CURRICULUM VITAE

Personal Data

Born October 7, 1956 at Buenos Aires, Argentina

Nacionality Argentine / Spanish

Home Address Moldes 1855, 3° A, Buenos Aires, C1428CRA, Argentina

Telephone (54-11) 4786-3621

Academic Address Instituto de Cálculo, Facultad de Ciencias Exactas and Naturales,

Ciudad Universitaria, Pabellón $0+\infty$, C1428 EHA, Buenos Aires, Argentina

Telephone/FAX (54-11) 5285-8378

Email gboente@dm.uba.ar

Orcid: https://orcid.org/0000-0003-0000-0687

ResearchGate: https://www.researchgate.net/profile/Graciela-Boente

Education

- Licenciada en Matematica (Mathematics Diploma). (1975-1978). Studied at the Departament of Matemáticas, FCEyN ¹, UBA ². Obtained the degree in Mathematics with the highest grade.
- Doctor in Mathematics, Universidad de Buenos Aires,1983.
 Phd Advisor: Prof. Víctor Yohai, Full Professor, Department of Mathematics, FCEYN¹, UBA².
 Thesis Title: Métodos robustos para componentes principales(Robust Procedures for Principal Components).

Academic Appointments

Current Positions

- November 2015-present: Investigador Superior (Superior Researcher) of the CONICET ³
- 04/2012-Present: Profesor Titular Plenario (Full Professor with permanent position). Area: Statistics: Department of Mathematics, FCEyN¹, UBA²

Honours and Distinctions

- 09/2001-08/2002: Fellowship from the John Simon Memorial Foundation
- 2008. Award from the National Academy of Exact, Physical and Natural Sciences in Argentina (Premio Consagración de la Sección de Matemática, Física y Astronomía de la Academia Nacional de Ciencias Exactas, Físicas y Naturales, http://www.ancefn.org.ar/academia/academy.html).

¹FCEYN is the School of Sciences (Facultad de Ciencias Exactas and Naturales)

²Universidad de Buenos Aires

³The CONICET is the National Research Council of Argentina that supports through supplementary salary and grants the work of Argentinian scientists. Admission to the CONICET is decided by a search committee of distinguished scientists. At admission, according to their age and performance, researchers are classified into five possible categories, Assistant Researcher being lowest one and Superior Researcher being the highest.

• 14/11/2009-29/11/2009 Invited Professor of the Department of Statistics from the University of British Columbia, Canada, sponsored by *The Constance van Eeden Fund*.

- 10/2010-12/2010. Research Fellow at the Statistical and Applied Mathematical Sciences Institute (SAMSI), North Carolina, USA.
- 2012. Fellow of the Institute of Mathematical Statistics (IMS). April 2013.
- 11/2014-12/2014. Visiting Fellow at the University Ca' Foscari, Venece, Italy.
- 2020. Member of the National Academy of Exact, Physical and Natural Sciences in Argentina. July 2020. https://www.ancefn.org.ar/categoria.asp?id=702
- 2021. Honorary member of the Unión Matemática Argentina since 1/10/2021.

Research Interests

My research has primarily focused in two areas of Mathematical Statistics, specifically, Robust Statistics, Nonparametric and Semiparametric Inference. I have mainly developed procedures in nonparametric regression and autoregression models, partly linear and generalized partly linear models as well as in multivariate statistics and functional data analysis. I developed robust procedures for conditional ROC curves as well as for compositional data.

Publications

Publications in Mathematical Statistics

- 1. 1987. G. Boente. Asymptotic theory for robust principal components. *Journal of Multivariate Analysis*, **21**, 67-78.
- 1987. G. Boente, R. Fraiman & V. Yohai. Qualitative robustness for stochastic processes. Annals of Statistics, 15, 1293-1312.
- 3. 1988. G. Boente & R. Fraiman. Consistency of a nonparametric estimate of a density function for dependent variables. *Journal of Multivariate Analysis*, **25**, 90-99.
- 4. 1988. G. Boente & R. Fraiman. On the asymptotic behavior of maximum likelihood estimates for the nonregular case. *Biometrika*, **75**, 45-56.
- 5. 1989. G. Boente & R. Fraiman. Robust nonparametric regression estimation. *Journal of Multivariate Analysis*, **29**, 180-198.
- 1989. G. Boente & R. Fraiman. Robust nonparametric regression estimation for dependent observations. Annals of Statistics, 17, 1242-1256.
- 1990. G. Boente & R. Fraiman. Asymptotic distribution of robust estimates for nonparametric models from mixing observations. Annals of Statistics, 18, 891-906.
- 8. 1990. G. Boente & R. Fraiman. Chain rule density estimates. *Journal of Multivariate Analysis*, **34**, 54-60.

9. 1990. G. Boente & R. Fraiman. Asymptotic distribution and strong order of convergence of nonparametric regression estimates. Revista de la Unión Matemática Argentina, Volumen de Homenaje a Rey Pastor, 35, 39-52.

- 10. 1991. G. Boente & R. Fraiman. Strong order of convergence and asymptotic distribution of nearest neighbor density estimates from dependent observations. Sankhya, 53, 194-205.
- 11. 1991. G. Boente & R. Fraiman. Strong uniform convergence rates for some robust equivariant non-parametric regression estimates for mixing processes. *International Statistical Review*, **59**, 355-372.
- 12. 1991. G. Boente & R. Fraiman. A functional approach to robust nonparametric regression. En: Directions in robust statistics and diagnostics, Werner Stahel and Sanford Weisberg (ed.). Proceedings of the IMA Institute, USA, Vol. 33, Part I, pp. 35-46.
- 13. 1994. G. Boente & R. Fraiman. Local L-estimators for nonparametric regression under dependence. Journal of Nonparametric Statistics, 4, 91-102.
- 14. 1995. G. Boente & R. Fraiman. Asymptotic Distribution of Data-driven smoothers in density and regression estimation under dependence. Canadian Journal of Statistics, 23, 383-397.
- 15. 1995. G. Boente & R. Fraiman. Asymptotic distribution of smoothers based on local means and local medians under dependence. *Journal of Multivariate Analysis*, 54, 77-90.
- 16. 1997. G. Boente, R. Fraiman & J. Meloche. Robust Plug-in Bandwidth Estimators in Nonparametric Regression. *Journal of Statistical Planning and Inference*, **57**, 109-142.
- 17. 1998. A. Bianco & G. Boente. Robust kernel estimators for additive models for dependent observations. Canadian Journal of Statistics, 26, 239-255
- 18. 1999. G. Boente & R. Fraiman. Comment on Robust principal component analysis for functional data by N. Locantore, J. Marron, D. Simpson, N. Tripoli, J. Zhang and K. Cohen. Test, 8, 28-35.
- 19. 2000. G. Boente & R. Fraiman. Kernel-based functional principal components. Statistics and Probability Letters, 48, 335-345.
- 20. 2000. A. Bianco, G. Boente & J. di Rienzo. Some results for robust GM-based estimators in heteroscedatic regression models. *Journal of Statistical Inference and Planning*, 89, 215-242.
- 21. 2001. G. Boente & L. Orellana. A robust approach to common principal components. *Proceedings of the Workshop on Statistical Methodology for the Sciences: Environmetrics and Genetics*, Luisa Turrin Fernholz, Stephan Morgenthaler and Werner Stahel, eds., pp. 117-147. Birkhauser Verlag, Trends in Mathematics, Basel.
- 22. 2002. A. Bianco & G. Boente. On the asymptotic behavior of one-step estimates in heteroscedastic regression models. *Statistics and Probability Letters*, **60**, 33-47.
- 23. 2002. G. Boente, A.M. Pires & I. Rodrigues. Influence functions and outlier detection under the common principal components model: A robust approach. *Biometrika*, **89**, 861-875.
- 24. 2002. G. Boente & R. Fraiman. Ergodicity, geometric ergodicity and mixing conditions for nonparametric ARMA processes. Bulletin of the Brazilian Mathematical Society, 33, 307-318.
- 2002. A. Bianco & G. Boente. A robust approach to partly linear autoregressive models. Estadística, 54, 249-287.
- 26. 2004. G. Boente & L. Orellana. Robust plug—in estimators in proportional scatter models. *Journal of Statistical Planning and Inference*, **122**, 95-110.

27. 2004. A. Bianco & G. Boente. Robust estimators in semiparametric partly linear regression models. Journal of Statistical Planning and Inference, 122, 229-252.

