

Curriculum Vitae

December 2020

## Experience

Carleton College	
Assistant Professor	2017–present
Lawrence University	
Assistant Professor	2014–2017
Visiting Assistant Professor	2013–2014
Iowa State University	
Research Assistant	2012–2013
Teaching Assistant	2007–2012
Des Moines Area Community College	
Adjunct Instructor	2010
Education	
Ph.D., Statistics, Iowa State University	2013
M.S., Statistics, Iowa State University	2009
B.A., Mathematics/Statistics, Luther College	2007

Department of Mathematics and Statistics

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## Honors & Awards

- Best Research Paper for Impact and Quality Award for "Understanding Corn Belt farmer perspectives on climate change to inform engagement strategies for adaptation and mitigation," *Journal of Soil and Water Conservation*, 2018
- Student paper competition winner for "Are You Normal? The Problem of Confounded Residual Structures in Hierarchical Linear Models," ASA Sections on Statistical Computing and Graphics, 2013
- Second place in the 2013 Data Expo for "A Tale of Four Cities: Exploring the Soul of Biloxi, Detroit, Milledgeville, and State College," ASA Sections on Statistical Computing and Graphics, 2013
- Award for Undergraduate Mentoring in Statistics, Iowa State University, 2012
- Preparing Future Faculty Associate, Iowa State University, 2012
- Teaching Excellence Award, Iowa State University, 2010
- Second place in the 2009 Data Expo for "Delayed, Canceled, On Time, Boarding. . . Flying in the

USA," ASA Sections on Statistical Computing and Graphics, 2009

- Jebe Fellowship, Iowa State University, 2007
- Phi Beta Kappa, National Honor Society, 2007
- Omicron Delta Epsilon, International Honor Society for Economics, 2007
- Pi Mu Epsilon, National Mathematics Honorary Society, 2006

# Teaching

#### **Carleton College**

Introduction to Statistics	W18, S18, F18, W19
Applied Regression Analysis	S18, S19
Probability	F17, F20*
Statistical Consulting	F19, W20, S20
Introduction to Data Science	W19, S20
Introduction to Statistical Inference	W18
Bayesian Statistics	F18, F19

#### DataCamp

Interactive Data Visualization with plotly in R Intermediate Interactive Data Visualization with plotly in R

#### Lawrence University Freshman Studies II W15, W16 Data-Scientific Programming W17, S17 **Elementary Statistics** W14, S14, W15, S16, F16\* Introduction to Probability and Statistics F13\*, F14\* **Applied Statistical Methods** S15 F15, F16 Probability W17 Statistical Modeling W14, W16 **Probability Theory** Statistical Theory S14, S16, S17 Iowa State University **Principles of Statistics** F09, S10, SS10, S11 Introduction to Statistics SS11 Introduction to Statistics for Engineers F10, F11, S12 **Des Moines Area Community College** F10 Statistics F10 **Business Statistics**

F = Fall, W = Winter, S = Spring, SS = Summer, \* = two sections

T	utorials & Directed Studies
0	Ryan Eardley, Generating Interactive Reports in R, Spring 2017
0	Eva Tourangeau, Data-Scientific Programming in Python, Spring 2017
0	Annabelle Tsai, Applied Statistical Methods (Stat2), Fall 2016
0	Liqi Chen, Jason Park, and Teresa Park, Introduction to Probability, Winter 2016
0	Galen Dods and Shelby Guinn, Exploratory Data Analysis in R, Fall 2015
0	Tim Dahlstrom, Time Series Analysis, Fall 2014
0	Troy Miller, Probability Theory, Fall 2014
0	Introduction to Statistical Computing in R, Spring 2014 (15 students)
Iı	ndependent Studies
0	Cassandra Li, Statistical Learning, Spring 2017
0	Aletta Su and Olivia Lin, Generalized Linear Models, Spring 2017
0	Abedin Rafique and Siyi Sun, Bayesian Data Analysis, Fall 2016
0	Bimal Rajbhandari and Deepta Jyoti, Financial Mathematics, Fall 2016
0	Jeannine Schulz, Linear Models, Spring 2016
0	Phong Le, Data Science in R, Spring 2016
0	Hallie Nguyen and Troy Miller, Statistical Learning in R, Spring 2016
0	Alex Damisch, Cluster Analysis and Algorithmic Development in R, Winter 2016
0	Henry Ward, Poll Tracking in R, Fall 2015, Winter 2016
0	Colin Huggins, Applying Markov Decision Processes to Student Retention, Spring 2015
0	Erin McNeely, Bayesian Reliability, Fall 2014, Winter 2015
0	Qianyu Chen and Zhuyi Yao, Bayesian Statistics, Spring 2014
0	Alice Fisher, An Exploration of Pedagogy for Elementary Mathematics, Spring 2014
0	Spenser Steele, Bootstrap Methods, Spring 2014

