Justin D. N. Weltz

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Academic Affiliation

Emerging Political Economies and Applied Complexity Fellow, Sept. 2024–Present
Topic: Statistical inference for complex network sampling techniques
Advisors: Matt Jackson, Eleanor Power, and Fiona Steele
Santa Fe Institute, Santa Fe, NM

Education

Duke University, Ph.D. in Statistical Science, Durham, NC Aug. 2019–Aug. 2024
Thesis: "Advances in Adaptive Sampling"
Advisors: Eric Laber and Alexander Volfovsky

Pomona College, Bachelor of Arts, Mathematics, Claremont, CA Aug. 2015–May 2019
Phi Beta Kappa (2018)

Research Interests

Social network sampling, model-based reinforcement learning, experimental design, community detection, discrete choice models, public health policy, causal inference, linear bandits, algorithmic fairness, and martingale estimating functions

Research Summary

Santa Fe Institute Sept. 2024-Present
- Incorporating household structure into social network models using discrete choice theory
- Modeling common network communities across multilayered networks

Duke University Nov. 2020–Aug. 2024
- Advance methodology used to estimate the size and characteristics of understudied groups such as undocumented workers, intravenous drug users and unhoused people
- Develop network sampling methods to study and assist hidden, at-risk populations using reinforcement learning
- Formulate efficient algorithms to identify optimal experimental designs with heteroskedastic noise

Working/Submitted Papers

Weltz, J., Yoon A., Zhang Y., Volfovsky, A., Laber, E.B. "Reinforcement learning respondent driven sampling." *Submitted to the Journal of the American Statistical Association (JASA)*. Received **Health Policy Statistics Section Best Student Paper Award** at the Joint Statistical Meetings (JSM).

Steele F., **Weltz, J.**, Power, E.A., Koster, J. "Multilevel modelling of double-sampled clustered social networks with individual-level data on between-cluster ties."

Weltz, J., Power, E.A., Koster, J., Steele F. "Modeling households in social networks using discrete choice models."

Power, E.A., Redhead, D., Rutter, T., Subramanyam, S., Jackson, **Weltz J.**, Koster, J., Mulder, M. B., Bowles S., and the ENDOW team, "The relationship between social network structure, wealth, and wealth inequality."

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Publications

Weltz, J., Volfovsky, A., Laber, E.B. "Improving hidden population size estimation with auxiliary information." *Proceedings of Machine Learning Research* (2024). Received a **Spotlight** at the Conference for Uncertainty in Artificial Intelligence (UAI) and a **Best Poster Award** at the International Society for Bayesian Analysis (ISBA).

Weltz, J., Fiez, T., Volfovsky, A., Laber, E., Mason, B., Nassif, H., & Jain, L. "Experimental designs for heteroskedastic variance." *NeurIPS* (2023).

Weltz, J., Volfovsky, A., Laber, E.B. "Reinforcement learning methods in public health." *Clinical Therapeutics* (2022).

Weltz, J., Hardin, J. "Over-policing and fairness in machine learning." Undergraduate thesis (2019).

Talks & Posters

"Study designs for social networks at different stages of the experimental process," Aug. 2025
Discussant at the Joint Statistical Meetings

"Reinforcement learning for respondent driven sampling," Aug. 2025
Contributed Talk at the Joint Statistical Meetings

"The relationship between social network structure, wealth, and wealth inequality," July 2025
Invited Talk at the Complexity Global School for Emerging Political Economies

"The relationship between social network structure, wealth, and wealth inequality," June 2025
Contributed Poster at the International Network for Social Network Analysis

"Improving hidden population size estimation with auxiliary information," July 2024
Spotlight Talk and Poster at the Conference on Uncertainty in Artificial Intelligence (UAI)

"Statistical learning for optimal public health policy," Mar. 2024
Invited Talk at the Santa Fe Institute

"Experimental designs for heteroskedastic variance," Dec. 2023
Contributed Poster at the Conference on Neural Information Processing Systems (NeurIPS)

"Improving hidden population size estimation with auxiliary information," Oct. 2022
Invited Talk at the International Conference on Advances in Interdisciplinary Statistics and Combinatorics (AISC)

"Improving hidden population size estimation with auxiliary information," June 2022
Contributed Poster at the International Society for Bayesian Analysis (ISBA) World Meeting; received Best Poster Award

Paper and Poster Awards

JSM Health Policy Statistics Section Student Paper Award February 2025
UAI Paper Spotlight July 2024
ISBA Best Poster Award July 2022

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Service

Reviewer for UAI, NeurIPS, and PLOS One

Invited Session Co-organizer at the Joint Statistical Meetings — Aug. 2025
Title: Study designs for social networks at different stages of the experimental process

Consultant for the Duke ASA Datafest — March 2024

High School Statistics Outreach — Oct. 2023

Undergraduate Mentor — Jan. 2021–Aug. 2025

Teaching

Instructor, The Complexity Global School for Emerging Political Economies — July 2025

Teaching Assistant, STA210L: Regression Analysis — Spring 2024

Teaching Assistant, STA642: Time Series and Dynamic Models — Fall 2021

Teaching Assistant, STA721: Linear Models — Fall 2020

Teaching Assistant, STA102: Introduction to Biostatistics — Spring 2020

Professional Experience

Amazon, New York, NY — June 2022–April 2023
Applied Research Scientist Intern, Machine Learning Team, Amazon Prime

- Produced a series of reinforcement learning algorithms to efficiently identify the optimal characteristics of prime membership advertisements through strategic sequential testing

Amazon, New York, NY — June–Aug. 2021
Applied Research Scientist Intern, Sponsored Products

- Designed a reinforcement learning algorithm to better select advertisements sourced by a variety of machine learning algorithms using query features and partially observed customer behavior signals

Technical Skills

Coursework: Time Series, Linear Models, Measure Theory, Multivariate Statistics, Probabilistic Machine Learning, Categorical Data Analysis, Bayesian Nonparametrics, Advanced Causal Inference
Languages: R, Python, Stata, Matlab, and Scala

References

Prof. Eric Laber
Statistical Science
Duke University
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Prof. Alexander Volfovsky
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Prof. Fiona Steele
Statistics
LSE
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Prof. Matt Jackson
Economics
SFI, Stanford University
jacksonm@stanford.edu