- 28. 2006. G. Boente, A.M. Pires & I. Rodrigues. General projection—pursuit estimators for the common principal components model: Influence functions and Monte Carlo study. *Journal of Multivariate* Analysis, 97, 124-147.
- 29. 2006. G. Boente & D. Rodriguez. Robust estimators of high order derivatives of regression functions. Statistics and Probability Letters, **76**, 1335-1344.
- 30. 2006. A. Bianco, G. Boente & E. Martínez. Robust tests in semiparametric partly linear models. Scandinavian Journal of Statistics, 33, 435-450.
- 31. 2006. G. Boente, X. He & J. Zhou. Robust Estimates in Generalized Partially Linear Models. *Annals of Statistics*, **34**, 2856-2878.
- 32. 2007. A. Bianco & G. Boente. Robust estimators under a semiparametric partly linear autoregression model: Asymptotic behavior and bandwidth selection. *Journal of Time Series Analysis*, **28**, 274-306.
- 33. 2007. G. Boente, F. Critchley & L. Orellana. Influence functions for robust estimators under proportional scatter matrices. Statistical Methods & Applications JISS, 15, 295-327.
- 34. 2008. A. Bianco, G. Boente, A.M. Pires & I. Rodrigues. Robust discrimination under a hierarchy on the scatter matrices. *Journal of Multivariate Analysis*. **99**, 1332-1357.
- 35. 2008. G. Boente, A.M. Pires & I. Rodrigues. Reweighted based estimators for the common principal components model: Influence funtions and Monte Carlo study. *Metrika*, **67**, 189-218.
- 2008. G. Boente & D. Rodriguez. Robust bandwidth selection in semiparametric partly linear regression models: Monte Carlo study and influential analysis. Computational Statistics and Data Analysis, 52, 383-397.
- 37. 2008. G. Boente & A. Farall. Robust multivariate tolerance region: Influence function and Monte Carlo study. *Technometrics*, **50**, 487-500.
- 38. 2009. G. Boente, W. González Manteiga & A. Pérez González. Robust nonparametric estimation with missing data. *Journal of Statistical Planning and Inference*, **139**, 571-592.
- 39. 2009. G. Boente, A.M. Pires & I. Rodrigues. Robust tests for the common principal components model. *Journal of Statistical Planning and Inference*, **139**, 1332-1347.
- 40. 2009. L. Bali & G. Boente. Principal points and elliptical distributions from the multivariate setting to the functional case. Statistics and Probability Letters, 79, 1858-1865.
- 41. 2010. A. Bianco, G. Boente, W. González Manteiga & A. Pérez González. Estimation of the marginal location under a partially linear model with missing responses. *Computational Statistics and Data Analysis*, **54**, 546-564.
- 42. 2010. G. Boente, D. Rodriguez & M. Sued. Inference under functional proportional and common principal components models. *Journal of Multivariate Analysis*, **101**, 464-475.
- 2010. G. Boente, J. Molina & M. Sued. On the asymptotic behavior of general projection-pursuit estimators under the common principal components model. Statistics and Probability Letters, 80, 228-235.
- 44. 2010. A. Bianco & G. Boente. On a partly linear autoregressive model with moving average errors. Journal of Nonparametric Statistics, 22, 797-820.

45. 2010. G. Boente, A. Pires & I. Rodrigues. Detecting influential observations in principal components and common principal components. *Computational Statistics and Data Analysis*, **54**, 2967-2975.

- 46. 2010. G. Boente, M. Ruiz & R. Zamar. On a robust local estimator for the scale function in heteroscedastic nonparametric regression. Statistics and Probability Letters, 80, 1185-1195.
- 47. 2010. G. Boente & D. Rodriguez. Robust inference in generalized partially linear models. *Computational Statistics and Data Analysis*, **54**, 2942-2966.
- 48. 2011. A. Bianco, G. Boente, W. González Manteiga & A. Pérez González. Asymptotic behavior of robust estimators in partially linear models with missing responses: The effect of estimating the missing probability on the simplified marginal estimators. *TEST*, **20**, 524-548
- 49. 2011. A. Bianco, G. Boente & S. Sombielle. Robust estimators for nonparametric generalized regression. Statistics and Probability Letters, 81, 1986-1994.
- 50. 2011. L. Bali, G. Boente, D. Tyler & J.-L. Wang. Robust Functional Principal Components: a projection-pursuit approach. *Annals of Statistics*, **39**,2852-2882.
- 51. 2011. I. Rodrigues & G. Boente. Multivariate outliers. En: International Encyclopedia of Statistical Science Miodrag Lovric (Ed.). pag: 910-912. Springer. ISBN: 978-3-642-04897-5
- 52. 2011. G. Boente, D. Rodriguez & M. Sued. Testing the equality of covariance operators. En: *Recent Advances in Functional Data Analysis and Related Topics*, F. Ferraty, (Ed.) pp. 49-53, Physica-Verlag, Heidelberg. ISBN 978-3-7908-2735-4
- 53. 2012. G. Boente, M. Ruiz & R. Zamar. Bandwidth choice for robust nonparametric scale function estimation. Computational Statistics and Data Analysis, 56, 1594-1608.
- 54. 2012. G. Boente & D. Rodriguez. Robust Estimates in generalized partially linear single-index models. TEST, 21, 386-411.
- 55. 2013. G. Boente, R. Cao, W. González Manteiga & D. Rodriguez. Testing in generalized partly linear models: A robust approach. Statistics and Probability Letters, 83, 203-212.
- 56. 2013. A. Bianco, G. Boente & I. Rodrigues. Resistant estimators in Poisson and Gamma models with missing responses and an application to outlier detection. *Journal of Multivariate Analysis*, **114**, 209-226.
- 57. 2013. A. Bianco, G. Boente & I. Rodrigues. Robust tests in generalized linear models with missing responses. Computational Statistics and Data Analysis, 65, 80-97.
- 58. 2014. L. Bali & G. Boente. Robust functional principal components. Invited Paper as chapter of the book New advances in statistical modelling and applications. Antonio Pacheco, Rui Santos, Maria do Rosario Oliveira and Carlos Daniel Paulino (Ed.). Springer. pp. 41-54. ISBN: 978-3-319-05322-6.
- 59. 2014. G. Boente, W. González Manteiga & D. Rodriguez. Goodness-of-fit test for directional data. Scandinavian Journal of Statistics, 41, 259-275.
- 2014. G. Boente, M. Salibián-Barrera & D. Tyler. A characterization of elliptical distributions and some optimality properties of principal components for functional data. *Journal of Multivariate Anal*ysis, 131, 254-264.
- 61. 2014. L. Bali & G. Boente. Consistency of a numerical approximation to the first principal component projection pursuit estimator. Statistics and Probability Letters, 94, 181-191.

62. 2014. C. Amado, A. Bianco, G. Boente & A. Pires. Robust bootstrap: an alternative to bootstrapping robust estimator. *REVSTAT*, **12**, 169-197.

