Aaron Gerding

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Research interests

Forecasting epidemiological time series, scoring rules, decision theory, information geometry of machine learning

Education

University of Massachusetts, Amherst

2019 – 2024 MS in Biostatistics (from the School of Public Health and Health Sciences)
Mentors: Evan Ray, Nick Reich
Areas of concentration: Infectious disease forecasting and forecast evaluation, Semi-parametric methods in causal inference

2006 – 2011 PhD in Mathematics (from the College of Natural Sciences)
Mentor: Franz Pedit
Areas of concentration: Differential geometry and integrable systems
Thesis: *Spectral methods for higher genus constant mean curvature surfaces*

2001 – 2006 MS in Mathematics

1999 – 2001 BS in Mathematics

Research experience

Dec 2020 – Present **Graduate Research Assistant**
Project: The COVID-19 Forecast Hub
Institution: Department of Biostatistics and Epidemiology, UMass, Amherst
Mentors: Evan Ray and Nick Reich.
Summary: Helped develop and produce 1-4 week ensemble COVID-19 forecasts used by the CDC to guide pandemic response. Maintained data pipelines, built visualization tools for assessing accuracy and value of forecasts, and coordinated with external forecasting teams. Worked to develop new methods of evaluating probabilistic forecasts of epidemiological events using theories of social choice and risk measurement.

Sept 2012 – Sept 2014 **Postdoctoral Scientist**
Project: SFB TR 71: Geometric Partial Differential Equations
Institution: Mathematics Institute, Universität Tübingen
Mentor: Franz Pedit
Summary: Expanded on doctoral work to discover and classify variationally defined immersions of higher genus Riemann surfaces into space forms using both numerical experiments and algebraic constructs from integrable systems theory.

June 2007 – Sept 2008 **Graduate Research Assistant**
Project: Surface Geometry and Integrable Systems: Theory and Experiment
Institution: Mathematics Institute, Universität Tübingen
Mentor: Franz Pedit
Summary: Studied ways in which the Hitchin system can be used to classify constant mean curvature surfaces in preparation for writing my doctoral thesis.

Teaching experience

Jan 2019 – Jan 2020 **Graduate Teaching Assistant in Biostatistics**
Department of Biostatistics and Epidemiology, UMass, Amherst
Graded and provided tutoring support for an introductory graduate biostatistics course. Redesigned Stata-based course notes to accommodate R users. Moderated large online biostatistics lecture classes for MPH students.

Jan 2016 – Aug 2018 **Lecturer in Calculus, Linear Algebra, Differential Equations**
Department of Mathematics and Statistics, UMass, Amherst
Taught three 60-student sections per semester. Helped to assess and improve teaching skills of new graduate students.

Sept 2001 – May 2007 **Graduate Intructor**
Department of Mathematics and Statistics, UMass, Amherst
Taught regular semester and summer session versions of undergraduate courses: Calculus for Scientists and Engineers, I, II, and III, and Calculus for Life Science and Business Majors. Served as an assistant for undergraduate Differential Equations, and as a grader for graduate Topology.

Publications

2023 **Comparing trained and untrained probabilistic ensemble forecasts of COVID-19 cases and deaths in the United States**
Evan L. Ray, Logan C. Brooks, Jacob Bien, Matthew Biggerstaff, Nikos I. Bosse, Johannes Bracher, Estee Y. Cramer, Sebastian Funk, Aaron Gerding, Michael A. Johansson, Aaron Rumack, Yijin Wang, Martha Zorn, Ryan J. Tibshirani, and Nicholas G. Reich.
International journal of forecasting.

2023 **Evaluating infectious disease forecasts with allocation scoring rules**
Aaron Gerding, Nicholas G Reich, Benjamin Rogers, and Evan L Ray.
arXiv preprint arXiv:2312.16201.

2022 **Evaluation of individual and ensemble probabilistic forecasts of COVID-19 mortality in the United States**
Estee Y Cramer, Evan L Ray, Velma K Lopez, Johannes Bracher, Andrea Brennen, Alvaro J Castro Rivadeneira, Aaron Gerding, Tilmann Gneiting, Katie H House, Yuxin Huang, and others.
Proceedings of the National Academy of Sciences.

2022 **The united states covid-19 forecast hub dataset**
Estee Y Cramer, Yuxin Huang, Yijin Wang, Evan L Ray, Matthew Cornell, Johannes Bracher, Andrea Brennen, Alvaro J Castro Rivadeneira, Aaron Gerding, Katie House, and others.
Scientific data.

2021 **Challenges in training ensembles to forecast COVID-19 cases and deaths in the United States**
Evan L Ray, LC Brooks, J Bien, J Bracher, A Gerding, A Rumack, M Biggerstaff, MA Johansson, RJ Tibshirani, and NG Reich.
International Institute of Forecasters, Forecasting Blog.

2011 **Constant mean curvature surfaces: an integrable systems perspective**
A. Gerding, F. Pedit, and N. Schmitt.
In Harmonic maps and differential geometry. A harmonic map fest in honour of John C. Wood's 60th birthday, Cagliari, Italy, September 7–10, 2009.

2009 **Global aspects of integrable surface geometry**
A Gerding, S Heller, F Pedit, and N Schmitt.
In Systèmes intégrables et théorie des champs quantiques.
Travaux en cours No. 75.

Talks and tutorials

June 2023 **Infectious Disease Forecast Evaluation Based On Realized Social Utility**
43rd International Symposium On Forecasting, Charlottesville, USA

Dec 2006 **Semi-stable Higgs Bundles and Constant Mean Curvature Surfaces**
CIMAT/CIMPA College on Vector Bundles, Guanajuato, Mexico

June 2005 **Global Aspects of Integrable Surface Geometry**
Integrable Systems and Quantum Field Theory (Fifth Meeting), Peyresq, France

Coding skills

Proficient in: R, Python, SAS, LaTeX, Git
Familiar with: SQL, Matlab, Stata, Lua, Javascript, C++