LUIS ALBERTO BARBOZA CHINCHILLA

Escuela de Matemática
Centro de Investigación en Matemática Pura y Aplicada
Universidad de Costa Rica
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RESEARCH

- Environmental Statistics.

- Bayesian estimation of spatio-temporal models.

- Space-State models and applications to Paleoclimate Reconstructions.

- Bayesian estimation of Dynamical Systems. Applications to epidemiological models.

- Applications of Statistical Learning techniques to epidemiological and climate modeling.

- Parameter Estimation of Long-Memory Processes.

- Functional data analysis.

EDUCATION

- **Purdue University** (West Lafayette, Indiana, USA)
  PhD Statistics, December 2012.
  Dissertation: New Methods of Estimation of Long-Memory Models with an Application in Climatology.
  Advisors: Frederi G. Viens, Bo Li.

- **Purdue University** (West Lafayette, Indiana, USA)
  MS Statistics with Specialization in Computational Finance, August 2011.

- **Universidad de Costa Rica** (San José, Costa Rica)
  MSc Applied Mathematics, July 2007.
  Dissertation: Interest Rate Swaps. Losses Estimation Model.
  Advisor: Jose A. Ramírez.

- **Universidad de Costa Rica** (San José, Costa Rica)
  Bachelor degree, Actuarial Science, December 2003.

ACADEMIC HONORS

- **UCREA Grant** for the research project: "Potencial aumento del riesgo en Costa Rica y Nicaragua por causa de ciclones tropicales en el Caribe", Collaborator. 2023-2025.

- **UCREA Grant** for the research project: "LaBsiq: Medidas de educación comunitarias para la prevención de arbovirosis en un cantón modelo (Siquirres)", Collaborator. 2022-2024.

- University of California at Davis - **Seed Grant Biostatistics, Public Health Sciences**. For the research project: Mathematical Models for Dengue Surveillance: Challenges and Opportunities. 2022.

- **UCREA Grant** for the research project: "Mathematical Models for the Development of Prevention/Control Strategies of Aedes aegypti in Costa Rica", Collaborator. 2018-2020.

- **Bilsland Dissertation Fellowship**
  Graduate School. Purdue University. May-December 2012.

- **Summer Research Grant**
  Graduate School. Purdue University. June-August 2009.

- **PhD Scholarship**
  Oficina de Asuntos Internacionales. Universidad de Costa Rica. August 2007-May 2012.

- **Academic Excellence Diploma**
  Universidad de Costa Rica. "Highest GPA: Actuarial Science Major". 2003.

- **Academic Excellence Diploma**
  Universidad de Costa Rica. "Highest GPA: Sciences Area". 1999.

RESEARCH PAPERS

1. Gómez, M. J., Barboza, L. A., Hidalgo, H. G., & Alfaro, E. J. (2024). Comparison of indicators to evaluate the performance of climate models. *International Journal of Climatology*, 44(13), 4907–4924. https://doi.org/10.1002/joc.8619.

2. Chou-Chen, S. W., Barboza, L. A. (2024) Forecasting hospital discharges for respiratory conditions in Costa Rica using climate and pollution data. *Mathematical Biosciences and Engineering*, 21(7): 6539-6558. https://doi.org/10.3934/mbe.2024285.

3. Orozco-Aguilar, L., López-Sampson, A., Barboza, L. A., Borda, M. J., Leandro-Muñoz, M. E., Bordeaux, M., Cerda, R. H., Villega, E. A., & Somarriba, E. (2024). Risk analysis and cacao pod survivorship curves to improve yield forecasting methods. *Frontiers in Agronomy*, 6. https://doi.org/10.3389/fagro.2024.1290035

4. Monge-Rojas, R., Barboza, L. A., & Vargas-Quesada, R. (2023). Reducing dietary intake of added sugars could affect the nutritional adequacy of vitamin A in adolescents: the Costa Rica case. *BMC Public Health*, 23, 2503. https://doi.org/10.1186/s12889-023-17243-w