- A. Bianco, G. Boente, W. González-Manteiga & A. Pérez-González. Robust inference in partially linear models with missing responses. Statistics and Probability Letters, 97, 88-98.
- 64. 2015. L. Bali & G. Boente. Influence function of projection—pursuit principal components for functional data. *Journal of Multivariate Analysis*, **133**, 173-199.
- 2015. G. Boente & A. Vahnovan. Strong convergence of robust equivariant nonparametric functional regression estimators. Statistics and Probability Letters, 100, 1-11.
- 66. 2015. G. Boente & M. Salibián–Barrera. S—estimators for functional principal component analysis. Journal of American Statistical Association, 110, 1100-1111.
- 67. 2016. G. Boente & A. Martínez. Estimating additive models with missing responses. Communications in Statistics: Theory and Methods, 45, 413-429.
- 68. 2016. G. Boente & J. C. Pardo-Fernández. Robust testing for superiority between two regression curves. Computational Statistics and Data Analysis, 97, 151-168.
- 2017. L. Bali & G. Boente. Robust estimators under a functional common principal components model. Computational Statistics and Data Analysis, 113, 424-440.
- 70. 2017. G. Boente & A. Vahnovan. Robust estimators in semi-functional partial linear regression models. Journal of Multivariate Analysis, 154, 59-84.
- 71. 2017. A. Bianco, G. Boente & I. Rodrigues. Conditional tests for elliptical symmetry using robust estimators. Communications in Statistics: Theory and Methods, 46, 1744-1765.
- 2017. G. Boente & A. Martínez. Marginal integration M-estimators for additive models. TEST, 26, 231-260.
- 73. 2017. G. Boente, A. Martínez & M. Salibian–Barrera. Robust estimators for additive models using backfitting. *Journal of Nonparametric Statistics*, **29**, 744-767.
- 74. 2018. G. Boente, D. Rodriguez & M. Sued. Testing equality between several populations covariance operators. Annals of the Institute of Mathematical Statistics, 70, 919-950.
- 75. 2019. A. Bianco, G. Boente, W. González-Manteiga & A. Pérez-González. Plug-in marginal estimation under a general regression model with missing responses and covariates. TEST, 28, 106-146.
- 2019 A. Alvarez, G. Boente & N. Kudraszow. Robust Sieve estimators for Functional Canonical Correlation Analysis. *Journal of Multivariate Analysis*. 170, 46-62.
- 77. 2019. G. Boente, D. Rodriguez & M. Sued. The spatial sign covariance operator: Asymptotic results and applications. *Journal of Multivariate Analysis*. **170**, 115-128.
- 78. 2020. G. Boente & J. C. Pardo-Fernández. Testing for superiority between two variance functions. Statistics and Probability Letters, 156, 108612. https://doi.org/10.1016/j.spl.2019.108612
- 79. 2020. G. Boente, D. Rodriguez & P. Vena. Robust estimators in a generalized partly linear regression model under monotony constraints. *Test*, **29**, 50-89.
- 80. 2020. C. Agostinelli, A. Bianco & G. Boente. Robust estimation in single index models when the errors have a unimodal density. *Annals of the Institute of Mathematical Statistics*, **72**, 855-893.

81. 2020. A. Bianco, G. Boente, W. González-Manteiga & A. Pérez-González. Robust location estimators in regression models with covariates and responses missing at random. *Journal of Nonparametric Statistics*, **12**, 915-939.

- 82. 2020. A. Bianco, G. Boente & I. Rodrigues. Robust Wald-type methods for testing equality between two populations regression parameters: A comparative study under the logistic model. *Computational Statistics and Data Analysis*, 142, 10682. https://doi.org/10.1016/j.csda.2019.106827
- 83. 2020. G. Boente, M. Salibián Barrera & P. Vena. Robust estimation for semi-functional linear regression models. *Computational Statistics and Data Analysis*, **152**, 107041. https://doi.org/10.1016/j.csda.2020.107041.
- 84. 2021. G. Boente & M. Salibián Barrera. Robust functional principal components for sparse longitudinal data. *Metron*, **79**, 159-188.
- 85. 2021. G. Boente. Inferencia robusta: un trayecto de lo finito a lo infinito-dimensional. Anales de la Academia Nacional de Ciencias Exactas, Fisicas & Naturales. 72, 150-178.
- 86. 2022. G. Boente & N. Kudraszow. Robust smoothed canonical correlation analysis for functional data. Statistica Sinica, 32, 1269-1293.
- 87. 2022. A. Bianco, G. Boente & G. Chebi. Penalized robust estimators in sparse logistic regression. *TEST*, **31**, 563-594
- 88. 2022. A. Bianco, G. Boente & W. González-Manteiga. Robust consistent estimators for ROC curves with covariates. *Electronic Journal of Statistics*, **16**, 4133-4161.
- 89. 2023. A. Bianco, G. Boente & G. Chebi. Asymptotic behaviour of penalized robust estimators in logistic regression when dimension increases. Robust and Multivariate Statistical Methods: Festschrift in Honour of David E. Tyler, Editors: M. Yi and K. Nordhausen, Springer, pp. 323-349. https://doi.org/10.1007/978-3-031-22687-8_15
- 90. 2023. A. Bianco, G. Boente, W. González-Manteiga & A. Pérez-González. Estimators for ROC curves with missing biomarkers values and informative covariates. *Statistical Methods and Applications*, **32**, 931-956.
- 91. 2023. G. Boente & A. Martínez. A robust spline approach in partially linear additive models. Computational Statistics and Data Analysis, 178, 107611. https://doi.org/10.1016/j.csda.2022.107611
- 92. 2023. A. Bianco & G. Boente. Addressing robust estimation in covariate—specific ROC curves. *Econometrics and Statistics*, https://doi.org/10.1016/j.ecosta.2023.04.001.
- 93. 2023. G. Boente & D. Parada. Robust estimation for functional quadratic regression models. Computational Statistics and Data Analysis, 187, 107798. https://doi.org/10.1016/j.csda.2023.107798
- 94. 2024. G. Boente & J. C. Pardo-Fernández. Robust testing to compare regression curves. Accepted in Statistics, July 2024. Available at https://arxiv.org/abs/2205.12065

Publications in Conference Proceedings

95. 2007. A. Bianco, G. Boente, W. González-Manteiga & A. Pérez-González. Estimation with missing responses in a semiparametric partially linear model. *Bulletin of the International Statistical Institute* 56th Session. *Proceedings*. Editors: M. Ivette Gomes, Dinis Pestana, Pedro Silva. ISBN: 978-972-8859-71-8. DVD version.

96. 2013. A. Vahnovan & G. Boente. Estimadores Robustos en Modelos de Regresión Semi-Funcionales Parcialmente Lineales. In: Anales del IV Congreso de Matemática Aplicada, Computacional e Industrial, MACI 4, G. La Mura, D. Rubio y E. Serrano (eds.), pp. 445-448, 4, Buenos Aires. ISSN: 2314-3282

- 97. 2013. A. M. Bianco, G. Boente, W. González-Manteiga & A. Pérez-González. Tests robustos para el modelo parcialmente lineal con respuestas faltantes. In: XLI Coloquio de la Sociedad Argentina de Estadística Trabajos Completos. ISBN: 978-987-575-116-3
- 98. 2014. G. Boente & M. Salibián Barrera. Robust inference in functional data analysis using S—estimators. In: Contributions in Infinite—dimensional Statistics and Related Topics. Editors: Enea G. Bongiorno, Ernesto Salinelli, Aldo Goia, Philippe Vieu.Societá Editrice Esculapio, pp. 61-65. ISBN: 978-88-7488-7637
- 99. 2014. G. Boente, A. Martínez & M. Salibián Barrera. Robust estimators in additive models with missing responses. In: II ISNPS (International Society of Non Parametric Statistics) Book of abstracts. Edited by Universidad Carlos III & The International Society for Non-Parametric Statistics. ISBN: 978-84-89315-69-3

Publications related to statistical consulting

- 100. 1993. A. Pacin, E. Martínez, G. Boente, F. Bordignon & J. Peri. Study of seasonal behavior of erythrocyte sedimentation rate. *Chronobiologia*, Vol. 20, 169-178.
- 101. 1994. A. Larumbe, H. González, M. Pollio, E. Martínez, S. Resnik, G. Boente, J. Adrover & G. Garibotti. Water Sorption Characteristics of Argentinien Wheat. Statistical Methodology. *Journal of Food Engineering*, Vol. 21, 291-304.
- 102. 1994. H. González, M. Pollio, E. Martínez, G. Boente & S. Resnik.Sorption Isotherms of Argentinien Maize Hybrids. Anales de la Asociación Química Argentina, Vol. 82, 147-154.
- 103. 1994. A. Pacin, C. Reale, H. Mirengui, L. Orellana & G. Boente. Subclinic effect of the administration of T-2 Toxin and Nivalenol in mice. Mycotoxin Research, Vol.10, 85-96.
- 104. 1995. G. Boente, A. Larumbe, M. Pollio, J. Monserrat, S. Sanmartino & S. Resnik. Multivariate statistical analysis of water sorption data of Argentine sorghum. *Journal of Food Engineering*, Vol.25, 73-84.
- 105. 1995. H. González, A. Pacin, E. Martínez, G. Boente & S. Resnik. Influence of Inoculum Preparation and Volume on Growth of Micotoxigenic Molds. *Journal of Food Protection*, Vol.58, 430-433.
- 106. 1996. G. Boente, H. González, E. Martínez, M. Pollio & S. Resnik. Sorption Isotherms of Corn. Study of Mathematical Models. *Journal of Food Engineering*, Vol.29, 115-128.
- 107. 1997. A. Bianco, G. Boente, M. Pollio, S. Resnik & A. Larumbe. Comparison of water sorption behaviour of three rice varieties: Temperature Influence. *Journal of Food Engineering*, Vol. 33, 395-403.
- 108. 2001. A. Bianco, G. Boente, M. Pollio & S. Resnik. Influence of oil content on sorption isotherms of four varieties of peanut at 25°c. *Journal of Food Engineering*, Vol. 47, 327-331.
- 109. 2005. A. Bianco, G. Boente, M. Pollio & S. Resnik. "Sorption isotherms of two varieties of Amaranthus at 25°c: Comparison of water sorption characteristics and mathematical models. *Journal of Food Technology*, Vol. 3, 294-299.

