

Luis Damiano

Postdoctoral appointee, Optimization & Uncertainty Quantification, Sandia National Laboratories, NM

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I design advanced Bayesian statistical models to address complex scientific computing and engineering challenges. My work includes probabilistic surrogate design and physics model calibration under uncertainty for large-scale systems like the Energy Exascale Earth System Model. As part of the Fusion Reactor Design and Assessment initiative, I accelerate fusion power plant development by integrating multi-fidelity tools into the Integrated Plasma Simulator. Beyond physics models, I specialize in expressive hidden Markov models for diverse applications, including constrained optimization methods for hierarchical hidden Markov models to infer advanced persistent threat activities from noisy, irregular time series. Prior to

graduate school, I developed Bayesian hierarchical approaches for financial time series analysis, focusing on regime-switching and volatility modeling.

With extensive expertise in R and Python, my research spans atmospheric science, fusion energy, cybersecurity, agriculture, and finance, supported by peer-reviewed publications and other scientific deliverables. I have collaborated with scientists at Sandia, Los Alamos, Lawrence Livermore, and Oak Ridge National Laboratories; the National Center for Atmospheric Research; NOAA; and NASA's Jet Propulsion Laboratory to embed advanced Bayesian methods into large-scale projects, enhancing simulation codes for complex physical systems.

Education

Iowa State University , Department of Statistics, IA Ph.D. in Statistics. Adviser: Dr. Jarad Niemi.	2023
Iowa State University , Department of Statistics, IA M.Sc. in Statistics. Adviser: Dr. Jarad Niemi.	2020
Universidad Nacional de Rosario , Department of Statistics, Argentina M.Sc. in Applied Statistics. Adviser: Maria Teresa Blacona.	2017
Pontificia Universidad Catolica Argentina , Department of Administration, Argentina Bachelor of Business Administration, <i>summa cum laude</i> .	2010

Skills

- Languages: R, Python, C++, Shell scripting.
- Statistical Modeling: Bayesian inference, hidden Markov models, Gaussian processes, time series and spatial data analysis, uncertainty quantification.
- Machine Learning: Model development and deployment, including metamodeling for computer experiments and unsupervised learning for system dynamics.
- Software Tools: Stan (probabilistic programming), Git, GNU Make, LaTeX, Org-mode, Emacs.
- Operating Systems: Proficient with Unix/Linux environments.

Research experience

Sandia National Laboratories, Department of Optimization & UQ 2023-Present
Postdoctoral appointee in the Optimization & Uncertainty Quantification department at the Center for Computing Research. I develop scientific optimization and uncertainty quantification algorithms for cutting-edge applications including: (i) enhancing equatorial zonal wind representation in tropical atmosphere for the Energy Exascale Earth System Model, (ii) optimizing performance and reliability in fusion reactor design through the Integrated Plasma Simulator, and (iii) conducting Bayesian inference on noisy, irregular time series to detect persistent threat activities.

Los Alamos National Laboratory, Computer, Computational, and Statistical Sciences 2022
Graduate Research Assistant for the Interstellar Boundary Explorer LDRD. Developed a prototype for

spatial modeling of energetic neutral atoms at heliosphere boundaries using non-stationary log-Gaussian Cox processes for (i) signal estimation and (ii) source separation between globally distributed flux and the enhanced emission ribbon. Mentors: Drs. Brian Weaver and David Osthus.

Iowa State University, Department of Statistics

2018-2022

Research Assistant for the Consortium for Cultivating Human and Naturally Regenerative Enterprises and Foundation for Food and Agriculture Research. Conducted (i) Bayesian hierarchical spatio-temporal modeling for agricultural trial analysis, (ii) statistical emulation of computer experiments, and (iii) design and implementation of an algorithm to process spatio-temporal data from destructive sampling. Mentor: Dr. Jarad Niemi.