5. Chou-Chen, S. W., Barboza, L. A., Vásquez, P., García, Y. E., Calvo, J. G., Hidalgo, H. G., & Sanchez, F. (2023). Bayesian spatio-temporal model with INLA for dengue fever risk prediction in Costa Rica. *Environmental and Ecological Statistics*. https://doi.org/10.1007/s10651-023-00580-9

6. García, Y. E., Chou-Chen, S. W., Barboza, L. A., Daza-Torres, M. L., Montesinos-López, J. C., Vásquez, P., Calvo, J. G., Nuño, M., & Sanchez, F. (2023). Common patterns between dengue cases, climate, and local environmental variables in Costa Rica: A wavelet approach. *PLOS Global Public Health*, 3(10), e0002417. https://doi.org/10.1371/journal.pgph.0002417

7. Barboza, L. A., Chou Chen, S. W., Alfaro Córdoba, M., Alfaro, E. J., & Hidalgo, H. G. (2023). Spatio-temporal downscaling emulator for regional climate models. *Environmetrics*, 34(7). https://doi.org/10.1002/env.2815

8. Gómez, M. J., Barboza, L. A., Vásquez, P., and Moraga, P. (2023). Bayesian spatial modeling of childhood overweight and obesity prevalence in Costa Rica. *BMC Public Health*, 23(1), 651. https://doi.org/10.1186/s12889-023-15486-1.

9. Barboza, L. A., Chou-Chen, S.-W., Vásquez, P., García, Y. E., Calvo, J. G., Hidalgo, H. G., and Sanchez, F. (2023). Assessing dengue fever risk in Costa Rica by using climate variables and machine learning techniques. *PLoS Neglected Tropical Diseases*, 17(1), e0011047. https://doi.org/10.1371/journal.pntd.0011047.

10. Calvo, J. G., Sanchez, F., Barboza, L. A., García, Y. E., and Vásquez, P. (2022). An implementation of a multilayer network model for the Covid-19 pandemic: A Costa Rica study. *Mathematical Biosciences and Engineering: MBE*, 20(1), 534–551. https://doi.org/10.3934/mbe.2023024.

11. Vásquez, P., Sanchez, F., Barboza, L., García, Y. E., Calvo, J. G., Chou-Chen, S.-W., and Mery, G. (2022). Mathematical and statistical models for the control of mosquito-borne diseases: the experience of Costa Rica. *Revista Panamericana de Salud Publica [Pan American Journal of Public Health]*, 46, 1. https://doi.org/10.26633/rpsp.2022.113

12. Sanchez, F., Calvo, J. G., Mery, G., García, Y. E., Vásquez, P., Barboza, L., Pérez, M. D., and Rivas, T. (2022). A multilayer network model of Covid-19: Implications in public health policy in Costa Rica. *Epidemics*, 39(100577), 100577. https://doi.org/10.1016/j.epidem.2022.100577

13. García, Y., Mery, G., Vásquez, P., Calvo, J.G., Barboza. L., Rivas, T., Sanchez, F. Projecting the Impact of Covid-19 Variants and Vaccination Strategies in Disease Transmission using a Multilayer Network Model in Costa Rica. (2022). *Nature-Scientific Reports* 12:2279.

14. Montesinos-López JC, Daza-Torres ML, García YE, Barboza.L., Sanchez F, Schmidt AJ, Pollock BH, Nuño M. The Role of SARS-CoV-2 Testing on Hospitalizations in California. *Life*. 2021; 11(12):1336. https://doi.org/10.3390/life11121336

15. Barboza, L., Vásquez, P., Mery, G., Sánchez, F., García, Y., Calvo, J.G., Rivas, T., Salas, D. The Role of Mobility and Sanitary Measures on the Delay of Community

Transmission of COVID-19 in Costa Rica (2021). *Epidemiologia* 2021, 2(3), 294-304; https://doi.org/10.3390/epidemiologia2030022.

