Amanda Luby, PhD

Northfield, MN
aluby@carleton.edu
aluby.github.io

Academic Appointments

Carleton College

2024 - **Assistant Professor of Statistics**

Swarthmore College

2019 - 2024 **Assistant Professor of Statistics**

Research Sabbatical F22 - S23

Visiting Appointments

Fall 2022 **Netherlands Forensic Institute** Statistics & Methodology, Big Data Analysis Groups

Education

2019 **Ph.D., Statistics**, *Carnegie Mellon University*.
Dissertation: Accounting for individual differences among decision-makers with applications to the evaluation of forensic evidence
Committee: Brian Junker, Anjali Mazumder (supervisors), Rebecca Nugent, Joseph B Kadane, Reinoud Stoel (Statistics Netherlands)

2015 **M.S., Statistics**, *Carnegie Mellon University*.
Project: A Log-Linear Model Approach to Eyewitness Identification
Advisor: Stephen E. Fienberg

2014 **B.A., Mathematics**, *College of Saint Benedict*, Summa Cum Laude.
Minor in Computer Science

Publications and Reports

* *Denotes Equal Contribution*

† *Denotes Undergraduate Co-author*

Peer-reviewed journal articles

9. Maria Cuellar, Susan Vanderplas, **Amanda Luby** and Michael Rosenblum, "Methodological Problems in Every Black-Box Study of Forensic Firearm Comparisons," *Revision Under Review*.
8. **Amanda Luby** and Joseph B Kadane, "A Variance Decomposition Approach to Inconclusives in Forensic Black Box Studies," *Revision Under Review*.
7. **Amanda Luby**, "Quantifying individual decision thresholds of fingerprint examiners," *Forensic Science International: Synergy*, 7: 100340, 2023.
6. Maria Cuellar, Jacqueline Mauro, and **Amanda Luby**, "A probabilistic formalization of contextual bias: From forensic analysis to systemic bias in the criminal justice system." *Journal of the Royal Statistical Society: Series A - Statistics in Society*, 185 (2), 2022.

5. Alex Reinhart, Ciaran Evans, **Amanda Luby**, Josue Orellana, Mikaela Meyer, Jerzy Wieczorek, Peter Elliott, Philipp Burckhardt, and Rebecca Nugent, "Think-aloud interviews: A tool for exploring student statistical reasoning," *Journal of Statistics and Data Science Education*, 30(2), 2022.
4. Shannon Gallagher*, Kayla Frisoli*, **Amanda Luby***, "Opening up the court: analyzing player performance across tennis Grand Slams", *Journal of Quantitative Analysis in Sports*, 2021. 17(4), 255-271.
3. **Amanda Luby**, Anjali Mazumder, Brian Junker, "Psychometric Analysis of Forensic Examiner Behavior", *Behaviormetrika*, 2020. 47, 355-384
2. **Amanda Luby**, Joseph B Kadane, "Proficiency testing of fingerprint examiners with Bayesian Item Response Theory," *Law, Probability & Risk*, 2018. 17(2), 111-121
1. **Amanda Luby**, "Strengthening Analyses of Lineup Procedures: A log-linear model framework," *Law, Probability & Risk*, 2017. 16(4), 241–257

Refereed Proceedings

3. **Amanda Luby**, Thomas Daillak†, Sherry Huang†, "A comparison of IRT-based methods for spatial responses." *Quantitative Psychology: The 86th Meeting of the Psychometric Society*, 2023.
2. **Amanda Luby** and Riley Thompson†, "Modeling Covarying Responses in Complex Tasks". *Quantitative Psychology: The 86th Meeting of the Psychometric Society*, 2022. Edited by Wiberg, M., Molenaar, D., Gonzalez, J., Kim, J-S., H. Hwang. 65–82
1. **Amanda Luby**, Anjali Mazumder, Brian Junker, "Psychometrics for Forensic Fingerprint Comparisons," *Quantitative Psychology: The 85th Meeting of the Psychometric Society*, 2021. Edited by Wiberg, M., Molenaar, D., Gonzalez, J., Bockenholt, U., Kim, J-S. 385–397

Book Chapters

1. **Amanda Luby**, "Decision Making in Forensic Identification Tasks," *Open Forensic Science in R*, 2019. Edited by Sam Tyner and Heike Hofmann.

