Carlos Erwin Rodríguez Hernández-Vela

In publications: Carlos E. Rodríguez

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1 General Information

Affiliation: Applied Mathematics and Systems Research Institute, UNAM (IIMAS-UNAM)
Office: Department of Probability and Statistics (DPyE), 103
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Bibliometrics: Google Scholar | ResearchGate | ORCID

Profile: I am a researcher specializing in statistics, with a primary focus on applied Bayesian statistics. My contributions include significant work in areas such as mixture models, MCMC methods, and predictive inference. I have also worked on inference methods for finite populations and the statistical analysis of complex phenomena, such as the relationship between symptoms, comorbidities, deaths, and hospitalizations in COVID-19 patients.

Since 2015, I have been invited to join the Technical Advisory Committees for Quick Counts, organized by the National Electoral Institute (INE) for various electoral processes.

I regularly teach the Statistical Inference course in the Master's program in Mathematical Sciences at UNAM, as well as foundational courses in statistics and probability for the Bachelor's program in Data Science at IIMAS-UNAM.

2 Academic Positions and Appointments

2.1 Current

Associate Researcher C August 2018 – Present
Department of Probability and Statistics, IIMAS-UNAM
National Researcher, Level I 2022 – Present
SNII-Secihti

2.2 Previous

Visiting Professor September 2016 – August 2018
Department of Mathematics, UAM-I, Mexico
Associate Researcher January – March 2013
Department of Genetics, Evolution, and Environment
University College London, United Kingdom

Academic Technician 2006 – 2008
Department of Probability and Statistics
IIMAS-UNAM, Mexico

3 Non-Academic Work Experience

External Consultant 2016–2020
Foro Consultivo Científico y Tecnológico
Data Scientist 2014–2016
Foro Consultivo Científico y Tecnológico
Data Processing and Analysis Manager 2013–2014
Berumen y Asociados

4 Academic Background

Ph.D. in Statistics (Doctor of Philosophy in Statistics) 2009–2013
University of Kent, United Kingdom
Thesis: Contributions to the Bayesian Analysis of Mixture Models
Supervisor: Stephen G. Walker
Master's in Mathematical Sciences 2004–2006
IIMAS-UNAM, Mexico
Degree obtained via comprehensive exams
Exams in analysis, statistics and probability
Bachelor's in Actuarial Science 1999–2005
Faculty of Sciences, UNAM, Mexico
Thesis: An Overview of Drinking Water Consumption in Mexico City
Supervisor: Pablo Barrera Sánchez

5 Academic Production

5.1 Articles Published in Indexed Journals

[1] Z. Yang and C. E. Rodríguez (2013). "Searching for efficient Markov chain Monte Carlo proposal kernels". In: *Proceedings of the National Academy of Sciences* 110.48 (2013), pp. 19307–19312. URL: https://doi.org/10.1073/pnas.1311790110.

[2] C. E. Rodríguez and S. G. Walker (2014). "Univariate Bayesian nonparametric mixture modeling with unimodal kernels". In: *Statistics and Computing* 24.1 (2014), pp. 35–49. ISSN: 0960-3174. URL: https://doi.org/10.1007/s11222-012-9351-7.

[3] C. E. Rodríguez and S. G. Walker (2014). "Label Switching in Bayesian Mixture Models: Deterministic Relabeling Strategies". In: *Journal of Computational and Graphical Statistics* 23.1 (2014), pp. 25–45. URL: https://doi.org/10.1080/10618600.2012.735624.

[4] C. E. Rodríguez, G. Núñez-Antonio, and G. Escarela (2020). "A Bayesian mixture model for clustering circular data". In: *Computational Statistics & Data Analysis* 143 (2020), p. 106842. ISSN: 0167-9473. URL: https://doi.org/10.1016/j.csda.2019.106842.

[5] G. Escarela, C. E. Rodríguez, and G. Núñez-Antonio (2020). "Copula Modeling of ROC and Predictiveness Curves". In: *Statistics in Medicine* 39.28 (2020), pp. 4252–4266. ISSN: 0277-6715. URL: https://doi.org/10.1002/sim.8723.

[6] C. E. Rodríguez and S. G. Walker (2021). "Copula Particle Filters". In: *Computational Statistics & Data Analysis* 161 (2021), p. 107230. ISSN: 0167-9473. URL: https://doi.org/10.1016/j.csda.2021.107230.

[7] C. E. Rodríguez, L. E. Nieto-Barajas, and C. S. Pérez-Pérez (2024). "Dealing with missing data under stratified sampling designs where strata are study domains". In: *Journal of Applied Statistics* 51.1 (2024), pp. 153–167. URL: https://doi.org/10.1080/02664763.2022.2112937.

[8] C. E. Rodríguez and R. H. Mena (2022). "COVID-19 Clinical Footprint to Infer About Mortality". In: *Journal of the Royal Statistical Society Series A: Statistics in Society* 185.Supplement_2 (2022), S547–S572. ISSN: 0964-1998. URL: https://doi.org/10.1111/rssa.12947.