Papers under revision

- 110. 2024. G. Boente & Marina Valdora. Robust estimation for functional logistic regression models. Submitted to *Electronic Journal of Statistics*, March 2024. Available at https://arxiv.org/abs/2308.02786
- 111. 2024. C. Amado, A. Bianco, G. Boente & I. Rodrigues. Robust estimation of heteroscedastic regression models: a brief overview and new proposals. Submitted to *Statistical Papers*. Revision recommendations sent end May 2024. Available at https://arxiv.org/abs/2311.02822
- 112. 2024. G. Boente, F. Leonardi, D. Rodriguez & M. Sued. Threshold detection under a semiparametric regression model. Submitted to *Annals of the Institute of Statistical Mathematics*, Revision recommendations sent end June 2024. Available at https://arxiv.org/abs/2310.18733
- 113. 2024. G. Boente & Alejandra Martinez. Robust variable selection for partially linear additive models.. Submitted to *Statistics and Computing*, Revision recommendations sent end June 2024. Available at https://arxiv.org/abs/2401.10869

Papers to be submitted

114. 2024. A. Bianco, G. Boente, W. González-Manteiga, . Gude Sampedro & A. Pérez-González. Robust nonparametric regression for compositional data: the simplicial-real case. Available at https://arxiv.org/abs/2405.12924

Students Supervision

Phd. Thesis

Advisor of the following PhD. Theses in Mathematics

- Lic. Daniela Rodriguez Estimación Robusta en Modelos Parcialmente Lineales Generalizados (Robust estimators in generalized partly linear models), FCEyN, Universidad de Buenos Aires. (March 28, 2008). (Outstanding with the honour of the jury).
 Actual Position: Investigador Independiente (Independent Researcher) CONICET and Associate Professor at the Instituto de Cálculo, FCEyN, UBA.
- 2. Lic. Sandro Marcelo Ruiz Contribución a la Teoría de la Estimación Robusta de Escala en Modelos de Regresión No-paramétricos (Contributions to the theory of robust scale estimation in nonparametric regression models). Universidad Nacional de Rio Cuarto. September 16 2008.(Outstanding). Actual Position: Associate Professor, Department of Mathematics, Faculty of Exact Sciences, Universidad Nacional de Río Cuarto.
- 3. Lic. Lucas Bali Métodos robustos de estimación de componentes principales funcionales y bajo el modelo de componentes principales comunes (Robust estimators for functional principal components and under a functional common principal components model), FCEyN, Universidad de Buenos Aires. (July 16, 2012) (Outstanding with the honour of the jury).

 Actual Position: Data Science Technical Lead at YPF (Yacimientos Petrolíferos Fiscales) and Assistant Professor at Universidad Nacional de San Martín.

4. Lic. Alejandra Valeria Vahnovan Estimadores robustos en modelos de regresión noparamétricos funcionales y en modelos semi-funcionales parcialmente lineales (Robust estimators in functional non-parametric regression models and under a partly linear semi-functional model), Facultad de Ciencias Exactas (FCE), Universidad Nacional de La Plata (UNLP). (November 4, 2013) (Outstanding). Actual Position: Position at the Department of Mathematics, FCE, ULP.

- 5. Lic. Alejandra Martinez Inferencia en modelos aditivos (Inference in additive models), FCEyN, Universidad de Buenos Aires. (March 12, 2014) (Outstanding).
 Actual Position: Assistant Professor at the National University of Luján. Assistant Researcher at CONICET.
- 6. Lic. Agustín Alvarez Métodos robustos en correlación canónica funcional (Robust methods in functional canonical correlation), FCEyN, Universidad de Buenos Aires. (March 22, 2017) (Outstanding). Actual Position: Assistant Professor at the Universidad de General Sarmiento.
- 7. Lic. Pablo Vena Estimación robusta en modelos semiparamétricos bajo restricciones de monotonía (Robust estimation in semiparametric models under monotone restrictions), FCEyN, Universidad de Buenos Aires. (September 30, 2019). (Outstanding). Actual Position: Data Developer at MUTT DATA.

Co-advisor with Ana Bianco of following PhD. Thesis in Mathematics

8. Lic. Gonzalo Chebi *M*-estimadores penalizados para regresión logística (Penalized *M*-estimators for logistic regression), FCEyN, Universidad de Buenos Aires. (December 20th, 2019). (Outstanding). Actual Position: Data Scientist at ASAPP.

Master Thesis advisor

Advisor of the following Master Theses in Biometry (Magister Scientiae en Biometría, Universidad de Buenos Aires)

- 1. Lic. Julio Di Rienzo Estimación de las reflectancias específicas de los cultivos o usos de la tierra a partir de imágenes satelitales de baja resolución con propósitos de monitoreo (Estimation of specific reflectances of crops or uses of the land from low resolution satellital images). December 1993. Actual Position: Professor at the Faculty of Agronomy. Universidad Nacional de Córdoba.
- 2. Lic. Elva Nora Beretta Análisis de variables directas y derivadas para analizar la tipificación de establecimientos agropecuarios (Analysis of direct and index variables to analyse the characteristics of agricultural and cattle establishments). May 1995.
- 3. Ing. Agrón. Susana Perelman Técnicas estadísticas de clasificación para la delimitación de comunidades vegetales de la Pampa deprimida (Statistical classification methods for delimitating grassland communities in the Flooding Pampa). July 1996.
 - Actual Position: Professor at the Faculty of Agronomy. Universidad de Buenos Aires, until retirement.
- 4. Lic. Gilda Garibotti Métodos estadísticos para estimar los parámetros de una distribución pluviométrica (Statistical methods for estimating the parameters of rainfall distribution). August 1996. Actual Position: Professor at the Universidad Nacional del Comahue.
- Lic. Liliana Orellana Métodos robustos para el análisis de componentes principales comunes (Robust methods for the analysis of common principal components) July 1999.
 Actual Position: Professor and Director of the Biostatistical Unit of the Heath School, Deakin University (Melbourne, Australia)

Advisor of the following Master Theses in Mathematical Statistics (Magister Scientiae en Estadística Matemática, Universidad de Buenos Aires)

- Susana Iturmendi Métodos para la estimación de la densidad relativa (Methods for the estimation of the relative density). June 2003.
 Actual Position: Professor at Department of Mathematics, Universidad Nacional del Sur, until retire-
- ment.
- 7. Andrés Farall Límites de tolerancia para datos multivariados (Robust tolerance regions for multivariate data). March 2005
 - Actual Position: Associate Professor at the Instituto de Cálculo, FCEN, Universidad de Buenos Aires.
- 8. Ing. Jemina García Análisis de sensibilidad en regresión no paramétrica (Sensitivity analysis in non-parametric regression). December 2020.

 Actual Position: Professor at the School of Engineering, Universidad de Buenos Aires. Also holding a position at the Instituto de Cálculo, FFCEN, Universidad de Buenos Aires, until January 2024, when she moved to Bariloche, Argentina.
- 9. Profesora Daniela Parada Estimación robusta en modelos de regresión funcional (Robust estimation in functional regression models. May 2023.

 Actual Position: Technical Professional of the CONICET with position at the Instituto de Cálculo, Universidad de Buenos Aires/CONICET. Also holding a position at the Department of Mathematics, FCEN, Universidad de Buenos Aires.

Co-Advisor with Ana Bianco of the following Master Thesis in Mathematical Statistics (Magister Scientiae en Estadística Matemática, Universidad de Buenos Aires) of

 Susana Sombielle Estimadores robustos en modelos noparamétricos generalizados (Robust estimators in generalized nonparametric regression models). April 2009.
 Actual Position: Profesor Adjunto (Assistant Professor), Universidad Tecnológica Nacional until retirement.