16. Lucke, O., Vega, A., Varela, M. Barboza, L., Garbanzo, J. The improvements of the Costa Rican ground-based gravity dataset as a result of a comprehensive attribute and spatial assessment of the historical databases (2021). *Applied Geomatics* 12(4). https://doi.org/10.1007/s12518-021-00356-5

17. Vazquez, P., Loría, A., Sánchez, F., Barboza. L. Climate-driven statistical models as effective predictors of local dengue incidence in Costa Rica: A Generalized Additive Model and Random Forest approach (2020). *Revista de Matemática: Teoría y Aplicaciones*, 27(1): 1-21.

18. Barboza, L., Emile-Geay, J., Li, B. and He, W. Efficient Reconstructions of Common Era Climate via Integrated Nested Laplace Approximations (2019). *Journal of Agricultural, Biological and Environmental Statistics (JABES)*, 24(3) 535-554.

19. Neukom, R., Barboza, L., Erb, M., Shi, F., Emile-Geay, J., Evans, M., Franke, J., Kaufman, D., Lücke, L., Rehfeld, K., Schurer, A., Zhu, F., Brönnimann, S., Hakim, G., Henley, B., Charpentier, F., McKay, N., Valler, V., von Gunten, L. Consistent multi-decadal variability in global temperature reconstructions and simulations over the Common Era (2019). *Nature Geoscience* 12, 643-649.

20. Sánchez, F., Barboza, L., Vázquez, P. Parameter estimates of the 2016-2017 Zika outbreak in Costa Rica: An Approximate Bayesian Computation (ABC) Approach (2019). *Mathematical Biosciences and Engineering* 16(4): 2738-2755.

21. Arroyo, J., Sánchez, F. and Barboza, L. Infection model for analyzing biological control of coffee rust using bacterial anti-fungal compounds. (2019) *Mathematical Biosciences*. 307, 13-24.

22. Sanchez, F., Barboza, L., Burton, D., Cintrón-Arias, A. Comparative Analysis of Dengue versus Chikungunya Outbreaks in Costa Rica. (2018) *Ricerche di Matematica*. Springer. 67: 163. https://doi.org/10.1007/s11587-018-0362-3.

23. Sibaja, R., Barboza, L., Rojas, C. Can mycetozoans be used as health indicators of soil in the agricultural context of Costa Rica? (2018) *Revista de Ciencias Ambientales (Tropical Journal of Environmental Sciences)* 52(1): 161-174.

24. Barboza, L. and Viens, F. Parameter Estimation of Gaussian Stationary Processes using the Generalized Method of Moments. Volume 11, Number 1, 401-439. *Electronic Journal of Statistics*. (2017).

25. Li, B., Barboza, L., Tingley, M. and Viens, F., Discussion on Temperature Reconstruction with Sediment Core Data in Ilvonen et al. (2016), *Environmetrics*. 27, 428-430.

26. Barboza, L., Li, B., Tingley, M. and Viens, F. Reconstructing Past Climate from Natural Proxies and Estimated Climate Forcings using Long Memory Models. *Annals of Applied Statistics*. Volume 8, Number 4, 1966-2001. (2014).

TECHNICAL REPORTS

1. Arias, R. Barboza, L. Ramírez, José A. Estudio Actuarial del Seguro de Invalidez, Vejez y Muerte administrado por la Caja Costarricense de Seguro Social. 2016.

2. Barboza, L. Solís, M. Víquez, Juan J. Informe Técnico. Convenio CCSS-SUPEN-UCR. 2015.

3. Barboza, L., Hernández, G. Evaluación Actuarial del Fondo de Socorro Mutuo de COOPEJUDICIAL R.L. 2014.

TEACHING EXPERIENCE

- *Mathematics Department, Universidad de Costa Rica*
  Profesor Catedrático (January 2013-)

  - Statistics courses for Actuarial Sciences: Actuarial Statistics I and II, Linear Models, Survival Analysis and Time Series.
  - Calculus and linear algebra courses for Engineering and Economics.
  - Creation of optative course in Time Series and Space-State processes.
  - Courses of the Master's program in Applied Mathematics.

