Anna Haensch

Contact

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Research Interests

Science and technology policy, especially the use of artificial intelligence in the public sector and critical infrastructure. Applications of artificial intelligence and statistical machine learning across social and complex systems with the goal of fairness, safety, and equity.

Academic & Professional Appointments

United States Senate, Office of U.S. Senator Elizabeth Warren, Washington, DC
Legislative Fellow for Artificial Intelligence, September 2024 – present.

Tufts University, Medford, MA
Senior Data Scientist, Tufts Institute for AI (formerly Data Intensive Studies Center), January 2021 – present.
Provost Lecturer, Fletcher Graduate School of Global Affairs, July 2021 – present.
Secondary Faculty Appointment, Department of Mathematics, 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.
Postdoctoral Researcher Jan. 2014 – May 2014.

National Public Radio, Washington, DC
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.

Recent Grant Funding

- (Under Review) PI, National Science Foundation Cyber-Physical Systems (NSF-CPS), *Cooperative In-Farm and Cross-Farm Transfer Learning for Offshore Wind Turbine Performance and Reliability*, $1,200,000, with Northeastern PI E. Tronci and Co-PI B. Moaveni, (January 2025 – December 2027).

- (Awarded) Co-PI, National Science Foundation Partnership for International Research and Education (NSF-PIRE), *Multi-Domain, Multi-Scale, Policy-Aware Digital Twin for Offshore Wind Energy Infrastructure*, $1,498,144, with PI B. Moaveni, Co-PI U. Khan, and Co-PI H. Ebrahimian, (January 2023 – December 2025) Award OISE-2230630.
- (Awarded) Key Personnel, Department of Defense Small Business Innovation Research (DoD-SBIR), *LAV25 Logistics Optimization using Machine Learning*, $1,593,070, with PI William Vega Brown, (May 2020 – November 2021) Award N68335-20-F-0459.
- (Awarded) PI, National Science Foundation Division of Mathematical Sciences (NSF-DMS), *Workshop on Automorphic Forms and Related Topics*, $14,987, with Co-PIs Ben Kane, Djordje Milićević, and Howard Skogman, (March 2019 - February 2020) Award DMS-1854113.

Projects in Progress

- *Dynamics of female representation in the mathematical sciences*, work in progress (with H.Z. Brooks, P. Chodrow, A. Haensch, H. Lee, M. Porter, J.G. Restrepo).

Preprints (* denotes papers where authors are ordered alphabetically)

1. **A. Haensch**, E. M. Tronci, A. Banerjee, V. Valencia, B. Moaveni. A Safety-Aware Framework for Offshore Wind Turbine Blade Maintenance, under review.
2. **A. Haensch**, C. Kelling. BlockR: An Areal Spatial Anonymization and Visualization Tool, under review.
3. **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.

Publications (* denotes papers where authors are ordered alphabetically)

29. **A. Haensch**, Becoming a Data Scientist: An Impractical Guide, *The American Mathematical Monthly*, 132(1), 2024, 6 – 13. DOI: 10.1080/00029890.2024.2409064
28. *J. W. Bourgeois, **A. Haensch**, S. Kher, D. Knox, G. Lanzalotto, and T.A. Wong. How to Use Causal Inference to Study Use of Force, *CHANCE*, 37:4, 2024, 6-10. DOI:10.1080/09332480.2024.2434435
27. C. Kelling, **A. Haensch**, A. Mendible, S. Brooks, A. Wiedemann, M. Aminian, W. Hasty, J. Higdon. Data Collection and Analysis for Small-Town Policing: Challenges and Recommendations, *Statistics and Public Policy*, 1-21, July 2024. DOI:10.1080/2330443X.2024.2379270
26. **A. Haensch**, D. Gordon, K. Knudson, J. Cheng. A Multi-Method Data Science Pipeline for Analyzing Police Service, *The American Statistician*, 1-18, July 2024. DOI:10.1080/00031305.2024.2374275
25. * C. Börgers, N. Dragovic, **A. Haensch**, A. Kirshtein. Particle Method for Continuous Hegselmann-Krause Opinion Dynamics. In *Complex Networks & Their Applications XII* (pp. 1-13). Springer Nature Switzerland AG. 2024. DOI: 10.1007/978-3-031-53499-7_37 final version at arXiv:2211.06265.
24. **A. Haensch**, E. Tronci, B. Moynihan, B. Moaveni. Regularized Hidden Markov Modeling with Applications to Wind Speed Predictions in Offshore Wind, *Mechanical Systems and Signal Processing*, Vol. 211, 2024, 111229.
23. * C. Börgers, N. Dragovic, **A. Haensch**, Political Centrism and Extremism: A Mathematical Analysis, *SIAM News*, January 19, 2024.

22. * C. Börgers, N. Dragovic, **A. Haensch**, A. Kirshtein, L. Orr. ODEs and Mandatory Voting, CODEE Journal special issue on *Engaging the World: Differential Equations Influence Public Policy*, Vol. 17, Article 11, 2024.

21. E. Tronci, **A. Haensch**, G. Georgalis, B. Moaveni. 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.

20. **A. Haensch**, E. Tronci, B. Moaveni, E. Hines. Multi-Factor Decision Framework for Offshore Wind Turbine Maintenance, extended abstract accepted to IMAC-XLII *Structural Modelling and Condition Assessment*, Jan. 2024.

19. * C. Börgers, B. Boghosian, N. Dragovic, **A. Haensch**. A blue sky bifurcation in the dynamics of political candidates, *The American Mathematical Monthly*, 131:3, 2023, 225 – 238. DOI:10.1080/00029890.2023.2286221, final version at arXiv:2302.07993.

18. **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.

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

16. **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.

15. **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.

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

13. * 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.

12. * 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.

11. * **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.

10. * 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.

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

8. * **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.

7. **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

6. * 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).

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

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

3. **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

2. * 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).

1. * 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

- Guest Editor, *The American Mathematical Monthly*, Special Issue on Data Science, 2025.
- Proposal Review Panelist, *National Science Foundation*, 2022, 2023.
- External Reviewer, *Quantitative Analysis Center*, Wesleyan University, 2022.

Selected Conferences & Seminars

Presenter

- Plenary Speaker, *Becoming a Data Scientist: An Impractical Guide*, Math For All Conference, Tulane University, New Orleans, LA, April 2024.
- Speaker, *Uncertainty Quantification of Bending Moments with Characterization of Strain Measurement Error on Offshore Wind Turbines*, 42*nd* International Modal Analysis Conference, Orlando, FL, Jan. 2024.
- Speaker, *A Multi-Factor Decision Framework for Offshore Wind Turbine Maintenance*, 42*nd* International Modal Analysis Conference, Orlando, FL, Jan. 2024.
- 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

- Facilitator, *Panel on AI, Design and Afro-Nowism*, Tufts University, Medford, MA, 2024 (with D. Martinez).
- *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).
- *Art Datathon*, Tufts University, Medford, MA 2024 (with D. Deitsch).
- *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

- Aidan Banerjee, Undergraduate Research Assistant, Jan. 2024 – present.
- Bridget Moynihan, Graduate Research Assistant, May 2022 – present.
- Mackenzie McPike, Graduate Research Assistant, Sept. 2023 – Dec. 2023.
- 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, Data Science and AI for Global Leaders.

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.