Graduate Thesis

Our degree in Mathematics is similar to a Master degree and requires a final original work.

- 1. Jointly advisor with Ana Bianco of the thesis for a licence degree in Computer Science of Elba Tonini, Title of the Thesis: Diversos Métodos de estimación en modelos aditivos (Several estimation Methods in Additive Models), November 1997.
- 2. Advisor of the thesis for a licence degree in Mathematics of Nancy Cifarelli, Title of the Thesis: Test de bondad de ajuste para familias de distribuciones (Goodness of fit test for distribution families), December 1999.
- 3. Advisor of the thesis for a licence degree in Mathematics of Karina Repetto, Title of the Thesis: Algunos resultados referidos a la estimación robusta de parámetros en regresión lineal heteroscedástica (Some results related with robust estimation in heteroscedastic linear regression), March 2000.
- 4. Advisor of the thesis for a licence degree in Mathematics of Daniela Rodriguez, Title of the Thesis: Métodos robustos para seleccionar el parámetro de suavizado en modelos parcialmente lineales (Robust methods to select the smoothing parameter in partly linear models), September 2003.

5. Advisor of the thesis for a licence degree in Mathematics of María Elena García, Title of the Thesis: Una propuesta plug-in robusta para el problema de discriminación bajo un modelo de componentes principales comunes para las matrices de covarianza (A plug-in robust proposal for the discrimination problem under the CPC model), December 2005.

- 6. Co-Advisor with Daniela Rodriguez of the thesis for a licence degree in Mathematics of Juan Lucas Bali, Title of the Thesis: Algunos resultados sobre puntos principales y distribuciones elípticas en el caso funcional (Some results on principal points and elliptical distributions in the functional setting), March 2008.
- 7. Co-Advisor with Mariela Sued of the thesis for a licence degree in Mathematics of Fernanda Julieta Molina, Title of the Thesis: Sobre el comportamiento asintótico de los estimadores de projection—pursuit para un modelo de componentes principales comunes (On the asymptotic behavior of the projection—pursuit estimators for the CPC model), March 2008.
- 8. Advisor of the thesis for a licence degree in Mathematics of Alejandra Martínez, Title of the Thesis: Estimación en modelos aditivos con respuestas faltantes (Estimation under an additive model with missing responses), March 2009.
- 9. Advisor of the thesis for a licence degree in Mathematics of Selva Figueroa, Title of the Thesis: Modelo de Regresión no Lineal (Nonlinear regression model), December 2013.
- Advisor of the thesis for a licence degree in Mathematics of Pablo Vena, Title of the Thesis: Detección de datos atípicos para datos funcionales asimétricos (Outlier detection for asymmetric functional data), March 2014.
- 11. Advisor of the thesis for a licence degree in Mathematics of Gonzalo Chebi, Title of the Thesis: Tests de igualdad de matrices de dispersión basados en signos en el contexto de alta dimensión (High-dimensional tests for comparing dispersion matrices based on signs) March 2015.
- 12. Advisor of the thesis for a licence degree in Mathematics of Ulises Bercovich, Title of the Thesis: Clasificación de datos funcionales (Classification of functional data), August 2022.

Ongoing Graduate Thesis

13. Advisor of the thesis for a licence degree in Mathematics of Gonzalo Carabajal, Title of the Thesis: Estimación de curvas ROC en presencia de covariables composicionales (ROC estimation with compositional covariates), Estimated Date of presentation: End August 2024.

Postdoc students

- Daniela Rodriguez (1/04/2008-31/03/2010)
- Nadia Kudraszow (1/04/2012-31/03/2014)
- Lucas Bali (1/04/2013-31/03/2014).
- Alejandra Martínez (1/04/2014-31/03/2016)
- Alejandra Vahnovan (1/04/2014-31/03/2016)
- Antonella Gieco (1/08/2019-31/03/2020)

Researchers supervision

Advisor of the following Assistant researchers at CONICET.

• Mariela Sued: 1/06/2006 to 31/03/2010, when she promoted to the next level.

• Daniela Rodriguez: 1/04/2010 to 12/11/2014, when she promoted to the next level.

• Nadia Kudraszow: 1/10/2014-

• Alejandra Martínez: 07/2021-

• Marina Valdora: 07/2021 to 31/10/2024, when she asked for an advisor change following my suggestion.

National Institutional Responsabilities and Evaluation Activities

- ★ Vice—chair of the Department of Mathematics, FCEYN, UBA, 01/05/1993 to 31/03/1994.
- ★ Chair of the Instituto de Cálculo⁴, FCEYN, UBA. 15/12/1998 to 30/04/2008.
- ★ Vice—Chair of the Master Degree in Mathematical Statistics⁵, FCEYN, UBA. March 1997 to October 1999.
- ★ Chair of the Master Degree in Mathematical Statistics, FCEyN, UBA. 26/08/2013 to 31/10/2016.
- ★ Member of the following Committees
 - i Member of the PhD. Committee from the Department of Mathematics, FCEyN, Universidad de Buenos Aires, May 2015–.
 - ii Member of the Selection Committee of the Instituto del Cálculo for a position of Profesional de la Carrera de Apoyo Profesional (CPA) in
 - (a) Data Science (03/2023)
 - (b) Data Analysis and Statistics (12/2023)
 - iii Member of the Ad-Hoc Committee for Promotion of the Category of Superior Researcher in the area of Exact Sciences at CONICET, March 2018-December 2021.
 - iv Member of the Junta de Calificación y Promoción of the CONICET⁶, March 2016-December 2017.
 - v Chair of the Mathematical Advising Committee of the CONICET⁷ (March 2010 December 2011)
 - vi Co-chair of the Mathematical Advising Committee of the CONICET (March 2010-December 2010)
 - vii Ad-hoc Multidisciplinary Committee for the evaluation of science projects for the National Agency of Science (ANPCYT): PICT 2013 (April 2014) and PICT 2016 (April 2017).

⁴The Instituto de Cálculo is a research center whose main interest focus on Statistics and Applied Mathematics. The aim is to give support to Institutions and Companies seeking expertise in these areas.

 $^{^5}$ The Master in Mathematical Statistics was created by the University of Buenos Aires in 1997 after the academic proposal made by Victor Yohai and myself.

⁶The *Junta de Calificación y Promoción* of the CONICET is the board that recommends the admission of scientists all the areas of science and their promotion to an upper category once they have been incorporated once the specific advising committee has finished his evaluation.

⁷The Mathematical Advising Committee of the CONICET recommends the admission of scientists in the area of Mathematics and Mathematical Statistics, their promotion to an upper category once they have been incorporated, as well as the support through grants of research projects presented by researchers belonging to the Institution. The decisions are taken based on the recommendation of external reviewers.

viii Mathematical Advising Committee of the CONICET: April 1994–December 1996, March 2006–December 2007.

- ix Committee for Research Scholarships from CONICET: March 1998–December 2002.
- x Committee for evaluating researchers in the area of Mathematics from the Consejo Interuniversitario Nacional (National Council of National Universities): March, July and December 1999.
- xi Committee for the selection of researchers which will participate in the activities of the ICTP (Agreement ICTP–Facultad de Ciencias Exactas and Naturales) from 1990 to 1993 and since 1/02/1999.
- * Evaluation of several research projects for the CONICET, Universidad Nacional de La Plata, Universidad Nacional del Sur, Universidad Nacional del Litoral, Universidad Nacional de General Sarmiento.
- * Member of the jury which evaluates the thesis to obtain the PhD. degree in Mathematics awarded by the Universidad de Buenos Aires, of Lic. Marta García Ben(1988), Lic. Ana Bianco(1990), Lic. Diana Kelmansky(1990), Lic. Jorge Adrover(1993), Lic. Daniel Gervini(1999), Lic. Elena Martínez(1999), Lic. Alberto Maltz, (1999) and Lic. Ana Julia Villar(2000).
- * Member of several jury panels that selected faculty members for the positions of Assistant and Associate Professors.