Research advising

**Independent research: Muyang Shi.** Exploring the efficacy of diagnostic tools for linear mixedeffects (LME) models. Muyang designed a simulation study to explore the efficacy of residual plots to diagnose key assumptions for LME models. Carleton College provided funding for this project to continue during winter break. Fall, winter 2020.

**Summer Research: Jaylin Lowe, Jack Moran.** Carleton College provided funding for Jaylin and Jack to overhaul the HLMdiag R package. This overhaul included updates so that HLMdiag uses tidyverse tools, streamlining the interface of functions for ease of use, along with fixing known bugs. aloy.github.io/HLMdiag/. Jaylin presented this work at the 2020 Women in Statistics and Data Science virtual conference, and both Jaylin and Jack presented this work at the 2020 Northfield Undergraduate Mathematics Symposium. Summer 2020.

**Summer Research: Jenna Korobova.** Carleton College provided funding for Jenna to help implement bootstrap procedures for nested linear-mixed effects models in the R package lmeresampler. This was a major revision and extension to the R package, which included an extension to generalized linear mixed-effects models and an investigation of parallel computing. aloy.github.io/ lmeresampler/. Summer 2020. **Independent research: Elliot Pickens.** Graphical inference with convolutional neural networks. Elliot explored a way to use convolutional neural networks to detect trends in scatterplots, taking inspiration from previous work done in quantifying scatterplots using scatterplot diagnostics. He won honorable mention in the spring 2019 Undergraduate Statistics Research Project competition. Spring 2019.

**Independent research: Nobuaki Masaki.** Diagnostic tools for gauge R &R studies. Nobuaki ran a simulation study to explore the impacts of model violations on gauge R & R models. He also reviewed the efficacy of traditional diagnostic tools at identifying these violations. Spring 2019.

**Comps: Elliot Cahn, Noah Feldman, Dylan Rye, Christian Zaytoun.** Predicting win probabilities in collegiate football. This group explored the ability of statistical and mathematical models to predict the probability that a team wins a collegiate football game. Winter and spring 2019.

**Comps: Cari Comnick, Logan Crowl, Sophia Gunn, Aidan Mullan.** Applications of statistical learning methods for pattern detection in scatterplots. This group used scagnostic measures (a set of summary statistic for scatterplots) and statistical learning models (e.g. random forests and SVMs) in an effort to automatically separate scatterplots into classes. Winter and spring 2018.

**Google Summer of Code:** Alexandre Almeida. Google Summer of Code provided funding for Alexandre to help develop an R package improving and extending Q-Q plots in the ggplot2 framework. aloy.github.io/qqplotr/. This work resulted in an *R Journal* article in addition to the published R package. Summer 2017.

**Summer Research: Alex Damisch.** Lawrence University provided funding for Alex to develop Shiny applications that can be used in elementary statistics courses. In addition to being easy to use, the intent is for these apps to help motivate the use of R. Summer 2015.

**Summer Research: Spenser Steele.** Lawrence University provided funding for Spenser to develop an R package implementing bootstrap procedures for linear mixed-effects models. The package has since been published on CRAN: https://cran.r-project.org/web/packages/lmeresampler/. Summer 2014.