[9] C. E. Rodríguez, R. H. Mena, and S. G. Walker (2024). "Martingale Posterior Inference for Finite Mixture Models and Clustering". In: *Journal of Computational and Graphical Statistics* 0.ja (2024), pp. 1–19. URL: https://doi.org/10.1080/10618600.2024.2441997.

[10] C. E. Rodríguez, S. G. Walker, and R. H. Mena (2025). "Finite population parametric Bayesian bootstrap with a view towards Quick Counts". Under review. 2025.

5.2 Peer-Reviewed Book Chapters

[11] C. E. Rodríguez and R. H. Mena (2023). "Chapter 15: Statistical modeling to understand the COVID-19 pandemic". In: *Mathematical Modelling, Simulations, and AI for Emergent Pandemic Diseases: Lessons Learned from COVID-19*. Ed. by E. Hernández-Vargas and J. X. Velasco-Hernández. Elsevier, 2023, pp. 287–299. ISBN: 978-0-323-95064-0. URL: https://www.elsevier.com/books/mathematical-modelling-simulations-and-ai-for-emergent-pandemic-diseases/hernandez-vargas/978-0-323-95064-0.

[12] M. Santana-Cibrian et al. (2024). "A retrospective analysis of COVID-19 dynamics in Mexico and Peru: Studying hypothetical changes in the contact rate". In: *Mathematical and Computational Modeling of Phenomena Arising in Population Biology and Nonlinear Oscillation*. Ed. by A. Gumel. AMS, 2024. ISBN: 978-1-4704-7104-0. URL: https://bookstore.ams.org/view?ProductCode=CONM/793.

5.3 Peer-Reviewed Conference Proceedings

[13] C. E. Rodríguez (2022). "Estimating the Composition of the Chamber of Deputies in the Quick Count for the 2021 Federal Election in Mexico". In: *Interdisciplinary Statistics in Mexico*. Vol. 397. Springer, 2022, pp. 193–210. ISBN: 978-3-031-12777-9. URL: https://doi.org/10.1007/978-3-031-12778-6.

[14] V. I. S. Flores and C. E. Rodríguez (2023). "Influencia de los factores socioeconómicos en la mortalidad por COVID-19". In: *Boletín de la Sociedad Mexicana de Computación Científica y sus Aplicaciones* 9 (2023). Como parte del premio Mixbaal 2023 a la mejor tesis de licenciatura en Matemáticas Aplicadas, pp. 92–106. ISSN: 2594-0457. URL: https://www.scipedia.com/public/Soule_Hernandez-Vela_2023a.

[15] C. E. Rodríguez (2025). "Toward Inference for Finite Populations". In: *Statistics, Society and Environment*. Ed. by J. A. Christen et al. Springer, 2025, pp. 1–18. ISBN: 978-3-031-78400-2. URL: https://doi.org/10.1007/978-3-031-78401-9.

5.4 Books Co-Authored

[16] J. Franco et al. (2015). *Ciencia y tecnología: una mirada ciudadana*. México: UNAM, 2015. ISBN: 978-607-02-6987-5. URL: http://www.losmexicanos.unam.mx/cienciaytecnologia/index.html.

[17] G. Bensusán et al. (2018). *La evaluación de los académicos: Instituciones y Sistema Nacional de Investigadores, aciertos y controversias*. México: FLACSO-UAM, 2018. ISBN: 978-607-8517-21-3 (Flacso México) y 978-607-28-1263-5 (UAM). URL: https://doi.org/10.2307/j.ctt21kk1b9.

6 Teaching

6.1 Thesis and Dissertation Supervision

6.1.1 Undergraduate

1. Vanessa I. Soulé Flores, B.Sc. in Mathematics, UNAM, 2022 (thesis, *winner of the Mixbaal 2023 award for best thesis in applied mathematics*).
2. Jesús H. Candelas Mejía, B.Sc. in Mathematics (*thesis in progress, PAPIIT scholarship*).

6.1.2 Master's

1. Jerónimo Hernández Mendoza, M.Sc., UAM-I, 2019 (thesis).
2. José Fuentes, M.Sc., UNAM, 2022 (*dissertation*).
3. Edgar G. Alarcón González, M.Sc., UNAM, 2022 (thesis, *with honors*).
4. José A. Florencio Chávez, M.Sc., UNAM, 2024 (thesis, *PAPIIT scholarship, with honors*).