International Activities

Evaluation

- ★ Member of the Ph.D. Committee at the Instituto Superior Técnico de Lisboa of Isabel Rodrigues (2003).
- ★ Member of the Jury for Professor Qualification (Comité de Agregação⁸) of Professor Ana Pires Parente. 2008
- * Member of two jury panels to select faculty member for positions of Associate Professor at the Department of Mathematics from the Instituto Superior Técnico de Lisboa, Portugal in 2009.
- * Elected member at large to serve a four-year term from January 2003 through August 2010, at the Commission on Development and Exchanges (CDE) of the International Mathematical Union (IMU).
- ★ Adviser for the Latin American and Caribbean Fellowship competition of the John Simon Guggenheim Memorial Foundation: 2005, 2006, 2007, 2008 and 2009.
- * Referee of projects presented at
 - National Science Foundation. 2003.
 - FONDECYT, CONICYT, Chile. 2005.
 - Programa de I+D de la Comisión Sectorial de Investigación Científica de la Universidad de la República, Uruguay. August 2008.
 - Czech Science Foundation, GARC, 2021

⁸The degree of Agregação is necessary for any Assistant Professor willing to apply to an Associate Professor position.

Member of Organizing and Scientific Committees

• 2001. International Conference on Contemporary Data Analysis: Theory and Methods. Buenos Aires, Argentina, March 5-9. Member of the local Organizing Committee.

- 2001. Congreso Latinoamericano de Probabilidad y Estadística Matemática (VIII CLAPEM), La Habana, November 12-16. Member of the Scientific Committee.
- 2004. Congreso Latinoamericano de Probabilidad y Estadística Matemática (IX CLAPEM), Punta del Este, Uruguay, March 22-26. Member of the Scientific Committee.
- 2006. International Conference on Robust Statistics (ICORS 2006), Lisbon, Portugal, July 16-21. Member of the Scientific Committee.
- 2006. Workshop on Robustness and Statistical Inference, In Honour of Victor Yohai, Madrid, Spain, October 4 and 5. Member of the Scientific Committee.
- 2007. 56th International Conference of the International Statistical Institute, Lisbon, Portugal, August 22-29. Member of the Scientific Committee of the Invited Paper Session for the parallel session of the Bernoulli Society.
- 2007. International Conference on Robust Statistics (ICORS 2007) held at Buenos Aires, September 16-21. Member of the Local Organizing Committee.
- 2008. International Conference on Robust Statistics (ICORS 2008), Antalya, Turkey, September 8-12. Member of the Scientific Committee.
- 2009. International Conference on Robust Statistics (ICORS 2009), Parma, Italy, June 14-19. Member of the Scientific Committee.
- 2009. 57th Meeting of the International Statistical Institute, Durban, South-Africa, August 16-22. Organizer of the parallel session on "Semi- and Nonparametric Statistics" of the Bernouilli Society.
- 2011. IWFOS 2011, Santander, Spain, June 17-19. Member of the Scientific Committee.
- 2011. International Conference on Robust Statistics (ICORS 2011), Valladolid, Spain, June 26-July 1.
 - * Member of the Scientific Committee.
 - * Member of the Scientific Committee. Joint organizer with Juan Cuesta–Albertos of the session on Functional Data Analysis.
- 2011. First Latin America Workshop on Functional Data, Universidad de San Andrés, Victoria, Prov. de Buenos Aires, Argentina, December 5-7. Member of the Organizing Committee.
- 2012. Fifth Winter School Luis Santaló, Departament of Matemática, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos, July 23-27. Member of the Scientific Committee.
- 2012. International Conference on Robust Statistics (ICORS 2012), Burlington, USA, August 5-10, 2012. Joint organizer with Ana Bianco of the sessions Computational statistics/Bootstrap and Robust analysis of functional and complex structures.
- 2012. 5th International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2012). Oviedo, Spain, December 1-3. Organizer of the special session ES16 on Robust Functional Data Analysis.
- 2013. 6th International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2013). London, United Kingdom, December 1-3. Organizer of the special session ES10 on Recent advances on robust analysis of functional data and complex structures.

• 2014. 6th Winter School Luis Santaló, Departament of Matemática, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos, March 12-14. Member of the Organizing Committee.

- 2014. II ISNPS (International Society of NonParametric Statistics) Conference. Cádiz, Spain, June 12-16,. Organizer of the special session on Robustness in Nonparametric Statistics.
- 2014. Congreso Latinoamericano de Probabilidad y Estadística Matemática (XIII CLAPEM), Colombia. Member of the Scientific Committee.
- 2014. 7th International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2014) to be held at Pisa, Italy, December 6-8.
 - \star Member of the Scientific Program Committee.
 - \star Organizer of the special session on Robust Methods on Functional Data and Complex Structures.
- 2015. International Conference on Robust Statistics (ICORS 2015). Calcuta, India, January 12-16. Organizer of the special session on *Robustness in Functional Data*.
- 2015. 8th International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2015). London, United Kingdom, December 12-14. Organizer of the special sessions ESI02: Robust procedures for functional and complex data analysis and EO296: Robustness and missing data.
- 2016. IX International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2016). Sevilla, Spain, December 8-12. Organizer of the special session EO203: Advances in robustness for functional and complex data.
- 2017. International Conference on Robust Statistics (ICORS 2017). Wollongong, Australia, July 3 7. Organizer of the special session Robustness in models with Missing data, High dimensional and Functional data.
- 2017. X International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2017). London, United Kingdom, December 16-18. Organizer of the special session EO138: Recent advances in FDA, high dimensional and spatial statistics.
- 2018. International Conference on Robust Statistics (ICORS 2018). Leuven, Belgium, July 2-6. Member of the Scientific Committee.
- 2018. XI International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2018). Pisa, Italy, December 14-16. Co-Organizer with Juan Romo of the special session EO292: New developments on robustness and functional data analysis.
- 2019. International Conference on Robust Statistics (ICORS 2019). Guayaquil, Ecuador, May 28-31. Member of the Scientific Committee.
- 2019. SUMA 2019, Jpint meeting of the UMA and SOMACHI. Mendoza, Argentina, September 24-27. Member of the Scientific Committee.
- 2019. 12th International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2019). London, United Kingdom, December 14-16. Organizer of the special session EO699: Recent advances on ROC curves.
- 2021. 14th International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2021). London, United Kingdom, December 18-20. Co- Organizer with Ana Bianco of the special session EO332: Robustness and data analysis.
- 2022. International Conference on Robust Statistics (ICORS 2022). Waterloo, Canadá, July 5-8. Member of the Scientific Committee.

• 2022. 15th International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2022). London, United Kingdom, December 17-19.

- \star Member of the Scientific Program Committee.
- * Co-Organizer with Ana Bianco of the special sessions EO541: Robustness and related topics I and EO542: Robustness and related topics II.
- 2023. International Conference on Robust Statistics (ICORS 2023). Toulouse, France, May 22-26. Member of the Scientific Committee.
- 2023. 16th International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2023). Berlin, Germany, December 16-18. Co-Organizer with Ana Bianco of the special session EO152: New developments in robust statistics.
- 2024. International Symposium on Nonparametric Statistics 2024 (ISNPS 2024). Braga, Portugal, June 25-29. Organizer Ana Bianco of the Invited Session Recent advances in depth and robust statistics.
- 2025. 6th International Workshop on Functional and Operatorial Statistics (IWFOS 2025), Novara, Italia, June 25-27. Member of the Scientific Committee.

Editorial Activities

- Associated Editor of Statistica Sinica, August 2002-November 2005.
- Associated Editor of Computational Statistics and Data Analysis, July 2014-December 2017.
- Associated Editor of Journal of Nonparametric Statistics, 2021- 2022.
- Associated Editor of REVSTAT, May 2014-.
- Associated Editor of REVUMA, November 2020-
- Served as Referee for several journals including: Annals of Statistics, Annals of the Institute of Statistical Mathematics, Biometrics, Biometrika, Communications in Statistics, Computers and Mathematics with Applications, Computational Statistics & Data Analysis, Estadística, Journal of the American Statistical Association, Journal of Computational and Graphical Statistics, Journal of Nonparametric Statistics, Journal of Statistical Planning and Inference, Journal of Multivariate Analysis, Journal of Computational and Applied Mathematics, Metrika, Revista de la Sociedad Argentina de Estadística, REVSTAT, Statistical Methods and Applications, Statistical Papers, Statistical Science, Statistical Methods and Applications, Statistics and Computing, Test.

Academic Visits

- Invited Professor of the Department o Statistics of the INTA (National Institute of Agriculture): Between 1987 to 1994. I taught several courses at their Master Program in Statistics and I was the advisor of several Master thesis.
- Stayed as a short time visitor at the following Universities:
 - ⋆ Universidad de la República, Montevideo, Uruguay: 1987, 1988, 1989, 1990, 1991, 1992, 1994, 1997. Joint work with Professor Ricardo Fraiman.
 - * Instituto de Matemática de la Universidad Federal de Río de Janeiro, Brazil: 1997.