**Internship: Biyue Dai.** Biyue worked to develop improved enrollment-projection models to be used by the administration of Lawrence University for strategic planning. During the course of this internship, Biyue learned about logistic regression models and Markov chain models, as well as the R statistical programming language. Fall 2013, Winter 2014.

**Data science advising**...... **MinneMUDAC.** Advised teams of undergraduates from Carleton during a month-long data analytics competition culminating in presentations at Optum in Eden Prarie, MN.

- Fall 2019 (2 teams) one team won the bonus round, more accurate predictions than any other undergraduate team
- Fall 2018 (2 teams)

Midwest Undergraduate Data Analytics Competition. Advised teams of undergraduates during

a 24-hour data analytics competition.

- Carleton College, April 2019 both teams placed in the top 5 (out of 30)
- Iowa State University, April 2012

**Data Visualization Student Challenge.** Co-mentored a team of undergraduates from Iowa State University in a data visualization competition sponsored by the United States Department of Transportation. The goal of the competition was to produce a visualization that would aid transportation investment and decision making. Fall 2012.

Workshops Taught

**A Week of R.** Team-taught a four-day workshop introducing faculty and graduate students to the R programming language. The sessions included: Introduction to R, A Day of R Graphics, Data wRestling, and (Extended) Linear Models in R. Iowa State University. May 2013.

A Week of R. Team-taught a five-day workshop introducing faculty and graduate students to the R programming language. The sessions included: Introduction to R, Advanced Graphics in R, Data Formatting and Reshaping in R, (Extended) Linear Models in R, and R Packages. Iowa State University. June 2012, August 2012.

**Introduction to R Workshop.** Team-taught a one-day workshop introducing faculty and graduate students to the R programming language. Iowa State University. June 2010, August 2010.

## Grants

- Hewlett Mellon Fellowship, Carleton College. Funding for one term of sabbatical leave (2020-2021).
- The West Foundation. This grant provided funds to renovate Lawrence University's statistics computer lab to accommodate students in introductory statistics courses and enabled the use of hybrid and flipped classroom approaches. \$50,000. (January 2017).
- Associated Colleges of the Midwest Faculty Career Enhancement (ACM FaCE) grant. *Harnessing Big Data: Planning for Collaborative Courses in Data Science.* This provided funds to develop material that will incorporate data science into introductory and intermediate statistics courses. \$9,300. (May 2016).
- Recipient of curricular development funds from the Teagle Hybrid Learning Project to help develop material that will incorporate data science into the statistics curriculum at Lawrence University. \$9,300. (May 2016).

## **Publications**

\* Indicates an undergraduate student coauthor

Journal Articles

- Maurer, K., Osthus, D., and Loy, A. (2019). A Tale of Four Cities: Exploring the Soul of State College, Detroit, Milledgeville, and Biloxi. *Computational Statistics* **34**(4), 1465–1487.
- Loy, A., Kuiper, S., and Chihara, L. (2019). Supporting Data Science in the Statistics Curriculum. *Journal of Statistics Education* **27**(1), 2–11.