- *Statistics Department, Universidad de Costa Rica*
  (January 2014-)

  - Graduate-level courses: Generalized Linear Models, Mixed and Multilevel Models.
  - Bachelor degree courses: Bayesian Statistics.

- *Statistics Department, Purdue University*
  Teaching Assistant (TA) (August 2007-May 2012)

  - Undergraduate courses (recitations and lectures) of Probability and Statistics: STAT 113, STAT 225, STAT 301.
  - Graduate course (lectures) of Financial Algorithms and Applications: STAT 598W.
  - Help Sessions related to statistical software (SAS, SPSS)
  - Grader in different courses for the Master and PhD programs in Statistics (Statistical Methods, Statistical Theory and Probability, Financial Mathematics)

- *Mathematics Department, Universidad de Costa Rica*
  Profesor Instructor (August 2003-June 2007)

  - Actuarial Science Courses and Calculus courses for students in Engineering and Economics majors.
  - MATLAB and VBA Labs with Actuarial Applications.

- Teaching Assistant in Probability, Stochastic Processes and Real Analysis courses.

ADMINISTRATIVE EXPERIENCE

- *Centro de Investigación en Matemática Pura y Aplicada, UCR*

  Director (2021-2024).

CONFERENCES

- International Conference on Malliavin Calculus and Stochastic Analysis. University of Kansas (March 2011) **Poster Session**.

- Coloquios de Matemática. Escuela de Matemática. Universidad de Costa Rica (June 2011) **Invited Talk**.

- TIES Third North American Regional Meeting. La Crosse, Wisconsin, USA. (July 2011) **Invited Talk**.

- XII Latin American Congress of Probability and Mathematical Statistics. Viña del Mar, Chile. (March 2012) **Contributed Talk**.

- AMS 2012 Spring Central Section Meeting. University of Kansas. Lawrence, KS, USA. (April 2012) **Invited Talk**.

- 8th International Purdue Symposium on Statistics. Purdue University. West Lafayette, IN, USA. (June 2012) **Invited Talk**.

- Probability Seminar. Purdue University. West Lafayette, IN, USA. (October 2012) **Contributed talk**.

- Graduate Student Organization (GSO-Statistics). Purdue University. West Lafayette, IN, USA. (November 2012) **Contributed talk**.

- XXXVIII Mini-Congreso. Centro de Investigaciones Geofísicas (CIGEFI). Universidad de Costa Rica. San José, Costa Rica. (April 2013) **Contributed talk**.

- Primer Simposio Centroamericano de Estadística Bayesiana. Escuela de Estadística, Universidad de Costa Rica. San José, Costa Rica (July 2013) **Contributed talk**.

- I Congreso Regional de Estadística y Matemática. Universidad de El Salvador. San Salvador, El Salvador. (July 2014) **Invited talk**.

- XIII Latin American Congress of Probability and Mathematical Statistics. Cartagena de Indias, Colombia. (September 2014) **Contributed Talk**.

- Pre-World Congress Meeting of New Researchers in Statistics and Probability. Fields Institute. Toronto, Ontario, Canada. (July 2016) **Poster Session**.

- World Congress in Probability and Statistics. Fields Institute. Toronto, Ontario, Canada. (July 2016) **Contributed Talk**.

- XIV Latin American Congress of Probability and Mathematical Statistics. San José, Costa Rica. (December 2016) **Contributed Talk**.

- 28th Annual Conference of the International Environmetrics Society (TIES 2018). CIMAT. Guanajuato, México. (July 2018). **Invited Talk**.

- Mini-Congreso. Centro de Investigaciones Geofísicas (CIGEFI). Universidad de Costa Rica. San José, Costa Rica. (April 2019) **Contributed Talk**.