Other Reports

1. **Amanda Luby**, "A review of existing methods for evaluating the combination of forensic evidence," 2017. *Center for Statistics and Applications in Forensic Evidence (CSAFE) Internal Project Report.*

Grants

2020-2025 PI, "Implementation of Item Response Theory in Forensic Proficiency Testing". Subaward to Swarthmore College. Center for Statistics and Applications in Forensic Evidence (a NIST-funded Center of Excellence.) $189,386

2021-2022 PI, " Detecting Misconceptions among Introductory Statistics Students". Swarthmore College Faculty Research Grant. $3,500

2018 Co-PI, "Women in Statistics at CMU: Fostering collaboration through formal mentorship". Carnegie Mellon University ProSEED/Crosswalk grant. $1,685

2017 PI, "Memory Effects and Statistical Methodology for Eyewitness Lineup Procedures". Carnegie Mellon University Graduate Small project Help (GuSH) Grant.

2016 -2019 Center for Statistics and Applications in Forensic Evidence. Tuition, stipend, and travel support.

Selected Presentations

Invited

2024 “An Empirical Approach to Inconclusives in Forensic Black Box Studies”, North Sea Group Seminar on Legal Evidence and Proof.

2023 “Psychometrics for quantifying variability in forensic decision-making”, NYU Biostatistics Seminar.

2022 “Quantifying varying degree of support scales among firearms examiners with IRT”, Forensic Big Data Analysis Colloquium, Netherlands Forensic Institute.

2022 “Think-Aloud Interviews: A Tool for Exploring Student Statistical Reasoning", Journal of Statistics and Data Science Education Webinar

2021 “Item Response Theory for Human Factors in Fingerprint Analysis", Center for Practice and Research at the Intersection of Information, Society, and Methodology (PRIISM) Seminar at New York University.

2021 “Bayesian Item Response Theory for Human Factors", Joint Statistical Meetings (Virtual due to COVID-19).

2021 “IRT For Forensics: A Re-Analysis of the FBI Black Box Study", CSAFE April Webinar.

2021 “Item Response Theory for Forensic Science,” Fordham University Psychometrics and Quantitative Psychology Program Seminar.

2020 “Analyzing the analyzers: understanding variability in forensic decision-making,” Moravian College Department of Mathematics and Computer Science Colloquium. Bethlehem, PA.

2019 “Modeling Fingerprint Identification Decisions with Item Response Theory,” Metropolitan Police Service. London, UK.

2019 “Modeling Fingerprint Identification Decisions with Item Response Theory,” Workshop on Probabilistic Reasoning and Decision-Making in Forensic Evidence at the Alan Turing Institute. London, UK.

2016 “A Graphical Model Approach to Eyewitness Identification,” joint work with Stephen E. Fienberg. Workshop on Bayesian networks and argumentation in evidence analysis at the Isaac Newton Institute for Mathematical Science. Cambridge, UK.

Contributed

2023 "An Alternative Statistical Framework for Measuring Proficiency", International Association of Identification Educational Conference. Baltimore, MD.

2023 "Examiner Variability in Pattern Evidence: Proficiency, Inconclusive Tendency, and Reporting Styles", Joint Statistical Meetings. Toronto, Canada.

2023 "Understanding Factors in Firearms Decision-Making using Item Response Theory", International Conference on Forensic Inference and Statistics. Lund, Sweden. *Awarded the Stephen E. Fienberg Young Investigator Award for the Best Project in Forensic Statistics.*

2022 “Characterizing Variability in Forensic Decision-Making with Item Response Theory", Joint Statistical Meetings. Washington, D.C.

2022 “Analyzing Spatial Responses: A Comparison of IRT-based Approaches ", International Meeting of the Psychometric Society. Bologna, Italy.

