# CURRICULUM VITAE

**Rayleigh X. Lei**
Department of Statistics
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University of Washington
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## EDUCATION

2016-2022 Ph.D. Statistics
University of Michigan
Thesis: Modeling Simplex-valued Data and Latent Structures
Advisor: Professor (Xuan)Long Nguyen

2009-2013 B.A. Mathematics (with Honors)
Columbia University
Honors thesis: Generalizing results from Eric Rowland's "A Natural Prime-Generating Recurrence"

## HONORS AND AWARDS

2023: BayesComp 2023 Travel Grant
2022-2024: University of Washington Data Science Postdoctoral Fellow
2022: Outstanding Teaching Award, *Honorable Mention*, Department of Statistics, University of Michigan
2021: U-M Graduate Teacher Certificate
2019: Junior Travel Support, the 12th International Conference on Bayesian Nonparametrics
2018-2023**:** National Science Foundation Graduate Research Fellowship (1 of the 10 statistics awardees in the country in 2018)
2018: Outstanding Teaching Award, Department of Statistics, University of Michigan

## RESEARCH EXPERIENCES

**Postdoctoral Fellow**; Advisor: Professor Abel Rodriguez
Department of Statistics, University of Washington
September 2022-*Ongoing*
Statistical Modeling:

- Develop Bayesian models to analyze embeddings of congressional and Supreme Court justices' votes

**Graduate Research Assistant**; Advisor: Professor (Xuan)Long Nguyen
Department of Statistics, University of Michigan
September 2016-August 2022
Statistical Modeling and Clustering:

- Developed random movement and direction models for changes in simplicial data
- Examined theoretical properties of and developed algorithms to fit general mixtures of probability simplices and tree-based probability simplices

- Applied optimal transport techniques to cluster traffic patterns and analyze these clusters

**Graduate Research Assistant;** Advisor: Professor Jun Zhang
Department of Mathematics, University of Michigan
June-July 2017
Markov Chain Monte Carlo Sampling:

- Explored connection between information geometry and Hamiltonian and Riemannian Manifold Hamiltonian Monte Carlo

**Researcher**; Advisor: Professor Andrew Gelman
Department of Statistics, Columbia University
June 2015-May 2016
Bayesian regression:

- Implemented Bayesian regression models to analyze voter behavior and national pride

Stan:

- Created unary vectorization testing framework and vectorized unary functions in Stan with template metaprogramming and compared inference results from the No U-Turn Sampler (NUTS) to Automatic Differentiation Variational Inference (ADVI)

**Undergraduate Researcher**; Advisor: Professor Chris Wiggins
Department of Mathematics, Columbia University
September 2010-May 2011

- Created a Python program to process databases and gather data

**Research Intern**; Advisor: Professor Lukas Mueller
Boyce Thompson Institute, Ithaca, NY
January 2011-May 2013 (three terms)
Bioinformatics:

- Developed web-based tools to facilitate visualization of experimental results using Moose, Catalyst, Mason, and PostgreSQL

## PUBLICATIONS

Papers under preparations:

1. **Rayleigh Lei**, Sunrit Chakraborty, and (Xuan)Long Nguyen. 2023. Modeling tree-based Mixtures of Probability Simplices.

2. **Rayleigh Lei** and Abel Rodriguez. 2023. Logistic Unfolding Models for Binary Preference Data.

Papers submitted and/or published

3. **Rayleigh Lei** and (Xuan)Long Nguyen. 2023. Modeling Random Direction of Changes in Simplex-valued Data. *Submitted to Statistical Modelling*. https://arxiv.org/abs/2310.19985.

4. **Rayleigh Lei** and Abel Rodriguez. 2023. A Novel Class of Unfolding Models for Binary Preference Data. *Under minor revision for Political Analysis.* https://arxiv.org/abs/2308.16288.

5. **Rayleigh Lei** and Abel Rodriguez. 2023. Dynamic Factor Models for Binary Data in Circular Spaces: An Application to the U.S. Supreme Court. *Under major revision for Journal of the Royal Statistical Society: Series C.* https://arxiv.org/abs/2305.19380.

6. Sunrit Chakraborty, Aritra Guha, **Rayleigh Lei**, (Xuan)Long Nguyen. *Proceedings of the Thirty-Ninth Conference on Uncertainty in Artificial Intelligence*, PMLR 216:282-292, 2023. https://proceedings.mlr.press/v216/chakraborty23a.html.

7. Aritra Guha**, Rayleigh Lei**, Jiacheng Zhu, (Xuan)Long Nguyen, and Ding Zhao. 2022. Robust unsupervised learning of temporal dynamic vehicle-to-vehicle interactions, *Transportation Research Part C: Emerging Technologies*, Volume 142, 103768, https://doi.org/10.1016/j.trc.2022.103768.

8. **Rayleigh Lei**, Andrew Gelman, and Yair Ghitza. 2017. The 2008 Election: A Preregistered Replication Analysis. *Statistics and Public Policy,* 4 (1), 1-8. https://doi.org/10.1080/2330443X.2016.1277966.

