Anna Haensch

Contact

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Academic & Professional Appointments

Tufts University, Medford, MA
Senior Data Scientist, Data Intenstive Studies Center, January 2021 – present.
Secondary Appointment, Department of Mathematics, July 2021 – present.
Lecturer, Fletcher Graduate School of Global Affairs, July 2021 – present.

Tagup Inc., Somerville, MA
Research Data Scientist, September 2019 – December 2020.

Duquesne University, Pittsburgh, PA
Associate Professor, Department of Mathematics & Computer Science, August 2020 – May 2021.
Assistant Professor, Department of Mathematics & Computer Science, August 2013 – August 2020.

Max Planck Institute for Mathematics, Bonn, Germany
Visiting Researcher, Jan. 2018 – May 2018; Jan. 2014 – May 2014.

National Public Radio, Washington, D.C.
AAAS-AMS Mass Media Fellow, May 2013 – Aug. 2013.

Education

Wesleyan University, Middletown, CT
Ph.D. Mathematics, May 2013.

State University of New York at New Paltz, New Paltz, NY
B.S. Mathematics, May 2007.

Research Interests

Applications of data science, mathematical modeling, and statistical machine learning to human networks and complex and social systems. Translational methods focused on sustainable climate solutions and policy, with an emphasis on human safety, fairness, and equity.

Recent Grant Funding

- (Awarded) National Science Foundation Partnership for International Research and Education (PIRE), Award OISE-2230630, *Multi-Domain, Multi-Scale, Policy-Aware Digital Twin for Offshore Wind Energy Infrastructure*, $1,498,144. Co-PI with PI B. Moaveni, Co-PI U. Khan, and Co-PI H. Ebrahimian. (January 2023 - December 2025)
- (Awarded) Department of Defense Small Business Innovation Research (SBIR), Award N68335-20-F-0459, *LAV25 Logistics Optimization using Machine Learning*, $1,593,070, Key Personnel. (May 2020 - November 2021)

- (Under Review) National Science Foundation DCSD, *Collaborative Research: A System-Wide Transfer Learning Framework for Offshore Wind Farm Performance and Reliability Assessment*, $600,000. PI with joint PI E. Tronci and Co-PI B. Moaveni.
- (Under Review) Ocean Energy Safety Institute, *Reduction of human exposure to hazards during installation, operation, maintenance and decommissioning of offshore wind energy systems*, $200,000. Co-PI with PI E. Tronci and Co-PIs B. Moaveni, B. Rosenberg, and E. Hines.

Projects in Progress

- *Uncertainty Quantification of Bending Moments with Characterization of Strain Measurement Error on Offshore Wind Turbines.* Extended abstract accepted to IMAC-XLII Uncertainty Quantification in Dynamics, Jan. 2024. (with E. Tronci, G. Georgalis, B. Moaveni)
- *A Multi-Factor Decision Framework for Offshore Wind Turbine Maintenance.* Extended abstract accepted to IMAC-XLII Structural Modelling and Condition Assessment, Jan. 2024. (with E. Tronci, B. Moaveni, E. Hines)
- *A block-based anonymization for spatial privatization.* Paper in preparation. (with C. Kelling)
- *Practical and technical challenges to studying policing in a small town.* Paper in preparation. (with C. Kelling, A. Mendible, M. Aminian, A. Wiedemann, S. Brooks)
- *A bounded confidence model to explain abrupt changes in public opinion.* Work in progress. (with C. Börgers, N. Dragovic, A. Kirshtein)

Preprints (* denotes papers where authors are ordered alphabetically)

1. C. Kelling, **A. Haensch**, A. Mendible, S. Brooks, A. Wiedemann, M. Aminian, W. Hasty, J. Higdon. Small-Town Police Accountability: Challenges and Recommendations, under review, up-to-date version on SocArXiv https://doi.org/10.31235/osf.io/2gyuv.
2. **A. Haensch**, D. Deitsch. An Equity-Aware Recommender System for Curating Art Exhibits Based on Locally-Constrained Graph Matching, under review, up-to-date version on ArXiv arXiv:2207.14367.
3. **A. Haensch**, D. Gordon, K. Knudson, J. Cheng. A Multi-Method Data Science Pipeline for Analyzing Police Service in the Presence of Misconduct, under review, up-to-date version on SocArXiv https://doi.org/10.31235/osf.io/645u7.
4. **A. Haensch**, E. Tronci, B. Moynihan, B. Moaveni. Regularized Hidden Markov Modeling with Applications to Wind Speed Predictions in Offshore Wind, under review, up-to-date version on SSRN http://ssrn.com/abstract=4419807.
5. * C. Börgers, N. Dragovic, **A. Haensch**, A. Kirshtein, L. Orr. ODEs and Mandatory Voting, to appear in the open access journal of the Community of Ordinarily Differential Equations' Educators (CODEE) special issue on *Engaging the World: Differential Equations Influence Public Policy*, up-to-date version at arXiv:2308.01489.
6. * C. Börgers, N. Dragovic, **A. Haensch**. Political centrism and extremism, to appear in *SIAM News*.
7. * C. Börgers, N. Dragovic, **A. Haensch**, A. Kirshtein. A particle method for continuous Hegselmann-Krause opinion dynamics, to appear in *Complex Networks and their Applications*, Studies in Computational Intelligence Book Series, Springer-Verlag arXiv:2211.06265.