★ Instituto Superior Técnico de la Universidad Técnica de Lisboa, Lisbon, Portugal: 2000, 2001, 2002, 2003, 2005, 2006, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 205, 2016, 2018, 2019, 2023 and 2024. Joint work with Professors Conceicao Amado, Ana Pires Parente and/or Isabel Rodrigues.

- ⋆ Departamento de Estadística e Investigación Operativa, Universidad de Santiago de Compostela, Santiago de Compostela, Spain, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2014. Joint work with Professors Wenceslao González-Manteiga and Ana Pérez-González.
- * Departamento de Estadística, Análisis Matemático y Optimización, Facultad de Matemáticas, Universidad de Santiago de Compostela, Santiago de Compostela, Spain, 2015, 2016, 2017, 2018, 2019, 2021, 2022, 2023 and 2024. Joint work with Professors Wenceslao González–Manteiga and Ana Pérez–González.
- * Facultad de Ciencias Económicas y Empresariales, Universidad de Vigo, Vigo, Spain, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023 and 2024. Joint work with Professor Juan Carlos Pardo–Fernández.
- * Visiting Fellow en la Universidad Ca' Foscari, Venecia, Italia, 2014. Joint work with Prof. Claudio Agostinelli.
- ⋆ Departament of Statistics from the University of British Columbia, Canada: 2009, 2010, 2012, 2015, 2019. Joint work with Matías Salibián-Barrera and Rubén Zamar.
- Invited researcher at SAMSI from October 27 to 17 de November 2010.

Membership

- Member of the Latin-American Committee of the Bernoully Society, 2000-2002.
- Member of the following academic societies: Bernouilli Society, Institute of Mathematical Statistics, American Statistical Association, International Statistical Institute, Sociedad Argentina de Estadística and Unión Matemática Argentina.

Research support

Current Funding

- 2021-2025. Member of the project Dinámica compleja e inferencia noparamétrica (PID2020-116587GB-I00, CoDyNP) funded by the Ministerio de Ciencia e Innovación y FEDER (Fondos Europeos de Desarrollo Regional), Spain. Main Investigators: Rosa María Crujeiras Casais / Wenceslao González Manteiga. Role: Non-resident Researcher
- 2021-2024. Member of the project "New Methodological and Computational Advances in Nonparametric and Semiparametric Statistics MECANOS3" (PID2020-118101GB-I00) funded by the Ministerio de Ciencia e Innovación y FEDER (Fondos Europeos de Desarrollo Regional), Spain. Main Investigators: Jacobo de Uña-Alvarez / Juan Carlos Pardo-Fernández. Role: Non-resident Researcher
- 2023-2025. Universidad de Buenos Aires. 20020220200037BA. Robust inference and semiparametric modelling for complex systems. Main Investigator: Graciela Boente, Co-responsible: Ana Bianco. Approved but without date for funds deposit.
- 2023-2027. ANPCYT. PICT 2021-I-A-00260. Robust inference and semiparametric modelling for complex systems. Main Investigator: Graciela Boente. Period: 28/07/2023 hasta 28/07/2027.

Past Funding

When there is no other indication, I acted as the Main Investigator (or Director) of the project.

- 1992-1994. UBA. Robust method in nonparametric regression.
- 1992-1994. CONICET. PID-BID 436. "Robust and nonparametric inference. Main Investigators: G. Boente and V.J. Yohai.
- 1995-1998. UBA. EX-038. Robust and nonparametric inference.
- 1997-2000. CONICET. PIP 4186/97. Robust and nonparametric methods in multivariate analysis and regression models. Main Investigators: G. Boente and V.J. Yohai.
- 1998-2000. UBA. TX-049. "Robust and nonparametric inference.
- 1998-2000. ANPCYT ⁹. PICT 03-00000-00576. Robust and nonparametric inference. Main Investigators: G. Boente and V.J. Yohai.
- 2000-2002. ANPCYT. PICT 03-00000-006277. "Robust and nonparametric statistical methods. Main Investigators: G. Boente and V.J. Yohai.
- 2003. UBA. X-644. Robust inference and semiparametric models.
- 2004-2007. UBA. X-094. Robust inference and semiparametric models.
- 2005-2006. CONICET. PIP 5505. Robust estimation and semiparametric methods.
- 2005-2007. ANPCYT. PICT 21407. Robust estimation and semiparametric methods.
- 2005-2006. Joint cooperation project with Portugal ANPCYT and GRICES PO/PA04-EIII/020 "Robust procedures for the analysis of multivariate data. Director from Argentina: Graciela Boente, from Portugal: Ana Pires.
- 2008-2010. UBA. X-018. Robust estimation and semiparametric methods.
- August 2009-July 2012. ANPCYT. PICT-2007-00821. Semiparametric models, functional data and robust inference.
- August 2009-July 2012. CONICET. PIP 112-200801-00216. Robust estimation and semiparametric methods.
- August 2012-July 2015. ANPCYT. PICT-2011-0397. Robust estimation, Semiparametric models and functional data.
- August 2012-July 2015. CONICET. PIP 112-201101-00339. Robust estimation, Semiparametric models and functional data.
- July 2011- June 2014. UBA. Project 20020100100276. Robust estimation and semiparametric methods.
- 2014-2016. Member of the joint cooperation project with Italy. IT1306. Agencia Nacional de Promoción Científica y Tecnológica-Ministero degli Affari Esteri (MAE) Métodos robustos para predicción de la duración y costos de estadías hospitalarias. Director from Argentina: Víctor Yohai, from Italy: Dr. Claudio Agostinelli.

⁹The ANPCYT (*Agencia Nacional de Promoción Científica y Tecnológica* is a National Research Council in Argentina depending on the Science Ministry that supports research through different grants including joint grants with some European countries

• 2014-2018. Universidad de Buenos Aires. 20020130100279BA. Robust estimation, Semiparametric methods and Functional data. Main Investigator: Ana Bianco, Co-responsible: Graciela Boente.

- 2014-2016. 2017-2020. Member of the project Inferencia no paramétrica: modelización, estimación, contrastes y aplicaciones funded by the Ministerio de Ciencia e Innovación y Agencia Nacional de Evaluación y Prospectiva (ANEP), Spain. Main Investigator: Wenceslao González Manteiga, Coresponsible: Rosa María Crujeiras Casais. Role: Non-resident Researcher
- 2016-2019. ANPCYT. PICT 2014-0351. Robust estimation, Semiparametric methods, Functional and High-Dimensional data.
- 2017-2020. Member of the project "Modelizacón noparamétrica de dinámicas y dependencias en sistemas complejos (INNPAR2D MTM2016-76969P) funded by the Ministerio de Gobierno y Competitividad y FEDER (Fondos Europeos de Desarrollo Regional), Spain. Main Investigator: Wenceslao González Manteiga, Co-responsible: Rosa María Crujeiras Casais. Role: Non-resident Researcher
- 2018-2023. Universidad de Buenos Aires. 20020170100022BA. Robust estimation, Semiparametric methods, Functional and High-Dimensional data. Main Investigator: Graciela Boente, Co-responsible: Ana Bianco.
- 2019-2023. ANPCYT. PICT 2018-00740. Robust methods in parametric and semiparametric models, functional and high-dimensional data.

