Wyatt Madden M.S.

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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. 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.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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

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 Talks & Posters

Neural Network Reveals Gravitational Coupling of Endemic Measles Dynamics — *Dec 2023*
Epidemics9 [Poster]
Bologna, Italy

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

Invited Panels

Machine Learning Panel — *Mar 2024*
CIDMATH Retreat
Atlanta, GA

Professional Experience

Los Alamos National Laboratory — Los Alamos, NM
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 laboratory 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 & Collaboration Experience

Collaborator — *Aug 2018 – Dec 2018*
Statistical Consulting And Research Services (SCRS)
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 (2nd 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 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