for Design & the Arts Scholarship , Arizona State University — Tempe, AZ	2010
Study.net Foundation Scholarship , Study.net — Fort Lauderdale, FL	2010
Dean's List (<i>4.00/4.00 GPA</i>), Arizona State University — Tempe, AZ	2009 - 2012

Talks, Exhibits & Presentations

Urban Planners in Technology , Alumni Panel, Columbia University — New York, NY	2021
Urban Planning Showcase , End of Year Show, Columbia University — New York, NY	2019
The Bexar Street Corridor , US Congresswoman Eddie Bernice Johnson's Office — Dallas, TX	2014
The Bexar Street Corridor , TR Hoover Community Development Corporation — Dallas, TX	2014
The Bexar Street Corridor , bcSHOPFRONT Series, bcWORKSHOP — Dallas, TX	2013
Realizing Interactive Architecture , Honors Symposium, Arizona State University — Tempe, AZ	2012

Mentorship Activities

Chawner Hurd , MBA, Business, Columbia University — New York, NY <i>Military service transition from US Army, 5th Special Forces Group to graduate school.</i>	2020 - 2021
Michael Bollinger , BA, Computer Science, Columbia University — New York, NY <i>Military service transition from US Army, 75th Ranger Regiment to undergraduate school.</i>	2019 - 2021
Daniel Hineline , BA, Political Science, Columbia University — New York, NY <i>Military service transition from US Army, 82nd Airborne Division to undergraduate school.</i>	2018 - 2021

Military Service

Assignments

US Army, 75th Ranger Regiment — Fort Lewis, WA <i>Infantry</i>	2015 - 2016
US Army, Ranger Training Detachment — Fort Benning, GA <i>Ranger Assessment and Selection Program</i>	2015
US Army, 1st Special Warfare Training Group — Fort Bragg, NC <i>Special Forces Assessment and Selection</i>	2014
US Army, 1st Special Warfare Training Group — Fort Bragg, NC <i>Special Forces Preparation and Conditioning</i>	2014
US Army, 507th Parachute Infantry Regiment — Fort Benning, GA <i>Airborne School</i>	2014
US Army, 19th Infantry Regiment — Fort Benning, GA <i>Infantry School</i>	2014

Decorations

Global War on Terrorism Service Medal , US Army, 75th Ranger Regiment — Fort Lewis, WA	2016
Expert Badge, Rifle Component Bar , US Army, 75th Ranger Regiment — Fort Lewis, WA	2016
Driver Badge, Wheeled Vehicle Component Bar , US Army, 75th Ranger Regiment — Fort Lewis, WA	2015
Parachutist Badge, Unit Trimming , US Army, 507th Parachute Infantry Regiment — Fort Benning, GA	2014
Infantry Blue Chord Fourragère , US Army, 19th Infantry Regiment — Fort Benning, GA	2014
National Defense Service Medal , US Army, 19th Infantry Regiment — Fort Benning, GA	2014
Army Service Ribbon , US Army, 19th Infantry Regiment — Fort Benning, GA	2014

Civil Service

Smithsonian Institution — Washington, DC <i>Digital Transcription</i>	2020 - 2021
AmeriCorps — Dallas, TX <i>Volunteer in Service to America (VISTA)</i>	2013 - 2014
Open Architecture Collaborative — Dallas, TX <i>Non-Profit Architecture & Planning</i>	2013 - 2014
Trinity Park Conservancy — Dallas, TX <i>Public Park Conservation</i>	2013 - 2014

Technical Skills

Languages

Scripting: Python, Bash
Statistical: R, Stata
Compiled: C/C++, Fortran
Database: SQL, NoSQL
Typesetting: L^AT_EX, Markdown

Frameworks

Data Science: NumPy, SciPy, Pandas, statsmodels, Featuretools, Tidyverse, Dplyr
Visualization: Matplotlib, Seaborn, Plotly, Processing, Shiny, ggplot
Statistical Learning: Scikit-Learn, XGBoost, LightGBM, CatBoost
Reinforcement Learning: OpenAI Baselines, Stable Baselines
Deep Learning: Pytorch, TensorFlow, ONNX

Deployment

DevOps: Git, Ubuntu, Docker, Kubernetes, CI/CD Pipelines, Pickle
Databases: SQL Server, PostgreSQL, SQLite, CosmosDB, Blobs
Web Services: Flask, Gunicorn, Nginx
Web Automation: Selenium, Puppeteer
Cloud Platforms: Azure, Azure Gov, AWS
Security: OWASP ZAP, STIGs

Software

Development Environments: VS, VS Code, RStudio, Jupyter, Spyder
Geographic Information Systems: ArcGIS, QGIS, OSM, Leaflet, Mapbox
3D Modeling & Optimization: Rhino, Grasshopper, SketchUp, AutoCAD, Unity
Design & Illustration: Adobe Photoshop, Illustrator, InDesign
Financial Modeling: Excel, Macros, CoStar
Studio & Live Audio: Logic, Protools

Prototyping

Sensors & Hardware: Arduino, Raspberry Pi, GPU, FPGA
Project Management: Agile, Scrum, Critical Path
Electrical: Soldering, Wiring, Safety
Ideation: Drawing & Sketching, Storyboarding
Analogs: Hand Drafting, Physical Modeling, Photography

Personal Activities

Music & Live Audio

Atlas North American Tour — US & Canada 2013
The Word Alive (*Fearless Records*), Co-Tour Manager
The Word Alive (*Fearless Records*), Guitar Tech

Fight the Silence Tour — US 2013
The Word Alive (*Fearless Records*), Guitar Tech
For Today (*Razor & Tie Records*), Guitar Tech

All Stars Tour — US 2012
The Word Alive (*Fearless Records*), Guitar Tech
A Skylit Drive (*Fearless Records*), Guitar Tech

Van's Warped Tour — US & Canada 2011
The Word Alive (*Fearless Records*), Co-Tour Manager
Of Mice & Men (*Rise Records*), Guitar Tech

Regional Performances — US 2011
The Rendering (*Authentik Artists*), Guitar

Outdoors & Endurance

Running (*Half Marathon, 13.1mi, Marathon, 26.2mi*)
Cycling (*Century Ride, 100mi*)
Hiking (*Mt. Rainier, Mt. Olympus, Mt. Denali*)
Overlanding (*Rubicon Trail, Alaskan Arctic Circle, All 50 States*)
Snowboarding (*Cascades, Sierra Nevadas, Colorado Plateau, Mississippi River Valley*)