8. * B. Boghosian, C. Börgers, N. Dragovic, **A. Haensch**. A blue sky bifurcation in the dynamics of political candidates, to appear in *The American Mathematical Monthly*, up-to-date version at arXiv:2302.07993.

PUBLICATIONS (* denotes papers where authors are ordered alphabetically)

1. **A. Haensch**, N. Dragovic, C. Börgers, B. Boghosian. A geospatial bounded confidence model including mega-influencers with an application to Covid-19 vaccine hesitancy, *The Journal of Artificial Societies and Social Simulations*, **26** (1) 2023, 8, final version at https://www.jasss.org/26/1/8.html.

2. **A. Haensch**. Review: Data Feminism, *The American Mathematical Monthly*, **129:5** (2022), 496 – 500. DOI: 10.1080/00029890.2022.2044214

3. **A. Haensch**, K. Knudson. Python for Global Applications: Teaching scientific Python in context to law and diplomacy students, *Proceedings of the 21st Python in Science Conference*, 2022, 59 – 64, final version at https://conference.scipy.org/proceedings/scipy2022/anna_haensch.html.

4. **A. Haensch**, I. Ljungberg, U. Khan, B. Moaveni. Monitoring of Offshore Wind Turbines Using Measured Accelerations and Hidden Markov Models with Physics-Based Initialization, extended abstract in conference proceedings IMAC-XL *Data Science for Advanced Manufacturing*, Society for Experimental Mechanics, 2022.

5. **A. Haensch**. Reflections on Hyperbolic Space, *Snapshots of modern mathematics from Oberwolfach* **7** (2021), 1 – 10. DOI: 10.14760/SNAP-2021-007-EN .

6. * M. Dutour Sikirić, **A. Haensch**, J. Voight and W. van Woerden. A canonical form for positive definite matrices, Proceedings of the *Fourteenth Algorithmic Number Theory Symposium, ANTS-XIV*, Mathematical Sciences Publishers, 2020, final version at arXiv:2004.14022.

7. * A. G. Earnest, **A. Haensch**. Classification of one-class spinor genera for quaternary quadratic forms, *Act Arith.* **91** 3 (2019) 259 – 287, final version at arXiv:1803.03028.

8. * **A. Haensch**, B. Kane. An algebraic and analytic approach to spinor exceptional behavior in translated lattices, *Automorphic Forms and Related Topics, Contemp. Math.*, **732**, 2019, Amer. Math. Soc., Providence, RI final version pdf available here.

9. * A. G. Earnest, **A. Haensch**. Completeness of the list of spinor regular ternary quadratic forms, *Mathematika*, **65** (2019), 213–235, final version at arXiv:1711.05811.

10. **A. Haensch**. Review: Foolproof and Other Mathematical Meditations, *Math Horizons*, **25:4** (2018), 29–29. DOI: 10.1080/10724117.2018.1434292

11. * **A. Haensch**, B. Kane. Almost universal ternary sums of polygonal numbers, *Res. number theory* (2018) 4: 4, final version at https://doi.org/10.1007/s40993-018-0098-x.

12. **A. Haensch**. The Blog on Math Blogs, *Notices of the American Mathematical Society*, **63:6** (2016), 643–644. DOI: http://dx.doi.org/10.1090/noti1387

13. * A. Feaver, **A. Haensch**, J. Liu, G. Nebe. On Kneser-Hecke operators for codes over finite chain rings, *Directions in Number Theory: Proceedings of the 2014 WIN3 Workshop*, Association for Women in Mathematics Series, Springer-Verlag, (2016).

14. **A. Haensch**. A characterization of almost universal ternary inhomogeneous quadratic polynomials with conductor 2, *J. Number Theory*, **156** (2015), 247–262.

15. **A. Haensch** A characterization of almost universal ternary quadratic polynomials with odd prime power conductor, *J. Number Theory*, **141** (2014), 202–213.