2022 “Measuring Proficiency Among Latent Print Examiners: A Statistical Approach From Standardized Testing", American Academy of Forensic Sciences Annual Scientific Conference. Seattle, WA.

2021 “Modeling Covarying Responses in Complex Decision-Making Tasks", International Meeting of the Psychometric Society (Virtual due to COVID-19).

2020 “Modeling covarying responses of forensic decision-makers within an IRT framework,” Joint Statistical Meetings. (Virtual due to COVID-19)

2020 “Psychometrics for Forensic Decision-Making,” International Meeting of the Psychometric Society. (Virtual due to COVID-19) *Selected as a Spotlight Talk.*

2019 Breakout Session. “Using think-aloud interviews to assess student understanding of statistics concepts," Reinhart, P Burckhardt, P W Elliott, C Evans, A Luby, M Meyer, J Orellana, R Yurko, G Weinberg, J Wieczorek, R Nugent. US Conference on Teaching Statistics. State College, PA.

2018 “Opening up the court (surface) in tennis grand slams,” Shannon Gallagher, Kayla Frisoli, and Amanda Luby. Carnegie Mellon Sports Analytics Conference. Pittsburgh, PA. *Honorable Mention - Reproducible Research Competition.*

2018 “Accounting for Individual Differences Among Fingerprint Examiners Using Item Response Theory,” Women in Statistics and Data Science Conference. Cincinnati, OH.

2018 “Accounting for individual differences among latent print examiners using Item Response Theory,” Joint Statistical Meetings. Vancouver, BC.

2017 “Proficiency Testing for Fingerprint Examiners: A Bayesian Approach,” joint work with Joseph B. Kadane. International Conference on Forensic Inference and Statistics. Minneapolis, MN.

2016 “A Log-Linear Model Approach to Eyewitness Identification,” joint work with Stephen E. Fienberg. Joint Statistical Meetings. Chicago, IL.

Posters

2019 “Item Response Theory for the FBI “black box” study," CSAFE All-Hands Meeting. Ames, IA.

2018 “Developing an assessment for concepts in introductory statistics and data science,” P Burckhardt, P Elliott, C Evans, K Lin, A Luby, J Hyun, CP Makris, M Meyer, J Orellana, GWeinberg, J Wieczorek, R Yurko, R Nugent, A Reinhart. Eberly Center Teaching and Learning Summit. Pittsburgh, PA. *People’s Choice Award.*

2018 “Identifying misconceptions of introductory data science using a think-aloud protocol,” P Burckhardt, P Elliott, C Evans, S Hyun, K Lin, A Luby, CP Makris, J Orellana, A Reinhart, J Wieczorek, R Yurko, G Weinberg, R Nugent. Electronic Conference on Teaching Statistics. `https://www.causeweb.org/cause/ecots/ecots18/posters/3-10`

2017 "Frameworks for complex evidential reasoning: statistical implications and comparative assessment." International Conference on Forensic Inference and Statistics. Minneapolis, MN.

2017 "Assessing the Combination of Forensic Evidence through a Probabilistic Graphical Model." Joint Statistical Meetings. Baltimore, MD.

2017 "Assessment of Student Learning and Misconception Identification in Introductory Statistics Courses," P Burckhardt, P Elliott, S Hyun, K Lin, A Luby, C Makris, J Orellana, A Reinhart, J Wieczorek, G Weinberg, R Nugent. Eberly Center Teaching and Learning Summit. Pittsburgh, PA.

2015 "A Log-Linear Model Approach to Eyewitness Identification Data," Advisor: Stephen E. Fienberg. SAMSI Forensics Opening Workshop, Raleigh, NC. Also presented at CSAFE Kickoff Conference, Ames, IA.