Google Summer of Code, R Project for Statistical Computing

2018

Contributor to “Full Bayesian Inference for Hidden Markov Models.” Mentors: Brian Peterson and Dr. Michael Weylandt. [🌐 details](#) [🐙 BayesHMM](#)

Google Summer of Code, R Project for Statistical Computing

2017

Contributor to “Bayesian Hierarchical Hidden Markov Models applied to financial time series.” Mentors: Brian Peterson and Dr. Michael Weylandt. [🌐 details](#) [🐙 gsoc17-hhmm](#)

Publications

Published

- C. Dutter, L. A. **Damiano**, J. Niemi, B. A. Miller, L. A. Schulte, M. Liebman, M. J. Helmers, R. M. Cruse, and M. D. McDaniel (2023). “Contour prairie strips affect adjacent soil but have only slight effects on crops”. In: *Field Crops Research* 296, p. 108905. ISSN: 0378-4290. DOI: [10.1016/j.fcr.2023.108905](https://doi.org/10.1016/j.fcr.2023.108905)
- M. Nowatzke, L. **Damiano**, F. E. Miguez, G. S. McNunn, J. Niemi, L. A. Schulte, E. A. Heaton, and A. VanLoocke (2022). “Augmenting agroecosystem models with remote sensing data and machine learning increases overall estimates of nitrate-nitrogen leaching”. In: *Environmental Research Letters* 17.11, p. 114010. ISSN: 1748-9326. DOI: [10.1088/1748-9326/ac998b](https://doi.org/10.1088/1748-9326/ac998b)
- E. J. Ward, S. C. Anderson, L. A. **Damiano**, M. E. Hunsicker, and M. A. Litzow (2019). “Modeling regimes with extremes: the bayesdfa package for identifying and forecasting common trends and anomalies in multivariate time-series data”. In: *The R Journal* 11.2, p. 46. ISSN: 2073-4859. DOI: [10.32614/rj-2019-007](https://doi.org/10.32614/rj-2019-007)
- L. **Damiano**, B. Peterson, and M. Weylandt (2018a). “A Tutorial On Hidden Markov Models Using Stan”. In: DOI: [10.5281/ZENODO.1284341](https://doi.org/10.5281/ZENODO.1284341)

Pre-print

- S. Xie et al. (2025). “The Energy Exascale Earth System Model Version 3. Part I: Overview of the Atmospheric Component”. In: Submitted to Journal of Advances in Modeling Earth Systems. DOI: [10.22541/essoar.174456922.21825772/v1](https://doi.org/10.22541/essoar.174456922.21825772/v1)
- L. **Damiano**, W. M. Hannah, C.-C. Chen, J. J. Benedict, K. Sargsyan, B. Debusschere, and M. S. Eldred (2025). *Improving the quasi-biennial oscillation via a surrogate-accelerated multi-objective optimization*. Submitted to Journal of Advances in Modeling Earth Systems. DOI: [10.48550/ARXIV.2503.13498](https://doi.org/10.48550/ARXIV.2503.13498)
- L. **Damiano** and J. Niemi (2022a). *The RITAS algorithm: a constructive yield monitor data processing algorithm*. DOI: [10.48550/ARXIV.2209.11313](https://doi.org/10.48550/ARXIV.2209.11313)
- L. **Damiano**, M. Johnson, J. Teixeira, M. D. Morris, and J. Niemi (2022). *Automatic Dynamic Relevance Determination for Gaussian process regression with high-dimensional functional inputs*. DOI: [10.48550/ARXIV.2209.00044](https://doi.org/10.48550/ARXIV.2209.00044)

Other publications

- L. **Damiano** and J. Niemi (2020b). *Quantification of the impact of prairie strips on grain yield at the Neal Smith National Wildlife Refuge*. Iowa State University, Department of Statistics. [📄 report](#)



Software

- E. J. Ward, S. C. Anderson, L. A. **Damiano**, M. E. Hunsicker, and M. A. Litzow (2025). *bayesdfa: Bayesian Dynamic Factor Analysis (DFA) with Stan*. Version 1.3.4. R package. DOI: [10.32614/CRAN.package.bayesdfa](https://doi.org/10.32614/CRAN.package.bayesdfa)
- L. **Damiano** and J. Niemi (2022b). *yieldMaps: Yield Monitor Data Processing via the RITAS Algorithm*. Version 0.1.0. R package. [📄 ritas-pkg](#)
- L. **Damiano**, B. Peterson, and M. Weylandt (2018b). *BayesHMM: Full Bayesian Inference for Hidden Markov Models*. Version 0.0.1. R package. [📄 BayesHMM](#)

