MELISSA JAY

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EDUCATION

PhD	University of Iowa, Biostatistics Advisor: Dr. Jacob Oleson	2018 – Present
MS	University of Iowa, Biostatistics	2018 – 2019
PhD Student	Harvard University, Biostatistics	2017 – 2018
BA	Colorado College, Mathematics Distinction in Mathematics, *cum laude*	2012 – 2016

GRADUATE EXPERIENCE

Research Experience

NSF Graduate Research Fellow 2017 – Present
University of Iowa, Iowa City, IA

- Developed a Bayesian mediation analysis framework for spatially correlated count data
- Collaborated with a cancer epidemiologist to propose statistical methods that have both relevance and utility in the field of epidemiology
- Worked with a research team to develop an optimal outcome variable for assessing Huntington's Disease progression in clinical trials
- Honed scientific communication skills by presenting research to audiences with varying backgrounds at four conferences

Graduate Research Assistant 2019 – 2020
University of Iowa, Iowa City, IA

- Drafted a pilot grant proposal with faculty mentors that was awarded funding to investigate the relationship between environmental and lifestyle factors and county-level cancer mortality rates
- Compiled a comprehensive, multi-year covariate dataset for US counties and applied for restricted-use, county-level mortality data from the National Center for Health Statistics
- Developed a statistical modeling framework for estimating age-adjusted cancer mortality rates from spatio-temporal datasets with excess zero counts
- Examined the association between county-level variables and lung cancer risk in the Midwest

Graduate Student Trainee in Quantitative Sciences for Cancer Research 2017 – 2018
Harvard University, Boston, MA

- Developed extensions of the Kaplan-Meier estimator that allow researchers to display survival estimates of patient groups defined by changes in covariate values over time
- Presented research at two Cancer Working Group meetings and incorporated feedback from working group members to strengthen my research

- Took four courses related to cancer epidemiology to broaden my understanding of epidemiological research

Teaching Experience

Tutor 2021
University of Iowa, Iowa City, IA
- *Course*: STAT:5101 Statistical Inference II
- Held weekly office hours for 12 biostatistics graduate students to review course concepts and answer homework questions

Graduate Teaching Assistant 2019
University of Iowa, Iowa City, IA
- *Course*: BIOS:4110 General Biostatistics, Iowa Summer Institute in Biostatistics
- Instructed bi-weekly computer programming labs for 24 undergraduate scholars participating in the Iowa Summer Institute in Biostatistics
- Created laboratory exercises that focused on exploratory data analysis and hands-on experience with a variety of health datasets in the R statistical software
- Assisted scholars with questions related to their research projects

HONORS AND AWARDS

Lester R. Curtin Award 2020
American Statistical Association

Delta Omega Honorary Society in Public Health 2020
University of Iowa College of Public Health

Advancing Graduate Student Success Award 2020
University of Iowa College of Public Health

NSF Graduate Research Fellowship 2017
National Science Foundation

Florian Cajori Award 2016
Colorado College Department of Mathematics & Computer Science

Sophie Germain Award 2016
Colorado College Department of Mathematics & Computer Science

Outstanding Winner in the Mathematical Contest in Modeling 2015
(top 10 out of 7,636 paper submissions)
Consortium for Mathematics and its Applications

INFORMS Prize 2015
(awarded for our 2015 Mathematical Contest in Modeling paper)
Institute for Operations Research and the Management Sciences

Colorado Mathematics Award 2015
(for the top-performing Colorado teams in the Mathematical Contest in Modeling)
Colorado Mathematics Awards Committee

Barry M. Goldwater Scholar 2015
Barry Goldwater Scholarship and Excellence in Education Program

Euclid Scholarship 2014
Colorado College Department of Mathematics & Computer Science

Finalist Winner in the Mathematical Contest in Modeling 2014
(top 21 out of 6,755 paper submissions)
Consortium for Mathematics and its Applications

Colorado Mathematics Award 2014
(for the top-performing Colorado teams in the Mathematical Contest in Modeling)
Colorado Mathematics Awards Committee

SIAM Student Chapter Certificate of Recognition 2014
Society for Industrial and Applied Mathematics