Teaching

Swarthmore College

Statistical Methods I (STAT 011)
Spring 2022 (2 sections)
Spring 2021 (1 section)
Fall 2019 (2 sections)

Statistical Methods II (STAT 021)
Fall 2021 (2 sections)
Spring 2024 (expected)

Topics in Applied Statistics: Data Visualization (STAT 041)
January 2021

Probability (STAT 051)
Spring 2020 (2 sections)

Mathematical Statistics I (STAT 061)
Fall 2023 (2 sections)

Carnegie Mellon University

Introduction to Probability Theory (36-225)
Summer 2018
Summer 2017

Experimental Design for Behavioral and Social Sciences (36-309)
Summer 2016

Teaching Assistant:
- Modern Regression (36-401)
- Statistical Graphics and Visualization (36-315)
- Experimental Design for Social Sciences (36-309)

Pedagogical Training

2022 Tri-Co Faculty Learning Community on Inclusive Research Mentorship

2018 Future Faculty Program, Eberly Center for Teaching Excellence and Educational Innovation. (Includes seminars, independent projects, and teaching observations)
`cmu.edu/teaching/graduatestudentsupport/futurefacultyprogram.html`

2018 Preparing to Teach workshop, Joint Statistical Meetings (Sponsored by the American Statistical Associaton). Vancouver, BC.
`sites.google.com/view/preparetoteach`

Other Teaching Experiences

2018 Guest Lecture. "Gender and Race Bias in Algorithms and AI." Introduction to Gender Studies (CMU 76-241)

2016-2017 Instructor. Introduction to Probability and Statistics for Forensic Science Undergraduate Students (CMU Summer Undergraduate Research Program)

2015 Graduate Student Advisor and Teaching Assistant. CMU Statistics Summer Undergraduate Research Program (CMU Summer Undergraduate Research Program)

Consulting

2020- Data Science for the Media Ecology Project
Data visualization, PDF scraping, and text analysis on archival film data
`https://mediaecology.dartmouth.edu`

Advising

Undergraduate Research

2022 Sarah Conley '24, *Item Response Theory in Forensics and Fingerprinting: Beyond the Black and White*

2022 Janet Barkdoll '22, *Data Visualization for Mathematics*
Co-advised with Prof. Cathy Hsu.

2021-22 Horace Shew '22, *Comparison of Different R Packages for Fitting IRT Models*

Applying Hierarchical Bayesian Models to ATP Data
Finalist in the Reproducible Research Competition - Student Methodology Track, Carnegie Mellon Sports Analytics Conference

2021 Thomas Daillak '22, *Clustering techniques for analyzing fingerprint minutiae labelings*

2021 Riley Thompson '22, *Is Reported Difficulty Predictive of a Correct Response for Fingerprint Analysts?*

2021 Sherry Huang '23, *Imputation Bias in the Forensic Fingerprint Analysis Process*

2021 Alyssa Zhang '24, *Modeling Patterns in Latent Fingerprint Examiner Errors* (Supported by the Lang Center)

Undergraduate Course Project Awards

Spring 2021 Jordan Perry, Ellie Tsapatsaris, Jimin Lee, and Sofie Pelayo, *Exploring Gender Inequality in Hollywood: A Correlational Analysis on the Impact of Female Representation on Film Prosperity in the Movie Industry*.
3rd place in USCLAP Introductory Statistics Competition.

Spring 2021 Trang Dang, Lucy Fetterman, and Yulin Chen, *NYC Squirrel Behavior Analysis*. Honorable Mention in USCLAP Introductory Statistics Competition.

Statistical Consulting (Swarthmore College)

2022 Camryn Slosky, Honors Thesis in Neuroscience

2022 Shadae Chambers, Honors Thesis in Psychology

Selected Honors and Awards

2023 Stephen E. Fienberg Young Investigator Award for the Best Project in Forensic Statistics, awarded at the 2023 International Conference on Forensic Inference and Statistics

2021 *Opening up the court: analyzing player performance across tennis Grand Slams* was selected as the JQAS Editor's Choice free access article (1 per issue)

2020 Spotlight Speaker, International Meeting of the Psychometric Society (8 selected of 250+ submissions)

2018 People's Choice Award, Teaching as Research Poster Session, Eberly Center Teaching and Learning Summit. "Developing an assessment for concepts in introductory statistics and data science"

2018 Reproducible Research Competition Honorable Mention, Carnegie Mellon Sports Analytics Conference. "Opening up the court (surface) in tennis grand slams"