- Almeida, A., Loy, A., and Hofmann, H. (2018). ggplot2 Compatible Quantile-Quantile Plots in R. *The R Journal* **10**(2), 248–261.
- **Loy, A.**, Hofmann, H., and Cook, D. (2017). Model Choice and Diagnostics for Linear Mixed-Effects Models Using Statistics on Street Corners. *Journal of Computational and Graphical Statistics* **26**(3), 478–492.
- Loy, A., Follett, L., and Hofmann, H. (2016). Variations of Q-Q Plots—The Power of our Eyes! *The American Statistician* **70**(2), 202–214.
- Loy, A. and Hofmann, H. (2015). Are You Normal? The Problem of Confounded Residual Structures in Hierarchical Linear Models. *Journal of Computational and Graphical Statistics* **24**(4), 1191–1209.
- Wright Morton, L., Hobbs, J., Arbuckle, J. G., Jr., and Loy, A. (2015). Upper Midwest Climate Variations: Farmer Responses to Excess Water Risks. *Journal of Environmental Quality* 44(3), 1191–1209.
- Arbuckle, J. G., Jr., Hobbs, J., **Loy**, **A.**, Wright Morton, L., Prokopy, L. S., and Tyndall, J. (2014). Understanding Corn Belt Farmer Perspectives on Climate Change to Inform Engagement Strategies for Adaptation and Mitigation. *Journal of Soil and Water Conservation* **69**(6), 505–516.
- Loy, A. and Hofmann, H. (2014). HLMdiag: A Suite of Diagnostics for Hierarchical Linear Models in R. *Journal of Statistical Software* 56(5), 1–28.
- Arbuckle, J. G., Jr., Prokopy, L. S., Haigh, T., Hobbs, J., Knoot, T., Knutson, C., Loy, A., Mase, A. S., McGuire, J., Wright Morton, L., Tyndall, J., and Widhalm, M. (2013). Climate Change Beliefs, Concerns, and Attitudes toward Adaptation and Mitigation among Farmers in the Midwestern United States. *Climatic Change* 117(4), 943–950.
- Loy, A. and Hofmann, H. (2013). Diagnostic Tools for Hierarchical Linear Models. *Wiley Interdisciplinary Reviews: Computational Statistics* 5(1), 48–61.
- Hofmann, H., Cook, D., Kielion, C., Schloerke, B., Hobbs, J., Loy, A., Mosley, L., Rockoff, D., Huang, Y., Wrolstad, D., and Yin, T. (2011). Delayed, Canceled, On Time, Boarding . . . Flying in the USA. *Journal of Computational and Graphical Statistics* 20(2), 287–290.

### Other Publications

Loy, A (2019). Visual Inference: Using Sesame Street Logic to Introduce Key Statistical Ideas. stattlc.com.

- Foti, S., Le, L., Ziegler, L., Whitaker, D., and Loy, A (2019). *Get the p outta here! Discussing the USCOTS 2019 significance sessions.* stattlc.com.
- Church, S., Haigh, T., Widhalm, M., Prokopy, L. S., Arbuckle, J. G., Jr., Hobbs, J., Knoot, T., Knutson, C., Loy, A., Mase, A. S., McGuire, J., Wright Morton, L., and Tyndall, J. (2015). *Farmer Perspectives on Agricultural Practices, Information, and Weather Variability in the Corn Belt: A Statistical Atlas, Volume* 2. Tech. rep. CSCAP 0184-2015. West Lafayette, IN: Purdue University Research Repository.
- Loy, A. (2015). Embracing Data Science. The UMAP Journal 36(4). Invited guest editorial, 285–292.
- Loy, A., Hobbs, J., Arbuckle, J. G., Jr., Wright Morton, L., Prokopy, L. S., Haigh, T., Knoot, T., Knutson, C., Mase, A. S., McGuire, J., Tyndall, J., and Widhalm, M. (2013). *Farmer Perspectives on Agriculture and Weather Variability in the Corn Belt: A Statistical Atlas, Volume 1*. Tech. rep. CSCAP 0153-2013. Ames, IA: Cropping Systems Coordinated Agricultural Project (CAP): Climate Change, Mitigation.

Loy, A. and Hofmann, H. (2009). Visual Monitoring of Data Streams. In: *JSM Proceedings, Section on Statistical Graphics*. American Statistical Association. Washington, DC.

Manuscripts in Preparation Loy, A. Bringing Visual Inference to the Classroom. Submitted.

Loy, A. Bootstrapping Clustered Data in R Using Imeresampler.