**PRESENTATIONS**

1. **Rayleigh Lei,** Sunrit Chakraborty, (Xuan)Long Nguyen. 2021. Geometrically Fitting Tree-directed Topic Models. Poster presentation at BayesComp 2023 on March 15th to 17th, 2023.

2. **Rayleigh Lei** and (Xuan)Long Nguyen. 2021. Modeling Random Directions in 2D Simplex Data. Speed oral presentation at Joint Statistical Meetings on August 6-11, 2021.

3. **Rayleigh Lei** and (Xuan)Long Nguyen. 2021. Modeling Random Directions in 2D Simplex Data. Oral presentation at International Society of Bayesian Analysis World Meeting 2021 on June 28-July 02, 2021.

4. **Rayleigh Lei** and (Xuan)Long Nguyen. 2019. Modeling Simplex Data Transformations (v2). Poster presentation at the Statistics in the Data Science Era: A Symposium to Celebrate 50 Years of Statistics at the University of Michigan, Ann Arbor, MI, September 20-21, 2019.

5. **Rayleigh Lei** and (Xuan)Long Nguyen. 2019. Modeling Simplex Data Transformations (v1). Poster presentation at the 12th International Conference on Bayesian Nonparametrics, Oxford, UK, June 24-28, 2019.

6. Aritra Guha, **Rayleigh Lei**, Jiahui Ji, Jawad Mroueh, and (Xuan)Long Nguyen. 2018. Clustering and Evaluation of Driving Primitives. Poster presentation at the 2018

University of Michigan Toyota Research Institute Annual Review, Ann Arbor, MI, November 13, 2018.

## TEACHING EXPERIENCES

Guest Lecturer, University of Michigan:

STATS 551: Topics in Bayesian modeling and computation, March 10th, 2021

- Introductory course on Bayesian statistics for Master's students
- Gave guest lecture on developing and implementing models to analyze random directions

Graduate Student Instructor, University of Michigan:

STATS 511: Statistical Inference, Spring 2022

- Second semester introductory statistics course for Master's students
- Graded homework assignments and exams

STATS 501: Applied Statistics, Fall 2021

- Second semester introductory applied statistics course for Master's students
- Graded homework assignments and exams

STATS 499: Honors Seminar, Fall 2018, 2019

- Undergraduate statistics honors seminar course focused on undergraduate research
- Helped to mentor undergraduates with their projects

STATS 503: Statistical Learning II: Multivariate Analysis, Spring 2018

- Introductory machine learning course for master's students
- Co-ran a weekly lab section
- Graded homework assignments and exams

STATS 408: Statistical Principles for Problem Solving: A Systems Approach, Fall 2017

- Introductory statistics course using high school mathematics for undergraduates
- Ran a lab section using created slides and lab exercises
- Graded homework assignments and exams

STATS 412: Introduction to Probability and Statistics, Spring 2017

- Introductory statistics course with calculus for engineering undergraduates
- Graded homework assignments and exams

STATS 250: Introduction to Statistics and Data Analysis, Fall 2016

- Introductory statistics course for non-statistics major undergraduates
- Ran a lab of 30+ students using existing and created material and graded homework assignments, midterm and final exams

## MENTORING EXPERIENCES

Fall 2020**,** *Xinyu He*, Junior in Data Science

- Explored the basics of optimal transportation

*Fall 2019, Di Wang*, Senior in Mathematics, Data Science, and Honors Statistics

- Utilized mixture model to model how the proportion for a certain income category in Los Angeles County changed yearly from 1990 to 2010

Fall 2018-Spring 2019, *Yingsi Jian*, Senior in Mathematics, Data Science, and Honors Statistics, Honors Thesis Student

- Applied topic modeling to analyze chords and voice leading strands in Bach chorales and explore topic modeling with a distance metric on "words"
- Supervised her Senior Honors Thesis that earned the highest honors in statistics

**PROFESSIONAL ACTIVITY**

Summer 2020-Summer 2022:
Statistics Graduate Student Justice, Equity, Diversity, and Inclusion committee member

Fall 2020-Spring 2021:
Co-organizer for Statistics Directed Reading Group

Spring 2019-Summer 2022:
Statistics Ph.D. Student Council member

Summer 2018-Spring 2019:
Co-Organizer for the 2019 Michigan Student Symposium for Interdisciplinary Statistics Sciences (representing the Department of Statistics)

Fall 2016-Fall 2018:
Union representative for the Department of Statistics' Graduate Student Instructors

**REFERENCES**

Dr. Abel Rodriguez
Chair of the Department of Statistics
Professor of Statistics
B-313C Padelford Hall
Department of Statistics
University of Washington
Seattle, WA 98195
Phone: 206-543-6774
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Dr. (Xuan)Long Nguyen
Professor of Statistics
461 West Hall
Department of Statistics
University of Michigan
Ann Arbor, MI 48109
Phone: 734-763-3499
Email: xuanlong@umich.edu

Dr. Fred Feinberg
Joseph Handleman Professor of Marketing and Chair
Professor of Statistics
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University of Michigan Stephen M. Ross School of Business
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