Mariah C. Boudreau, Ph.D.

(802) 582-9854 | mariahcecileboudreau@gmail.com | mariahcboudreau.github.io

Professional Summary

A passionate computational scientist with 5 years of experience transforming complex data into actionable insights through probabilistic modeling and simulations. I thrive on tackling challenging research problems that leverage computational methods to drive meaningful health outcomes and inform critical decisions.

Education

University of Vermont | Burlington, VT
Aug. 2019 - Aug. 2024
Ph.D. in Mathematical Sciences

Saint Michael's College | Colchester, VT
Aug. 2015 - May 2019
B.S. in Mathematics
Minors in Computer Science and Statistics

Skills

Coding: Python (numpy, pandas, matplotlib, geopandas, scikit-learn), parallelization, GitHub, LaTeX, RStudio, SQL.

Technical material: Probability theory, Statistical analysis (linear and logistic regression), Advanced mathematical topics, such as branching process theory, Stochastic simulations, Machine learning techniques.

Work Experience

Postdoctoral Researcher | The Roux Institute at Northeastern University, Portland, ME
Sept. 2024 - Present

- Developed scalable Python workflows for large-scale network data processing and optimization analysis.
- Extending this workflow to include global surveillance optimization for high-risk spillover regions.
- Collaborating with the CDC on optimizing disease surveillance systems in the US.
- Created data visualizations and geospatial analysis to communicate optimization results to stakeholders and inform strategic decision-making.
- Delivered technical presentations to diverse audiences, translating complex analytical frameworks into actionable insights.
- Established a postdoctoral researcher affinity group to connect this community within the Roux research vertical.
- Participated in a 'Foundations of A.I.' course.

Ph.D. Candidate | University of Vermont, Burlington, VT
Aug. 2019 - Aug. 2024

- Designed and implemented three predictive modeling frameworks to quantify uncertainty in multi-scale dynamic systems..
- Developed a mechanistic model in Python to estimate human papillomavirus (HPV) viral load parameters for a population-level model.
- Extended a time-dependent stochastic model to incorporate two public health intervention strategies, and concisely conveyed the results with four intervention comparison metrics.

- Validated all projects mentioned above with event-driven simulations.
- Presented chapters of my dissertation research to technical audiences at two conferences.
- Integrated and analyzed multi-source datasets including biomarker data, survey responses, and wearable device metrics.
- Applied advanced statistical modeling to identify relationships between physiological markers from OURA Ring Gen3 data and behavioral data, segmented by demographic variables.
- Performed stochastic simulations in Python on the University of Vermont's computer cluster.

Contractor | Institute for Disease Modeling at the Gates Foundation, Seattle, WA
May 2022 - July 2022

- Contributed to development of open-source predictive models through parameter estimation and validation techniques with the Computational Science Research group.
- Studied the agent-based model framework developed at the Institute for Disease Modeling.
- Analyzed complex system dynamics to inform mechanistic model development and improve predictive accuracy.
- Collaborated with HPV experts and clinicians.
- Participated in brainstorming and strategic planning meetings to understand the role of projects in the foundation's goals.

Technical Services Intern | Mylan Technologies, Saint Albans, VT
June 2019 - Aug. 2019

- Conducted process optimization analysis to identify operational inefficiencies and recommended data-driven solutions.
- Applied quantitative analysis techniques to identify process bottlenecks and quality control issues in transdermal patch manufacturing operations.
- Presented all of the above analyses to a non-technical audience.

Publications

M.C. Boudreau, A.J. Allen, N.J. Roberts, A. Allard, & L. Hébert-Dufresne
Temporal and probabilistic comparisons of epidemic interventions
Bull. of Math. Biol. 85(12), 118

A.J. Allen, **M.C. Boudreau**, N.J. Roberts, A. Allard, & L. Hébert-Dufresne
Predicting the diversity of early epidemic spread on networks
Phys. Rev. Research 4, 013123

Interests

Volunteer work: Ski patrol, Mount Otto Rhode Race volunteer