PUBLICATIONS

1. **Jay M**, Oleson J, Charlton M, Arab A. A Bayesian approach for estimating age-adjusted rates for low-prevalence diseases over space and time. *Statistics in Medicine*. 2021;1-17.
2. **Jay M**, Betensky RA. Displaying survival of patient groups defined by covariate paths: Extensions of the Kaplan-Meier estimator. *Statistics in Medicine*. 2021;40:2024-2036.
3. Sewell DK, Penney J, **Jay M**, Zhang Y, Paulsen JS. Predicting an optimal composite outcome variable for Huntington's disease clinical trials. *Journal of Applied Statistics*. 2020;1-10.
4. Mao Q, **Jay M**, Hoffman JL, Calvert J, Barton C, Shimabukuro D, Shieh L, Chettipally U, Fletcher G, Kerem Y, Zhou Y, Das R. Multicentre validation of a sepsis prediction algorithm using only vital sign data in the emergency department, general ward and ICU. *BMJ Open*. 2018;8:e017833.
5. Desautels T, Calvert J, Hoffman J, Mao Q, **Jay M**, Fletcher G, Barton C, Chettipally UK, Kerem Y, Das R. Using transfer learning for improved mortality prediction in a data-scarce hospital setting. *Biomedical Informatics Insights*. 2017;9:1-8.
6. Calvert J, Hoffman J, Barton C, Shimabukuro D, Ries M, Chettipally U, Kerem Y, **Jay M**, Mataraso S, Das R. Cost and mortality impact of an algorithm-driven sepsis prediction system. *Journal of Medical Economics*. 2017;20(6):646-651.
7. Desautels T, Calvert J, Hoffman J, **Jay M**, Kerem Y, Shieh L, Shimabukuro D, Chettipally U, Feldman MD, Barton C, Wales DJ, Das R. Prediction of sepsis in the Intensive Care Unit with minimal electronic health record data: a machine learning approach. *JMIR Medical Informatics*. 2016;4.3:e28.
8. Calvert J, Mao Q, Hoffman J, **Jay M**, Desautels T, Mohamadlou H, Chettipally U, Das R. Using electronic health record collected clinical variables to predict medical intensive care unit mortality. *Annals of Medicine and Surgery*. 2016;11:52-57.
9. Calvert J, Desautels T, Chettipally U, Barton C, Hoffman J, **Jay M**, Mao Q, Mohamadlou H, Das R. High-performance detection and early prediction of septic shock for alcohol-use disorder patients. *Annals of Medicine and Surgery*. 2016;8:50-55.
10. Calvert J, Mao Q, Rogers AJ, Barton C, **Jay M**, Desautels T, Mohamadlou H, Jan J, Das R. A computational approach to mortality prediction of alcohol use disorder inpatients. *Computers in Biology and Medicine*. 2016;75:74-79.

11. Calvert JS, Price DA, Chettipally U, Barton CW, Feldman MD, Hoffman JL, **Jay M**, Das R. A computational approach to early sepsis detection. *Computers in Biology and Medicine*. 2016;74:69-73.
12. **Jay M***, Mankovich N*, Campbell E*. Searching for a lost plane: a neighborhood-based probabilistic model. *UMAP Journal*. 2015;36.3:149-168.
13. **Jay M***, Karapakula VG*, Krakoff E*. Determining the top all-time college coaches through Markov chain-based rank aggregation. *SIAM Undergraduate Research Online*. 2015;8:12-27.

* Indicates equal contributions from all authors.

PRESENTATIONS

Invited Presentations

1. Understanding "how" in a study of cause and effect: An introduction to mediation analysis in epidemiology. University of Iowa INFORMS Student Chapter Knowledge Cafe. Virtual presentation. 2020.

Conference Presentations

1. Modeling age-adjusted rates from spatio-temporal data sets with excess zero counts. Conference on Statistical Practice. Virtual meeting. 2021.
2. Displaying survival of patient groups defined by covariate paths: Extensions of the Kaplan-Meier estimator. Eastern North American Region International Biometric Society Spring Meeting. Virtual meeting. 2020.
3. Estimating lung cancer mortality rates in U.S. counties using Bayesian spatial models. Midwest Rural Agricultural Safety and Health Conference. Marshalltown, IA. 2019.
4. Creating small-area cancer risk estimates to promote cancer control activities in rural areas. Women in Statistics and Data Science Conference. Bellevue, WA. 2019.
5. A probabilistic, neighborhood-based model for locating lost transoceanic flights. Gulf Coast Undergraduate Research Symposium. Houston, TX. 2015.
6. Determining the top all-time college coaches through Markov chain-based rank aggregation. Front Range Applied Mathematics Student Conference. Denver, CO. 2015.
7. Speech intelligibility index model: A key aspect to a child's development of speech and language. Nebraska Conference for Undergraduate Women in Mathematics. Lincoln, NE. 2015.

Other Presentations

1. Colorado College SIAM Student Chapter graduate school panel (panelist). Virtual panel. 2020.
2. Modeling age-adjusted rates from spatio-temporal data sets with excess zero counts. University of Iowa Biostatistics Student Organization Student Seminar. Virtual presentation. 2020.
3. Estimating lung cancer mortality rates in U.S. counties using Bayesian hierarchical Poisson regression models. University of Iowa Department of Biostatistics Seminar. Iowa City, IA. 2019.

4. Opportunities in biostatistics. Colorado College SIAM Student Chapter. Virtual presentation. 2019.
5. Goldwater Scholarship graduate school webinar (panelist). Virtual panel. 2018.
6. Displaying survival of groups defined by covariate paths. Harvard University Cancer Working Group. Boston, MA. 2018.
7. Use of time-varying covariates in Kaplan-Meier estimators. Harvard University Cancer Working Group. Boston, MA. 2017.
8. Predicting student drop-out in massive open online courses. Hong Kong University of Science and Technology RIPS Research Symposium. Clear Water Bay, Hong Kong. 2016.
9. Predicting student drop-out in massive open online courses. University of Macau Math Department Presentations. Taipa, Macau. 2016.
10. Priority queueing models for kidney transplant allocation. Colorado College Capstone Presentations. Colorado Springs, CO. 2016.
11. Searching for a lost plane: a probabilistic, neighborhood-based model for locating lost transoceanic flights. Colorado College Mathematics and Computer Science Poster Session. Colorado Springs, CO. 2015.
12. Speech intelligibility index model: A key aspect to a child's development of speech and language. Colorado College Mathematics and Computer Science Poster Session. Colorado Springs, CO. 2014.
13. Speech intelligibility index model: A key aspect to a child's development of speech and language. University of Iowa ISIB Research Symposium. Iowa City, IA. 2014.

