

# Justin D. N. Weltz

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## ACADEMIC AFFILIATION

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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

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**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

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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

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**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

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**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.”

## PUBLICATIONS

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- 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

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|---|-----------|
| “Study designs for social networks at different stages of the experimental process,”<br>Discussant at the Joint Statistical Meetings  | Aug. 2025 |
| “Reinforcement learning for respondent driven sampling,”<br>Contributed Talk at the Joint Statistical Meeting   | Aug. 2025 |
| “The relationship between social network structure, wealth, and wealth inequality,”<br>Invited Talk at the Complexity Global School for Emerging Political Economies  | July 2025 |
| “The relationship between social network structure, wealth, and wealth inequality,”<br>Contributed Poster at the International Network for Social Network Analysis  | June 2025 |
| “Improving hidden population size estimation with auxiliary information,”<br>Invited Spotlight Talk and Poster at the Conference on<br>Uncertainty in Artificial Intelligence (UAI)                           | July 2024 |
| “Statistical learning for optimal public health policy,”<br>Invited Talk at the Santa Fe Institute  | Mar. 2024 |
| “Experimental designs for heteroskedastic variance,”<br>Contributed Poster at the Conference on Neural Information<br>Processing Systems (NeurIPS)  | Dec. 2023 |
| “Improving hidden population size estimation with auxiliary information,”<br>Invited Talk at the International Conference on Advances in Interdisciplinary<br>Statistics and Combinatorics (AISC)             | Oct. 2022 |
| “Improving hidden population size estimation with auxiliary information,”<br>Contributed Poster at the International Society for Bayesian Analysis<br>(ISBA) World Meeting; received <b>Best Poster Award</b> | June 2022 |

## PAPER AND POSTER AWARDS

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| 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

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Reviewer for UAI and PLOS One

Invited Session Co-organizer at the Joint Statistical Meetings Spring 2021–Aug. 2025  
Title: Study designs for social networks at different stages of the experimental process

Consultant for the Duke ASA Datafest March 2025

High School Statistics Outreach Presenter Oct. 2023

Undergraduate Mentor Spring 2021–Aug. 2025

## TEACHING

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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

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**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

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**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

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Prof. Eric Laber  
Statistical Science  
Duke University  
[eric.laber@duke.edu](mailto:eric.laber@duke.edu)

Prof. Alexander Volfovsky.  
Statistical Science  
Duke University  
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Prof. Fiona Steele  
Statistics  
LSE  
[f.a.steele@lse.ac.uk](mailto:f.a.steele@lse.ac.uk)

Prof. Matt Jackson  
Economics  
Stanford University  
[jacksonm@stanford.edu](mailto:jacksonm@stanford.edu)