16. **A. Haensch**. My Summer at NPR, *Notices of the American Mathematical Society*, **60:11** (2013), 1477–1478. https://www.ams.org/notices/201311/rnoti-p1477.pdf

17. * W. K. Chan, **A. Haensch**. Almost universal ternary sums of squares and triangular numbers, *Quadratic and Higher Degree Forms*, Developments in Mathematics, Springer-Verlag, (2013).

18. * K. Doerksen, **A. Haensch**. Primitive prime divisors in zero orbits of polynomials, *INTEGERS: The Online Journal of Combinatorial Number Theory*, **12** (2012).

Selected Professional Service

- Proposal Review Panelist, *National Science Foundation*, 2022, 2023.
- Guest Editor, *The American Mathematical Monthly*, Special Issue on Data Science, 2023.
- External Reviewer, *Quantitative Analysis Center*, Wesleyan University, 2022.

Selected Conferences & Seminars

Presenter

- Speaker, *Small Town Police Accountability: A data science toolkit*, SciPy: Scientific Computing with Python Conference, Austin, TX, July 2023.
- Invited Speaker, *Data Science for Police Accountability*, X-SIG Seminar Series, Gettysburg College, Gettysburg, PA, Feb. 2023.
- Featured Speaker, *From Riemann Zeta to Big Data: A journey through mathematics and the lessons learned along the way*, Graduate Research Opportunities for Women (GROW) 2022, Duke University, Durham, NC, Oct. 2022.
- Speaker, *Python for Global Applications: Teaching scientific Python in context to law and diplomacy students*, SciPy: Scientific Computing with Python Conference, Austin, TX, July 2022.
- Featured Speaker, *An Equity-Aware Recommender System for Curating Art Exhibits Based on Locally-Constrained Graph Matching*, Data4Justice Conference, Institute for the Quantitative Study of Inclusion, Diversity & Equity, *virtual*, April 2022.
- Invited Speaker, *Southeastern-Massachusetts Quantitative Engagement and Literacy Conference*, Bridgewater State University, Bridgewater, MA, Feb. 2022.
- Plenary Speaker, *Some results on class numbers for quadratic forms*, Upstate Number Theory Conference, University of Buffalo, Buffalo, NY, April 2018.
- Invited Speaker, *Quadratic forms and the representation problem*, Oberseminar, Max Planck Institute for Mathematics, Bonn, Germany, March, 2018.

Organizer

- *AMS Spring Sectional Meeting - Special Session on Mathematics of Data Science*, Tufts University, Medford, MA, 2022. (with A. Tasissa, J. Murphy, A. Patra, and V. Maroulas)
- *33rd Automorphic Forms Workshop*, with funding from the National Science Foundation Award DMS-1854113, Duquesne University, Pittsburgh, PA, 2019. (with B. Kane, D. Milićević, and H. Skogman).
- *Sage Days 90: Women in Sage*, with funding from Microsoft Research and the Beatrice Yorkmark Foundation, Harvey Mudd College, Claremont, CA, 2017. (with A. Deines, B. Thompson, U. Whitcher)

Media Outreach

- Moderator, *A Conversation with the New York Times*, Tufts University, Medford, MA, Sept. 2021.
- Guest, *As It Happens*, CBC Radio One, June 2017.
- Guest, *Press Play with Madeleine Brand*, KCRW the NPR station out of Santa Monica, CA, March 2017.
- Guest, *Essential Pittsburgh*, WESA Pittsburgh's NPR News Station, May 2016.
- Podcast Co-Host, *The Other Half*, a podcast about math, available on iTunes, May 2015-May 2016.
- Editor/Contributor, AMS Blog on Math Blogs, Feb. 2015– Aug. 2019.

Pedagogy Activities

Students Advised & Mentored

- Mackenzie McPike, Graduate Research Assistant, Sept. 2023 – present.
- Bridget Moynihan, Graduate Research Assistant, May 2022 – present.
- Rosie Rong, Graduate Research Assistant, May 2022 – May 2023.
- Isabel Ljungberg, Master's Thesis Advisor, degree completed Dec. 2021.
- Tyler Gaona, Undergraduate Research Assistant, Sept. 2015 – May 2017.
- C. Thomas Dean, Undergraduate Research Assistant, Sept. 2014 – Dec 2014.

Courses Taught at Tufts University

- Foundations of Data Analytics, Mathematical Aspects of Data Analysis, Data Science with Global Applications.

Courses Taught at Duquesne University

- Calculus I, Calculus II, Discrete Math, Foundations of Mathematics, Linear Algebra, Number Theory, Abstract Algebray, Complex Variables, Problem Solving Seminar.