Podcast Episodes

1. Using statistics to understand cancer. Goldwater Scholar Highlights Podcast. 2019.

LEADERSHIP AND SERVICE

Student Ambassador 2021 – Present
Department of Biostatistics, University of Iowa

Competitive Scholarships Mentor 2020 – Present
Dear Future Colleague

Mentor 2020 – Present
Biostatistics Student Organization, University of Iowa

President 2020 – Present
Biostatistics Student Organization, University of Iowa

Mentorship Program Committee Member 2020 – Present
Goldwater Scholar Community Council

Student Advisory Committee Member 2019 – 2020
Department of Biostatistics, University of Iowa

Curriculum Committee Student Representative 2019 – 2020
College of Public Health, University of Iowa

Professional Development Activities Coordinator 2019 – 2020
Biostatistics Student Organization, University of Iowa

Graduate Student Ambassador 2018 – 2019
College of Public Health, University of Iowa

Service Coordinator 2018 – 2019
Biostatistics Student Organization, University of Iowa

Mentor 2017 – 2018
Women in STEM Mentorship Program, Harvard College

Treasurer 2015 – 2016
SIAM Student Chapter, Colorado College

President 2013 – 2015
SIAM Student Chapter, Colorado College

Student Founder 2013
SIAM Student Chapter, Colorado College

COURSEWORK

- Probability
- Statistical Inference I
- Methods I & II
- Theory of Biostatistics I & II
- Biostatistical Computing in SAS
- Advanced Biostatistical Computing
- Bayesian Methods and Design
- Machine Learning for Biomedical Data
- Statistical Analysis of Network Data
- Big Data Analysis with Python
- Survival Data Analysis
- Analysis of Categorical Data
- Principles & Advanced Topics in Clinical Trials
- Causal Inference
- Survey Design and Analysis
- Epidemiology I & II
- Epidemiology of Cancer
- Molecular Biology for Epidemiologists
- Responsible Conduct of Research
- Longitudinal Data Analysis (in progress)
- Theory of Linear/ Generalized Linear Models (in progress)
- Bayesian Analysis for High Dimensional Correlated Data (in progress)

PROFESSIONAL DEVELOPMENT

Short Courses Attended

- Navigating Tough Conversations in Statistical Collaboration. Conference on Statistical Practice. Virtual Meeting. 2021.
- Mixed Models: A Critical Tool for Dependent Observations. Conference on Statistical Practice. Virtual Meeting. 2021.

UNDERGRADUATE EXPERIENCE

Research Experience

Junior Statistician and Technical Writing Lead 2015 – 2017
Dascena, Hayward, CA

- Contributed to the development of machine learning algorithms to predict sepsis onset and patient decompensation in the hospital using Electronic Health Record (EHR) data
- Drafted scientific journal publications and marketing case studies
- Managed databases and generated SQL queries to efficiently obtain data from multiple sources

Student Researcher 2016
Research in Industrial Projects for Students – Hong Kong
Hong Kong University of Science and Technology, Clear Water Bay, Hong Kong

- *Project:* Predicting student drop-out in massive open online courses
  Industry sponsor: Huawei Technologies Co.

Student Researcher 2015 – 2016
Colorado College, Colorado Springs, CO

- *Project:* Priority queueing models for kidney transplant allocation

Student Researcher 2014
Iowa Summer Institute in Biostatistics
University of Iowa, Iowa City, IA

- *Project:* Speech intelligibility index model: A key aspect to a child's development of speech and language

Teaching Experience

Volunteer Tutor 2016
Warren Village, Denver, CO

- *Course*: Introductory Statistics
- Tutored a group of single parents who lived at Warren Village, a non-profit organization focused on helping low-income, single-parent families achieve personal and economic self-sufficiency
- Assisted with homework questions and course concepts for an introductory statistics course

Peer Tutor 2014 – 2016
Colorado College Quantitative Reasoning Center, Colorado Springs, CO

- Tutored students on an individual basis and during QRC drop-in hours in calculus, probability and statistics, linear algebra, and other math courses
- Led math essentials review sessions for 100- and 200-level physics students

Learning Assistant 2014 – 2015
Colorado College Quantitative Reasoning Center, Colorado Springs, CO

- *Courses*: MA117 Probability and Statistics, MA217 Probability and Statistical Modeling
- Worked with a professor to develop R labs and incorporate R into the MA217 curriculum

- Attended lab sessions to assist students with R
- Led problem sessions to review course content and answer homework questions

PROFESSIONAL MEMBERSHIPS

American Statistical Association 2019 – Present