# Wyatt Madden M.S.

Grace Crum Rollins Room 359
Department of Biostatistics & Bioinformatics
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## EDUCATION

**Emory University**                                                        *2021 – Present*
Ph.D. in Biostatistics & Bioinformatics

**Montana State University**                                                *2017 – 2019*
M.S. in Statistics

**University of California, Santa Cruz**                                     *2011 – 2015*
Bachelor of Arts, Economics & Mathematics *With Honors*
Bachelor of Arts, Film & Digital Media *With Honors*

## RESEARCH INTERESTS

Bayesian computation, spatio-temporal modeling, probabilistic machine learning & deep learning, data integration, Bayesian nonparametrics, variational inference and sequential Monte Carlo methods. Applications include viral surveillance, disease ecology, epidemiology and quality control.

## PUBLICATIONS

1. **W. Madden**, W. Jin, B. Lopman, A. Zufle, B. Dalziel, J. Metcalf, B. D. Grenfell, and M. S. Lau, "Neural networks for endemic measles dynamics: Comparative analysis and integration with mechanistic models," *MedRxiv*, May 2024, Under Review.
2. J. Lagergren, M. Ruiz-Aravena, D. J. Becker, *et al.*, "Environmental and ecological signals predict periods of nutritional stress for eastern australian flying fox populations," *bioRxiv*, 2023, Under Review.
3. P. Eby, A. Peel, A. Hoegh, **W. Madden**, J. Giles, P. Hudson, and R. Plowright, "Pathogen spillover driven by rapid changes in bat ecology," *Nature*, pp. 1–3, Nov. 2022, Full Paper.
4. D. J. Becker, P. Eby, **W. Madden**, A. J. Peel, and R. K. Plowright, "Ecological conditions predict the intensity of hendra virus excretion over space and time from bat reservoir hosts," *Ecology Letters*, Oct. 2022, Full Paper.
5. M. S. Y. Lau, A. Becker, **W. Madden**, L. A. Waller, C. J. E. Metcalf, and B. T. Grenfell, "Comparing and linking machine learning and semi-mechanistic models for the predictability of endemic measles dynamics," *PLOS Computational Biology*, vol. 18, no. 9, pp. 1–14, Sep. 2022, Full Paper.
6. M. D. Cherne, A. B. Gentry, A. Nemudraia, *et al.*, "Severe acute respiratory syndrome coronavirus 2 is detected in the gastrointestinal tract of asymptomatic endoscopy patients but is unlikely to pose a significant risk to healthcare personnel," *Gastro Hep Advances*, vol. 1, no. 5, pp. 844–852, 2022, Full Paper.
7. A. Hoegh, A. Peel, **W. Madden**, M. Ruiz-Aravena, A. Morris, A. Washburne, and R. Plowright, "Estimating viral prevalence with data fusion for adaptive two-phase pooled sampling," *Ecology and Evolution*, vol. 11, Sep. 2021, Full Paper.
8. W. Rogers, M. Ruiz-Aravena, D. Hansen, *et al.*, "High-frequency screening combined with diagnostic testing for control of sars-cov-2 in high-density settings: An economic evaluation of resources allocation for public health benefit," *medRxiv*, 2021, Under Review.

## INVITED PRESENTATIONS

Mechanism-Integrated Machine Learning for Infectious Disease Dynamics Prediction   *Oct 2024*
High Meadows Environmental Institute Workshop
On the Accuracy (and Niceness) of Prediction: from Epidemics to Climate and Weather
Princeton, NJ

Machine Learning Approaches for Epidemic Modeling                                  *Mar 2023*
Princeton Serology Conference
Princeton, NJ

Compartmental Models: Deterministic & Bayesian Approaches                          *Nov 2020*
Rocky Mountain Data Science
Bozeman, MT

R Studio in Action - DataFest                                                                    *Oct 2018*
    Montana ASA Chapter Meeting
    Bozeman, MT

CONTRIBUTED   Neural Network Reveals Gravitational Coupling of Endemic Measles Dynamics    *Dec 2023*
TALKS &           Epidemics9 [Poster]
POSTERS         Bologna, Italy

              Bias-Correcting Daily Satellite-Retrieved AOD for Air Quality Research       *Sep 2023*
                  EnviBayes Workshop [Poster]
                Fort Collins, CO

INVITED       Machine Learning Panel                                                        *Mar 2024*
PANELS            CIDMATH Retreat
                Atlanta, GA

PROFESSIONAL   **Los Alamos National Laboratory**                                    Los Alamos, NM
EXPERIENCE    Applied Machine Learning Research Fellow                             *May 2024 – Aug 2024*

              • Developed deep learning methods for high energy density experiments.
              • Designed and implemented PyTorch model fitting pipelines for use on high performance
                computing clusters.

              **Bozeman Disease Ecology Lab**                                              Bozeman, MT
              Statistician                                                             *Jan 2019 – Jul 2021*

              • Researched spatio-temporal data integration techniques for viral surveillance and prediction.
              • Provided statistics & machine learning consulting for international team of scientists.
              • Developed R packages to automate routine statistical analysis, visualization, and wrangling.
              • Designed and implemented SQL database and data pipelines, ensuring data quality and access.

              **Weyerhaeuser**                                                              Seattle, WA
              Statistics Intern                                                        *May 2018 – Aug 2018*

              • Implemented machine learning models aimed at lowering defects in industrial processes, after
                diagnosing issues through exploratory visualization and analyses.
              • Formulated mixed-model experimental designs.
              • Developed Shiny web applications to automate data cleaning/wrangling workflows.

              **Accenture**                                                              Sacramento, CA
              Analyst                                                                   *Jul 2016 – Apr 2017*

              • Improved loan approval processes through analysis of credit profiles.

CONSULTING &  Collaborator                                                              *Aug 2018 – Dec 2018*
COLLABORATION     Statistical Consulting And Research Services (SCRS)
EXPERIENCE        Department of Mathematical Sciences, Montana State University

              Volunteer                                                                 *Jan 2018 – Apr 2018*
                  Statistics Without Borders (SWB)
                  Under direction of Dr. Nicole Carnegie, Montana State University

TEACHING      Teaching Assistant                                                          *Summer 2024*
                  Introduction to Machine Learning for ID Modeling
                  Summer Institute in Statistics and Modeling in Infectious Diseases, Emory University

              Instructor, Creator                                                    *Spring 2023 – Fall 2024*
                  Neural Networks with PyTorch Tutorial

Department of Biostatistics and Bioinformatics, Emory University

Teaching Assistant                                                    *Fall 2022 – Spring 2024*
    INFO 534 - Applied Machine Learning
    Department of Biostatistics and Bioinformatics, Emory University

Instructor                                                            *Fall 2017 – Fall 2018*
    MATH 105 - Contemporary Mathematics
    Department of Mathematical Sciences, Montana State University

## Awards

Patel-Naik Award (2$^{nd}$ Place), Emory University                        *Dec 2023*

Outstanding Graduate Student Award, Montana State University                *May 2019*

Excellence in Data Visualization, ASA Data Fest - Montana State University   *Apr 2018*

## Service

Emory BIOS Student Council, Pre-quals Representative                  *Spring 2022 – Present*

Georgia Statistics Day 2024, Student Volunteer                            *Oct 25th, 2024*

Georgia Statistics Day 2021, Student Volunteer                            *Oct 11th, 2021*

Bozeman Environmental Statistics Group, Member                            *2019 – 2021*

American Statistical Association Student Chapter at Montana State, Treasurer  *2018 – 2019*

## Membership

American Statistical Association