

# Nick Kunz

## Data Scientist

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## Research Interests

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**Domains:** Cyber-Physical Systems, Urbanism, 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

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**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

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### 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

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

## Software Packages

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|   |      |
|---|------|
| <b>PUPHL: Proximal Policy Optimization Utilizing Pseudo-Huber Loss</b><br> Github <a href="#">[Link]</a> | 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  $\delta$  in an effort to further reduce variance to PPO and future policy gradient methods. *Currently in development.*

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| <b>SMOGN: Synthetic Minority Over-Sampling Technique for Regression with Gaussian Noise</b><br> Github <a href="#">[Link]</a>  PyPI <a href="#">[Link]</a>  Kaggle <a href="#">[Link]</a>  Stack Exchange <a href="#">[Link]</a>  Stack Overflow <a href="#">[Link]</a> | 2020 |
|--|------|



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.

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|--|------|
| <b>NestedHyperBoost: Nested Cross-Validation for Bayesian Optimized Gradient Boosting</b><br> Github <a href="#">[Link]</a>  PyPI <a href="#">[Link]</a> | 2020 |
|--|------|

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.

|   |      |
|---|------|
| <b>NestedHyperLine: Nested Cross-Validation for Bayesian Optimized Linear Regularization</b><br> Github <a href="#">[Link]</a>  PyPI <a href="#">[Link]</a> | 2020 |
|---|------|

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.

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|---|------|
| <b>CRASSMAT: Conditional Random Sampling Sparse Matrices</b><br> Github <a href="#">[Link]</a>  CRAN <a href="#">[Link]</a> | 2019 |
|---|------|

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 or Singular Value Decomposition (SVD).

## Selected Projects

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**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

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

## Talks, Exhibits & Presentations

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

## Mentorship Activities

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

## Military Service

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### Assignments

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

### Decorations

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

## Civil Service

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

## Technical Skills

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### Languages

**Scripting:** Python, Bash  
**Statistical:** R, Stata  
**Compiled:** C/C++, Fortran  
**Database:** SQL, NoSQL  
**Typesetting:** L<sup>A</sup>T<sub>E</sub>X, 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

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### 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. Denali, Mt. Rainier*)  
Overlanding (*Rubicon Trail, Alaskan Arctic Circle, All 50 States*)  
Snowboarding (*Cascades, Colorado Plateau, Sierra Nevadas, Mississippi River Valley*)