Talks

- L. **Damiano** (2025). *Towards Realistic QBO Representation Through Surrogate-Accelerated Multi-Objective Optimization*. Talk presented at the SIAM Conference on Computational Science and Engineering, Forth Worth, TX
- L. **Damiano** (2024a). *Surrogate-based Calibration for the Quasi-Biennial Oscillation*. Talk presented at the Joint Statistical Meetings, Portland, OR
- L. **Damiano** (2024c). *Surrogate-Accelerated Parameter Optimization for the Quasi-Biennial Oscillation*. Talk presented at the SIAM Conference on Uncertainty Quantification, Trieste, Italy
- L. **Damiano** (2023a). *Automatic Relevance Determination for Gaussian Processes with Functional Inputs*. Candidate seminar presented at Sandia National Laboratories, Albuquerque, NM
- L. **Damiano** (2022d). *Automatic Relevance Determination for Gaussian Processes with Functional Inputs*. Candidate seminar presented at Argonne National Laboratory (MCS Mathematics and Computer Science), Virtual
- L. **Damiano** (2022a). *Automatic Dynamic Relevance Determination for Gaussian process regression with functional inputs*. Talk presented at NASA JPL Uncertainty Quantification for Remote Sensing Inverse Problems, Virtual
- L. **Damiano** (2022b). *Automatic Dynamic Relevance Determination for Gaussian process regression with functional inputs*. Talk presented at Pacific Northwest National Laboratory – ISU Workshop, Virtual
- L. **Damiano** (2022e). *Non-stationary log-Gaussian Cox process for source separation in the context of the Interstellar Boundary Explorer mission*. Summer internship talk presented at Los Alamos National Laboratory, Virtual
- L. **Damiano** (2022c). *Automatic Dynamic Relevance Determination for Gaussian process regressions with functional inputs*. Talk presented at the SIAM Conference on Uncertainty Quantification, Virtual. [📄 slides](#)
- L. **Damiano** (2021a). *Automatic Dynamic Relevance Determination of atmospheric states over vertical pressure grids for the MLS forward model emulation*. Talk presented at NASA JPL Uncertainty Quantification for Remote Sensing Inverse Problems, Virtual
- L. **Damiano** and J. Niemi (2020a). *Emulation of Agricultural Production Systems sIMulator (APSIM)*. Joint invited seminar at Los Alamos National Laboratory, Virtual. [📄 slides](#)
- L. **Damiano** (2020). *An autonomous algorithm for smooth yield maps*. Talk presented at the Science-based Trails of Rowcrops Integrated with Prairie Strips Research Symposium, Ames, IA. [📄 slides](#)
- L. **Damiano** (2019a). *Augmenting Trading Systems with Hidden Markov Models using BayesHMM*. Talk presented at R/Finance 2019, Chicago, IL
- L. **Damiano** (2018). *Hierarchical Hidden Markov Models in High-Frequency Stock Markets*. Talk presented at R/Finance 2018, Chicago, IL. [📄 slides](#)
- L. **Damiano** (2017b). *Daily Stock Price Forecasts in Argentina Using Hidden Markov Models*. Talk presented at the Inter-American Statistical Conference 2017, Rosario, Argentina. [📄 slides](#)
- L. **Damiano** (2017a). *A Quick Introduction to Hidden Markov Models Applied to Stock Volatility*. Talk presented at R/Finance 2017, Chicago, IL. [📄 slides](#); [📖 notebook](#)

Posters

- L. Damiano (2024b). *Surrogate-accelerated multi-objective optimization for improving the QBO*. Poster presented at the SciDAC-5 Principal Investigator Meeting, Rockville, MD
- L. Damiano (2023b). *Automatic Relevance Determination for Gaussian Processes with Functional Inputs*. Poster presented at the Conference on Data Analysis, Santa Fe, NM
- L. Damiano (2021b). *Automatic Dynamic Relevance Determination of soil properties over different soil layers for yield prediction using APSIM*. Poster presented at the Conference on Applied Statistics in Agriculture and Natural Resources, Virtual.  [poster](#)
- L. Damiano (2019b). *BayesHMM: Full Bayesian Inference for Hidden Markov Models*. Poster presented at the University of Arkansas 44th Annual Spring Lecture Series, Fayetteville, AR.  [poster](#)


