CURRICULUM VITAE

Rayleigh X. Lei
Department of Statistics
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University of Michigan
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EDUCATION

2016-present Ph.D. Statistics
University of Michigan
Advisor: Professor XuanLong 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

2018-2023**:** National Science Foundation Graduate Research Fellowship (1 of the 10 statistics awardees in the country in 2018)
2019: Junior Travel Support, the 12th International Conference on Bayesian Nonparametrics
2018: Outstanding Teaching Award, Department of Statistics, University of Michigan

RESEARCH EXPERIENCES

September 2016-present, Graduate Research Assistant
Department of Statistics, University of Michigan; Advisor: Professor XuanLong Nguyen
Statistical Modeling and Clustering:

- Develop random movement and random direction models for changes in simplicial data
- Examine theoretical properties of and developed algorithms to fit general mixtures of probability simplices and tree-based probability simplices
- Apply optimal transport techniques to cluster traffic patterns and analyze these clusters

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

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

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

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

- Created a Python program to process databases and gather data

January 2011-May 2013, Research Intern (three terms)
Boyce Thompson Institute, Ithaca, NY; Advisor: Professor Lukas Mueller
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 XuanLong Nguyen. 2021. Identifiability and learning algorithms for topic models with tree-structured hidden layers.
2. Sunrit Chakraborty, **Rayleigh Lei**, and XuanLong Nguyen. 2021. Identifiability and parameter estimation of mixtures of probability simplices**.**

Papers submitted and/or published

3. **Rayleigh Lei** and XuanLong Nguyen. 2021. Modeling Random Directions in 2D Simplex Data. *Under revision for Bayesian Analysis*. https://arxiv.org/abs/2103.12214.
4. Sunrit Chakraborty, Aritra Guha, **Rayleigh Lei**, and XuanLong Nguyen. 2021. Scalable Nonparametric Bayesian Learning for Heterogeneous and Dynamic Velocity Fields. *Under revision*. https://arxiv.org/abs/2102.07695**.**
5. Aritra Guha**, Rayleigh Lei**, Jiacheng Zhu, XuanLong Nguyen, and Ding Zhao. 2021. Robust Unsupervised Learning of Temporal Dynamics. *Revised and submitted to IEEE Transactions on Intelligent Transportation Systems*. https://arxiv.org/abs/2006.10241.
6. **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** and XuanLong Nguyen. 2021. Modeling Random Directions in 2D Simplex Data. Speed oral presentation at Joint Statistical Meetings on August 6-11, 2021.
2. **Rayleigh Lei** and XuanLong 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.
3. **Rayleigh Lei** and XuanLong 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.

4. **Rayleigh Lei** and XuanLong Nguyen. 2019. Modeling Simplex Data Transformations (v1). Poster presentation at the 12th International Conference on Bayesian Nonparametrics, Oxford, UK, June 24-28, 2019.
5. Aritra Guha, **Rayleigh Lei**, Jiahui Ji, Jawad Mroueh, and XuanLong 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 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-present:
Statistics Graduate Student Justice, Equity, Diversity, and Inclusion committee member
Fall 2020-Spring 2021:
Co-organizer for Statistics Directed Reading Group
Summer 2018-Spring 2019:
Co-Organizer for the 2019 Michigan Student Symposium for Interdisciplinary Statistics Sciences (representing the Department of Statistics)
Spring 2019-present:
Statistics Ph.D. Student Council member
Fall 2016-Fall 2018:
Union representative for the Department of Statistics' Graduate Student Instructors

WORK EXPERIENCES

June 2013-May 2015, Technical Service, Hospital Billing, Epic, Verona, WI
- Flagged extreme transactions using non-parametric statistics

REFERENCES

Dr. (Xuan) Long Nguyen
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Dr. Fred Feinberg
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R5324 Michigan Ross
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Dr. Yang Chen
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