- Division of Applied Mathematics. Brown University, Providence, RI, USA. (October 2019) **Invited Talk**.

- II Semana de Riesgos. Instituto Nacional de Seguros. San José, Costa Rica (October 2020) **Invited Talk**.

- Workshop: Climate Change, Human Behavior, and Vector-Borne Diseases. University of California, Davis (UCDavis). (May 2022). **Invited Talk.**

- Mini-Congreso. Centro de Investigaciones Geofísicas (CIGEFI). Universidad de Costa Rica. San José, Costa Rica. (May 2022) **Contributed Talk.**

- Seminario Divisional de Ciencia de Datos. Universidad Autónoma Metropolitana, Iztapalapa, Ciudad de México, México. (July 2022) **Invited talk** (on-line)

MAJOR ADVISOR OF:

- Fabio Santamaría. Tesis: Aplicación de Series de Tiempo en la Evaluación de Regímenes de Pensiones. *Licenciatura en Ciencias Actuariales.* 2016.

- Greivin Hernández González. Tesis: Modelo Espacial Bayesiano para la Incidencia de Dengue en la Isla Principal de Puerto Rico para el Año 2014. *Maestría Académica en Matemática Aplicada.* 2017.

- Andrés Quirós Granados. Tesis: Estimación de Parámetros en un Modelo de Volatilidad Estocástica con Memoria Larga usando Filtro de Partículas. *Maestría Académica en Matemática Aplicada.* 2021.

- Siviany Araya Vargas. Tesis: Aplicación de la Teoría Bayesiana en la Tarifación de un Seguro de Aviación. *Licenciatura en Ciencias Actuariales.* 2021.

- Luis Diego Fernández. Tesis: Efecto de la Dependencia entre Retornos Financieros en la Optimización de Portafolios de Inversión: un Abordaje mediante el Uso de Cópulas. *Maestría Académica en Estadística*. 2021.

- Yenny Rodriguez Campos and Ricardo Venegas Oses. Tesis: Tabla de Mortalidad para Riesgos de Trabajo aplicando Modelos de Supervivencia. *Licenciatura en Ciencias Actuariales*. 2022.

- José Ignacio Suárez Abarca. Tabla de Invalidez para la Línea Colectivo de Vida del Instituto Nacional de Seguros. *Licenciatura en Ciencias Actuariales*. 2023.

- Mario J. Gómez Camacho. Comparación de Métodos de Evaluación de Modelos Climáticos Globales para América Central. *Maestría Académica en Estadística*. 2023.

- Carlos A. Pasquier Jaramillo. Modelado Bayesiano de Extremos Espacio-Temporales de Precipitación: Aplicaciones en Estimación de Modelos con Covariables. *Maestría Académica en Matemática Aplicada*. 2025.

REVIEWER OF:

- **Academic Journals**: Journal of the Royal Statistical Society, Journal of Time Series Analysis, Environmetrics, Plos One, SIAM Journal of Control and Optimization, Stochastics and Dynamics, Electronic Journal of Statistics, Revista de Matemática: Teoría y Aplicaciones.

- **Risk Models and coding**: Banco Nacional de Costa Rica.

INDUSTRIAL EXPERIENCE

- *Dirección Corporativa de Riesgo, Banco Nacional de Costa Rica*
  Quantitative Analyst and Actuary (2005-2007)

    - Quantitative modeling (Finance) and implementation.

    - Actuarial studies.

- *Direccion Actuarial, Caja Costarricense de Seguro Social*
  Actuary (2002-2005)

    - Actuarial studies of retirement and healthcare funds.

TECHNICAL SKILLS

- Mathematical and statistical software: R, MATLAB, Python.

- General Programming languages: C++, Visual Basic.

PROFESSIONAL AND ACADEMIC MEMBERSHIP

- The International Environmetrics Society (TIES)

- Institute of Mathematical Statistics (IMS)

- International Statistical Institute (ISI)

- Colegio de Profesionales en Ciencias Económicas de Costa Rica.