6.2 Courses Taught

6.2.1 Undergraduate

1. Mathematics, UAM-I
   (a) Statistics I, 2016-F
   (b) Regression, 2017-S
2. Administration and Economics, UAM-I
   (a) Statistics I, 2016-F
   (b) Mathematics I, 2017-F
   (c) Statistics III, 2017-F
3. Social Psychology, UAM-I
   (a) Statistics III, 2018-S
4. Experimental Biology, UAM-I
   (a) Biostatistics I, 2018-S
5. Actuarial Science, Faculty of Sciences, UNAM
   (a) Statistical Inference, 2017-1
   (b) Nonparametric Models and Regression, 2019-1
6. Data Science, IIMAS-UNAM
   (a) Statistical Methods, 2020-2, 2021-2, 2022-2, 2023-2, 2024-2, 2025-2
   (b) Applied Probability, 2024-1

6.2.2 Graduate

1. Specialization in Applied Statistics, IIMAS-UNAM.
   (a) Nonparametric Statistics, 2007-2
   (b) Regression, 2008-2
   (c) Statistical Inference, 2008-1 and 2009-1
2. Master's in Applied and Industrial Mathematics, UAM-I.
   (a) Stochastic Simulation, 2017-S and 2018-F
3. Master's in Mathematical Sciences, UNAM (coordinated by IMATE-FC-IIMAS).
   (a) Nonparametric Bayesian Statistics, 2019-2 (co-taught with R. H. Mena)
   (b) Statistical Inference, 2020-1, 2021-1, 2022-1, 2023-1, and 2025-1

7 Projects

7.1 Research

1. Mathematical Modeling of COVID-19, 2020 – Present
Participant, led by Dr. Jorge X. Velasco Hernández
UNAM-DGAPA-PAPIIT project IV1002020

2. Inference in Finite Populations under Sampling Schemes, 2023 – 2024
Principal Investigator, UNAM-DGAPA-PAPIIT project TA100623

7.2 Institutional Collaboration

1. Diagnostic Study on the Shared Responsibility of Care within the Academic Community of UNAM, 2021 – 2023
Co-Principal Investigator, project by IIMAS in collaboration with the Coordination for Gender Equality (CIGU) at UNAM. Successfully completed project, see results report.

2. Diagnosis of the Settlement Algorithm for the CCV of the Mexican Stock Exchange (BMV) 2023 – 2024
Co-Principal Investigator, project by IIMAS and the Faculty of Sciences at UNAM in collaboration with the Central Securities Counterparty (CCV), part of the Mexican Stock Exchange (BMV). Successfully completed project.

8 Other Academic and Collaborative Activities

8.1 Current

1. Co-organizer of the DPyE Seminar, IIMAS-UNAM 2019 – Present
2. Member of the Graduation Subcommittee for the B.Sc. in Data Science, IIMAS-UNAM 2020 – Present
3. Member of the Advisory Committee for the Data Science Diploma, DGTIC-UNAM 2020 – Present
4. Representative of the DPyE in the Engagement Committee, IIMAS-UNAM 2022 – Present

8.2 Past

1. Member of the Academic Committee for the Actuarial Science Program, UNAM 2019 – 2022
2. Editor of the DATOS newsletter of the Mexican Statistical Association (AME) 2018 – 2019
3. Member of the Board of Directors of the AME (Vocal) 2019 – 2023
4. Member of the Editorial Committee for the AME Proceedings 2016 – 2017

9 Distinctions

1. National Researcher (SNII-Secihti), Level I 2016–2018 and 2022 – Present
2. Academic Performance Bonus (PRIDE), Level B 2021 – Present
3. Support for New Full-Time Professors (PRODEP) 2017
4. Scholarship for Ph.D. Studies (CONACyT) 2009 – 2012
5. Scholarship for Master's Studies (CONACyT) 2004 – 2006
6. Scholarship for Master's Studies (DGEP-UNAM) 2004 – 2006

10 Talks at International Conferences

1. Finite Population Parametric Bayesian Bootstrap with a View Towards Quick Counts 2024
International Symposium on Nonparametric Statistics, Braga, Portugal

2. Copula Particle Filters 2022
15^{th} International Conference of the ERCIM WG on Computational and Methodological Statistics, King's College, London, United Kingdom

3. Bayesian Nonparametric Mixture Modeling with Unimodal Kernels 2011
8^{th} International Conference in Bayesian Nonparametrics, Veracruz, Mexico

11 Member of Technical Committees

1. Quick Count organized by the INE (National Electoral Institute) 2015 – 2016 and 2018 – 2024
2. Survey for the Leadership Election of MORENA, INE 2020
3. Quick Count organized by the IEEM (Electoral Institute of the State of Mexico) 2017

12 Media Appearances

1. Interview about the INE Survey for the Leadership of Morena October 2020
Milenio TV

2. Press Conference on the Methodology of the INE Survey for the Leadership of Morena October 2020
INE TV

3. Interview on the Advisory Technical Committee for Quick Counts in the State of Mexico April 2017
Program "Entre Todos" with Lupita Juárez

13 Languages

Spanish Native
English (TOEFL iBT) 98 out of 120 in 2008 (before Ph.D.)

14 Computer Skills

Category	**Tool/Level**
Operating Systems	Linux (basic), Windows (intermediate), macOS (advanced)
Programming	R (advanced[1]), C (basic)
Statistical Tools	RStudio (advanced), SPSS (intermediate)
Document Editing	LaTeX (advanced), MS Word (intermediate), PowerPoint (intermediate), Excel (intermediate)

[1] Interfaces between R-C, R-LaTeX, and parallel processing