## Presentations

- "Bringing visual inference to the classroom." Invited seminar talk, Department of Statistics, University of Nebraska–Lincoln, Virtual, October 2020.
- "Bringing visual inference to the classroom." Contributed conference presentation, Joint Statistical Meetings, August 2020.
- "Bringing visual inference to the classroom." Refereed conference presentation, Symposium on Data Science and Statistics, June 2020.
- "Exploring automatic evaluation of statistical graphics." Invited seminar talk, Graphics Working Group, Iowa State University, Ames, IA, October 2019.
- "Can't a computer do that? Exploring automatic evaluation of statistical graphics." Invited seminar talk, Gustavus Adolphus College MCS Seminar, St. Peter, MN, September 2019.
- "Visual inference for model checking." Invited paper, Joint Statistical Meetings, Denver, CO, July 2019.
- "Bringing visual inference to the classroom." Peer-reviewed poster presentation, United States Conference on Teaching Statistics (USCOTS), State College, PA, May 2019.
- "A discussion of visual inference." Invited seminar talk, Invited Statistical Sciences Seminar Series, Los Alamos National Laboratory, Los Alamos, NM, December 2018.
- "Q-Q plots: To De-trend, or Not to De-trend." Invited seminar talk, Department of Mathematics and Statistics, Macalester College, St. Paul, MN, November 2018.
- "Statistics in the Data Science Curriculum." Invited panel discussion, The 2018 Liberal Arts Data Science Workshop, Sarasota, FL, January 2018.
- "Training Statisticians to Be Effective Instructors." Invited panel discussion, Joint Statistical Meetings, Baltimore, MD, August 2017.
- "Infusing Data Science into the Statistics Curriculum." Roundtable discussion, Joint Statistical Meetings, Baltimore, MD, August 2017.
- "Modules for Infusing Data Science into the Statistics Curriculum." Preconference workshop, United States Conference on Teaching Statistics (USCOTS), State College, PA, May 2017.
- "Modules for Infusing Data Science into the Statistics Curriculum." Peer-reviewed poster presentation, United States Conference on Teaching Statistics (USCOTS), State College, PA, May 2017.
- "Making Decisions with Data: Planning for Collaborative Courses in Data Science." Grant report with Shonda Kuiper, Teagle Hybrid Learning Conference, Oak Brook, IL, April 2017.
- "Q-Q plots: To De-trend, or Not to De-trend." Invited colloquium talk, Department of Mathematics and Statistics, Carleton College, Northfield, MN, January 2017.

- "Variations of Q-Q Plots—The Power of our Eyes!" Contributed poster, Joint Statistical Meetings, Chicago, IL, August 2016.
- "Q-Q plots: To De-trend, or Not to De-trend." Invited colloquium talk, Department of Mathematics and Computer Science, Ripon College, Ripon, WI, April 2016.
- "Q-Q plots: To De-trend, or Not to De-trend." Invited colloquium talk, Department of Mathematics and Computer Science, Beloit College, Beloit, WI, February 2016.
- "Better Diagnostics for Linear Mixed-Effects Models Using Visual Inference." Invited seminar talk, Graphics Working Group, Iowa State University, Ames, IA, December 2014.
- "Visual Inference for Linear Mixed-Effects Models." Contributed poster, Joint Statistical Meetings, Boston, MA, August 2014.
- "Understanding Farmer Perspectives on Climate Change and Adaptation to Increased Weather Variability." Guest lecture for Environmental Studies 300, Lawrence University, Appleton, WI, March 2014.
- "A Discussion of Visual Inference." Invited talk, Department of Mathematics, Oberlin College, Oberlin, OH, December 2013.
- "A Discussion of Visual Inference." Invited talk, Department of Mathematics and Statistics, Grinnell College, Grinnell, IA, December 2013.
- "Escaping Asymptopia: How Visual Inference Can Help Solve Finite Sample Problems." Invited talk, Department of Mathematics, Lawrence University, Appleton, WI, November 2013.
- "Are You Normal? The Problem of Confounded Residual Structures in Hierarchical Models." Topic contributed talk, Joint Statistical Meetings, Montréal, Canada, August 2013.
- "A Tale of Four Cities: Exploring the Soul of Biloxi, Detroit, Milledgeville, and State College." Data Expo poster with Karsten Maurer and Dave Osthus (second place), Joint Statistical Meetings, Montréal, Canada, August 2013.

## Software

**qqplotr:** An R package providing ggplot2 compatible quantile plots. Alexandre Almeida and Heike Hofmann coauthored this package during Google Summer of Code 2017.

**Imeresampler:** An R package implementing bootstrap procedures for nested linear mixed-effects models fit using either the lme4 or nlme packages. Spenser Steele\* and Jenna Korobova\* coauthored this package.