2018 Gertrude M. Cox Scholarship (ASA Award) Honorable Mention

2017 Travel Award. International Conference on Forensic Inference and Statistics

2014 Phi Beta Kappa

2013 Delta Epsilon Sigma

2013 Pi Mu Epsilon

Media

2019 "CSAFE Book Highlights How Statistics Benefits Criminal Justice Outcomes," CSAFE Press Release.
`forensicstats.org/news-posts/discover-forensic-applications-of-the-statistical-language-r-in-new-csafe-book`

2018 "Women of Data Science – Dr. Rebecca Nugent and the CMU Statistics & Data Science Team," Data Makes Possible by Western Digital.
`datamakespossible.com/women-data-science-rebecca-nugent-team/`

2018 "CMU Celebrates Pittsburgh Women in Data Science," Dietrich College News.
`cmu.edu/dietrich/news/news-stories/2018/march/women-in-data-science.html`

Service

Professional Service

2023 Secretary & Treasurer: Justice, Equity, Diversity, and Inclusion (JEDI) Outreach Group of the American Statistical Association

2022-2024 Member: American Statistical Association Advisory Committee on Forensic Science

2022 Judge: Undergraduate Statistics Research Project (USRESP) sponsored by CAUSE and the American Statistical Association

2021-2024 Statistics Scientific Working Group Representative to the Friction Ridge Subcommittee, Organization of Scientific Area Committees for Forensic Science

2021-2022 Meeting Coordinator, CSAFE Latent Print Analysis Research Team

2021 Judge: Undergraduate Statistics Research Project (USRESP) sponsored by CAUSE and the American Statistical Association

2020 Judge: Undergraduate Statistics Research Project (USRESP) sponsored by CAUSE and the American Statistical Association

2020 Judge: Reproducible Research Competition, Carnegie Mellon Sports Analytics Conference

Journal Referee

2023 *Statistics and Public Policy*
Journal of Statistics and Data Science Education
Journal of Forensic Sciences
Psychological Review

2022 *The Annals of Applied Statistics*
Journal of Statistics and Data Science Education
Journal of Forensic Sciences
Science & Justice

2021 *Journal of Statistics and Data Science Education*

2020 *The Annals of Applied Statistics*
Journal of Statistics and Data Science Education
Harvard Data Science Review

Departmental Service

2020 - 2024 Organizer, Swarthmore Data Science Problem Solving

2021 - 2022 Applied Mathematics Search Committee

2021 - 2022 Community Building Committee Co-Lead

2020 - 2021 Community Building Committee Co-Lead

2020 Math 97/Senior Comprehensive Experience Sub-Committee

2020 - 2021 Mathematics Search Committee

2019 - 2020 Statistics Search Committee

2019 - 2020 Mathematics Search Committee

College Service

2023-2024 Committee on Academic Requirements

2023-2024 Data Governance Committee

2020 - 2023 Mentor, Richard Rubin Scholars Program

2021 - 2022 Faculty Get Out the Vote Committee

2020 - 2021 Faculty Committee for Honorary Degrees

Other Service Activities

2018 - 2019 Graduate Student Representative, Dietrich College Council

2017 - 2019	Statistics Department Representative, CMU Graduate Student Assembly
2015 - 2019	CMU Women in Statistics Co-President and Founding Member
2018-2019	Executive Program Committee, Women in Data Science Pittsburgh@CMU
2018-2019	Co-PI and coordinator, Matched Pairs Mentorship Program

Research Interests

- Applications in Forensics and the Law
- Bayesian Methods
- Statistics Education
- Digital Humanities
- Item Response Theory
- Latent Variable Models
- Data Visualization

Computing

R/RStudio, quarto, markdown, Stan, Git/Github, LaTeX(expert)
Python, MATLAB, shiny, Java, bash, SPSS, Qualtrics, JAGS/WinBugs (proficient)
SQL, JavaScript (some experience)

Memberships

American Statistical Association
Justice, Equity, Diversity, and Inclusion (JEDI) Outreach Group of the ASA
Caucus for Women in Statistics