Honors and Awards

- **Employee Recognition Award**, Sandia National Laboratories, 2025
Recognized for significant contributions to enhancing the mentorship experience in the CSRI Internship program, which hosts over 100 interns annually, as part of a team effort.
- **Outstanding Mentorship Award**, Sandia National Laboratories, 2024
Recognized for providing outstanding mentorship and guidance to Sandia colleagues, modeling Sandia's priorities while offering experiences and opportunities that prepare them for the next stage of their career.
- **Research Excellence Award**, Iowa State University, 2023
Given to the top 10% of students writing theses or dissertations at Iowa State University.
- **Teaching Excellence Award**, Iowa State University, 2023
Given to the top 10% of teaching assistants at Iowa State University.
- **Vince Sposito Statistical Computing Award**, Department of Statistics, Iowa State University 2022
For outstanding potential in statistical computing, awarded annually to one graduate student demonstrating excellence in statistical computing during their assistantship.
- **Jebe Fellowship**, Department of Statistics, Iowa State University, 2018-2019
Awarded on admission to one graduate assistant per year.
- **Student Travel Funding**, University of Arkansas 44th Annual Spring Lecture Series, 2019
- **Student Travel Award**, R/Finance Conference, 2019
- **Student Travel Award**, R/Finance Conference, 2018
- **Student Travel Award**, R/Finance Conference, 2017

Mentoring

- Riti Bahl (2024–Present). “*Dimensionality Reduction for Quasi-Biennial Oscillation Data*”. Year-round intern at Sandia National Laboratories. Ph.D. student in Computational Mathematics at Emory University.
- Kwesi Ohene-Obeng (2024–Present). “*Scientific Machine Learning for Enhancing Model Predictability via Model Form Error Quantification*”. Year-round intern at Sandia National Laboratories. Ph.D. student in Data Science at the University of Texas at El Paso.
- **Benedict Neo** (2022). “*Development of WEPPR: An R Interface to the Water Erosion Prediction Project Computer Model*”. Senior undergraduate student in Statistics and Computer Science at Iowa State University.
- Aridania Gerardo (2021). “*Bayesian Hierarchical Model for Drop Probabilities*”. Senior undergraduate student in Anthropology and Statistics at Iowa State University.

Service

- Reviewer for *Annals of Applied Statistics*, *METRON*, *PeerJ Computer Science*, and *Scientific Reports*.
- Active contributor to the open-source community and similar collaborative efforts.
- Maintainer of  [STRIPSyield](#), the yield monitor data repository for the [STRIPS experiment](#) (2018–2023).
- Performed statistical analysis of benchmark data for the [LumoSQL](#) open-source project (Fall 2022).
- Founder and leader of the Gaussian Process Reading Group at Iowa State University (Spring 2019).

Teaching experience

Co-Instructor

Universidad Nacional de Rosario, Department of Statistics, Argentina 2018
 Time Series Analysis (graduate level): Stationary ARMA processes; models of non-stationary time series; seasonality; maximum likelihood estimation; diagnostics and model selection; forecasting; intervention analysis and outlier detection; introduction to state-space models.


Teaching Assistant

Iowa State University, Department of Statistics 2022
 STAT 266: Introduction to Business Statistics I (undergraduate level). Role: Instructor.

Iowa State University, Department of Statistics 2018-2019
 STAT 544: Bayesian Statistics (graduate level). Role: office hours, grading. STAT 101: Principles of Statistics (undergraduate level). Role: Instructor of laboratory sessions.

Pontificia Universidad Católica Argentina, Department of Administration 2010
 Finance II (undergraduate level): Valuation and capital budgeting; return and risk; capital structure and dividend policy.

Short Courses

- “*Data Validation*” and “*Data Wrangling*”, Data Management Workshop (2022), Iowa State University. 15-minute presentations. Role: Instructor.
- “*Bayesian Inference and Volatility Modeling Using Stan*”, R/Finance Conference (2019), Chicago, IL. 1-hour tutorial. Role: Co-instructor.
- “*R and Data Visualization*”, Midwest Big Data Summer School (2019), Iowa State University. 1-day session. Role: Assistant.
- “*Bayesian Inference and Volatility Modeling Using Stan*”, R/Finance Conference (2018), Chicago, IL. 1-hour tutorial. Role: Co-instructor.  [slides](#)

Professional experience

FIRST Capital Group, Head of Asset Management, Buenos Aires, Argentina 2015-2018
 Developed quantitative strategies involving GARCH models for foreign exchange volatility, principal component analysis of the yield curve, cross-sectional and time-series analysis of currency futures, Monte Carlo simulation for modeling delta-neutral commodity trading strategies, and hierarchical linear models for cohort analysis of credit portfolios.

FIRST Capital Group, Lead Structurer for ABS, Rosario, Argentina 2010-2015
 Deloitte & Touche Corporate Finance Advisors (prior to the 2013 spin-off). Primary responsibilities included structuring asset-backed securities (ABS) and producing all technical documentation for the initial public offering. Quantitative work involved statistical analysis of historical asset performance, managing databases with over 100 million records, and forecasting cash flows.