**HLMdiag:** An R package providing a suite of diagnostic tools for hierarchical linear models fit using either the lme4 or nlme packages. Jaylin Lowe\* and Jack Moran\* helped update and maintain this package.

# Consulting

**KagenAir.** Compared two new mobile app-based system-control questionnaires for rhinitis and asthma to validated questionnaires. The goal of the project is to demonstrate that the app-based questionnaires are measuring rhinitis and asthma with a comparable level of accuracy. 2015–present.

Community Early Learning Center. Created and maintained a MySQL database to store sociodemo-

graphic and assessment data for the five partner organizations, enabling them to utilize longitudinal data in their analyses. Prior to the database, the partner organizations treated each year in isolation. This database will be used for research by developmental psychologists at Lawrence University and the University of Wisconsin–Fox Valley. 2014–2017.

**Jeff Clark (Geology).** Explored a data set of meander geometry measurements from rivers around the world in five distinct environments (arid, temperate, tropical, periglacial, and bedrock) in an effort to determine if geometric features differ across environments. 2014–2015.

**Lori Hilt (Psychology).** Advised in the selection of models to analyze a psychology experiment. Reshaped data for use with statistical software. 2013–2014.

**Statistics in the Community (StatCom).** Provided pro bono statistical consulting including survey preparation, data management and manipulation, tabular and graphical summaries, and analysis. Completed projects include: the Ericson Public Library Community Survey and the Perry Public Library Community Survey. 2011–2013.

# **Professional Memberships**

• American Statistical Association

# Service

### Departmental Service

- Faculty advisor for MinneMUDAC, Carleton College, 2018–present
- Independent comps committee member (9), Carleton College, 2017-present
- Faculty advisor, Midwest Undergraduate Data Analytics Competition, Carleton College, 2019– present
- Mathematics and Statistics colloquium & events committee member, Carleton College, 2018–2019
- Search committee member, Carleton College
  - Visiting position in Mathematics/Statistics, Winter/Spring 2020
  - Visiting position in Statistics, Winter/Spring 2019
- Search committee member, Lawrence University
  - Visiting position in Statistics, Winter/Spring 2017
  - Tenure-track position in Mathematics, Winter 2017
  - Visiting position in Mathematics, Spring 2016
  - Tenure-track position in Biology, Fall 2015
  - Visiting position in Mathematics, Winter 2014

### College Service

- Institutional Review Board (IRB) member, Carleton College, 2018–2020
- Writing portfolio reader, Carleton College, 2019, 2020
- Data science working group, Lawrence University, 2015–2017
- Benefits advisory committee, Lawrence University, 2015-2017
- Phi Beta Kappa Secretary, Lawrence University, 2016–2017
- Diversity point person for systems and data services librarian search committee, Lawrence University, Summer/Fall 2016

- Huebner Pre-Law Fellowship Review Panel, Lawrence University, 2016–2017
- Honors thesis committee member (2), Lawrence University

Professional Service

- Conference session chair, Symposium on Data Science & Statistics, 2020
- Editorial board member, *StatTLC* blog, 2019–present
- Organizing committee member, Southern Stat Chat: Effective Pedagogy in Data Science, 2018– 2019
- Reviewer, USCOTS Posters and Beyond Committee, 2019
- Judge, Undergraduate Statistics Project Competition, The Consortium for the Advancement of Undergraduate Statistics Education (CAUSE), 2018, 2020
- Discussant, Professional Opportunities at Smaller Colleges and Universities, Joint Statistical Meetings, August 2016
- Director, Wisconsin Chapter of the American Statistical Association, 2015–2017
- Referee for *Journal of Statistics Education* (7 reviews), *Journal of Computational and Graphical Statistics* (1), *Journal of Statistical Software* (1), *R Journal* (1), *The American Statistician* (2), *Computational Statistics* (3), *Journal of Soil and Water Conservation* (1), VIS 2020 (1)
- Textbook proposal reviewer for CRC (8), Routledge (1), Wiley (1), Pearson (1)

#### Community Service

• Community Early Learning Center, Research Committee Member, 2014–2017