Invited Presentations in Conferences/Workshops

- 1994. Future Directions in Robustness and Data Analysis, Symposium organized at the Princeton University. 27 June-02 July. Princeton, U.S.A.. Invited Talk: Robust Plug-in Bandwidth Estimators.
- 1995. VI Congreso Latinoamericano de Probabilidad and Estadística Matemática (VI CLAPEM). Viña del Mar, Chile. November. **Invited Talk:** Data-Driven Bandwidth Selectors in Nonparametric Regression: Sensitivity to anomalous Data.
- 1996. Symposium on Statistics and the Sciences, held at the Dalhousie University. 12-16 August. Halifax, Canadá. **Invited Talk:** Robust estimators in heteroscedatic regression models with applications to the estimation of the reflectance of crops with NOAA-AVHRR data.
- 1999. Workshop on Statistical Methodology for the Sciences: Environmetrics and Genetics. Ascona, Switzerland. 23-28 May. **Invited Talk:** A robust approach to common principal components.
- 2001. International Conference on Contemporary Data Analysis: Theory and Methods. Buenos Aires, Argentina, 5-9 March. **Invited Talk:** Robust estimators in semiparametric regression.
- 2002. International Conference on Robust Statistics (ICORS 2002), Vancouver, Canada, 12-18 May. **Invited Talk:** Robust estimators in partly linear models.
- 2002. International Conference On Current Advances And Trends In Nonparametric Statistics, Crete, Grece, 15-19 July. **Invited Talk:** Robust Procedures for Semiparametric Partly Linear Autoregression.
- 2003. International Conference on Robust Statistics (ICORS 2003) Antwerp, Belgium, 13-19/07. Invited Talk: Robustness in Semiparametric Partly Linear Models.
- 2004. International Conference on Robust Statistics (ICORS 2004) Beijing, China, 12-17/07. **Invited Talk:** Reweighted estimators for the common principal components model: Influence functions and Monte Carlo study.

• 2006. Workshop on Robustness and Statistical Inference, In Honour of Victor Yohai, Universidad Carlos III de Madrid, Spain, 4 and 5 October. **Invited Talk:** Robust estimators in Generalized Partially Linear Models.

- 2008. Annual Meeting from the Unión Matemática Argentina. Mendoza, Argentina, 25-27 September. Invited Talk: Robust methods in partial linear regression models.
- 2008. International Workshop on Flexible Modelling: Smoothing and Robustness, FMSR 2008, Leuven, Belgium, 12-14 November. Invited Speaker: Robust procedures in generalized partially linear models.
- 2009. X Congreso Dr. Antonio Monteiro. Bahía Blanca, Argentina, 27-29 May. Invited Speaker: Common principal components: A robust approach.
- 2009. International Conference on Robust Statistics (ICORS 2009) Parma, Italy, 14-19 June. **Invited Talk:** Robust methods in semiparametric estimation with missing responses.
- 2009. 27th European Meetings of Statisticians (EMS 2009) Toulouse, France, 20-24 July. **Invited Talk:** A robust approach to test in semiparametric models.
- 2010. Interface Functional and Longitudinal Data Analysis Workshop. Research Triangle Park, North Carolina, 8-10 November. Invited Talk: Robust functional principal components: A projection pursuit approach.
- 2011. XIX Annual Meeting of the Portuguese Statistical Society, Nazaré, Portugal. 28 September to October 1st. Plenary Speaker: Some recent results in functional data analysis.
- 2012. 2nd Institute of Mathematical Statistics Asia Pacific Rim Meeting, Tsukuba, Japan, 2 to 4 July. Invited speaker at the Distinguished Lecturer session on Dimension Reduction for Functional Data: Robust estimators under a functional common principal components model.
- 2012. X CLATSE, Congreso Latinoamericano de Sociedades de Estadística, Córdoba, Argentina, 16 to 19 October. **Opening Conference**: Robust inference for functional data.
- 2013. VI International Conference of the ERCIM Working Group on Computing & Statistics (ERCIM2013). London, United Kingdom, 14 to 16 December. Invited talk at the session ES16 "Nonparametric and robust statistics": Robust estimators under a semi-functional partly linear model.
- 2014. II ISNPS (International Society of Non Parametric Statistics) Conference. Cádiz, Spain, 12 to 16 June. Invited talk at the session on "Robustness in Nonparametric Statistics": Robust estimators in additive models with missing responses.
- 2014. IWFOS 2014 (Third International Workshop on Functional and Operatorial Statistics). Stresa, Italy, 19 to 21 de June. **Invited Speaker:** Robust Inference in functional data analysis using S-estimators.
- 2016. XIV CLAPEM-2016 (Latin American Congress of Probability and Mathematical Statistics).
 San José, Costa Rica, 5 al 9 de Diciembre. Plenary Speaker: Robust inference in functional data analysis.
- 2017. Workshop Celebrating for Peter Rousseeuw 60th Birthday. Leuven, Belgium, 31 May to June 2. **Invited Talk:** Marginal estimation under a general regression model with missing responses and covariates.
- 2017. International Conference on Robust Statistics (ICORS 2017). Wollongong, Australia, 3 to 7 July. **Keynote Speaker:** Robust inference in functional data analysis.

• 2019. International Conference on Robust Statistics (ICORS 2019)-4th Latin American Conference on Statistical Computing (4th LACSC). Guayaquil, Ecuador, 28 to 31 May. Invited talk at the session EO230 "Robust methods: advances and applications" organized by Vanda Milheiro Lourenço: Robust B-splines estimators in partly linear regression under monotony constraints.

- 2020. AGRANDA 2020 Simposio Argentino de Ciencia de Datos y GRANdes DAtos. Buenos Aires, Argentina, 19 to 30 October. **Invited Talk:** Robust Inference: From the finite to the infinite—dimensional setting.
- 2021. International Conference on Robust Statistics (ICORS 2021). Viena, Austria, 21 to 24 September. Invited talk at the session IS1 "Robustness for functional data" organized by Stefan Van Aelst: A robust smoothed approach to functional canonical correlation analysis.
- 2021. LXX Reunión Anual, Unión Matemática Argentina, VIRTUMA2021, Argentina, 20 to 24 September. Plenary Speaker (Conferencia Rey Pastor): Robust methods based on B-splines for functional regression models.
- 2021. XV Congreso Gallego de Estadística e Investigación de Operaciones (XV SGAPEIO), Santiago de Compostela, Spain, 4 to 6 November. Plenary Speaker: Robust methods for functional data based on sieves and penalizations.
- 2022. II Encuentro RSME-UMA, Ronda, Spain, 12 to 16 December. Plenary Speaker: Estimation of conditional ROC curves.
- 2023. IX Congreso de Matemtica Aplicada, Computacional e Industrial (MACI 2023), 8 to 11 May, Santa Fé, Argentina. Plenary Speaker: Robust estimators in functional quadratic regression models.

Invited Seminars at Academic Units

- 1982. Swiss Federal Institute of Technology. Zurich, Suitzerland. **Seminar:** Robust Methods in Principal Component Analysis.
- 1997. Instituto de Matemática, Universidade Federal do Río de Janeiro. July. **Seminar:** Robust Kernel Estimators for additive Models under Dependent Observations.
- 1998. Instituto Argentino de Matemática, CONICET. Buenos Aires. November. Seminar: Robus estimation in heteroscedastic regression models.
- 1999. Center for Statistics. Limburgs Universitair Centrum. Diepenbeek. Belgium. 31 May. **Seminar:** High breakdown point estimators in heteroscedastic regression models.
- 2000. Institut de Statistique et de Recherche Opérationelle. Université Libre de Bruxelles, Brussels, Belgium. 4 February. **Seminar:** Robust estimators for common principal components and proportional models.
- 2000. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 28 February. **Seminar:** Robust estimators for common principal components and proportional models.
- 2001. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 17 May. **Seminar:** Robust estimators for partly linear models.
- 2002. Department of Statistics. University of California at Davis, Davis, USA. 6 February. Seminar: Robust estimators for proportional models.

• 2002. Department of Mathematics. University of Indiana at Bloomington, Bloomington, USA. 13 February. **Seminar:** Robust estimators in partly linear models.

- 2003. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 21 May. **Seminar:** Robust Procedures for Semiparametric Partly Linear Autoregression.
- 2003. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 3 December. Seminar: Robust tests in semiparametric partly linear models.
- 2005. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 13 January. Seminar: Robust bandwidth selectors in semiparametric partly linear regression models.
- 2005. Departamento de Estadística, Universidad Carlos III, Madrid, Spain. 26 January. Seminar: Reweighted estimators for the common principal components model: Influence functions and Monte Carlo study.
- 2005. Departamento de Informática, Universidad de La Coruña, La Coruña, Spain. 10 February. Seminar: Robust bandwidth selectors in semiparametric partly linear regression models.
- 2005. Departamento de Estadística e Investigación Operativa, Universidad de Santiago de Compostela, Santiago de Compostela, Spain. 16 February. Seminar: Reweighted estimators for the common principal components model: Influence functions and Monte Carlo study.
- 2006. Departamento de Estadística e Investigación Operativa, Universidad de Vigo, Vigo, Spain. 2 February. **Seminar:** Regiones de tolerancia robustas multivariadas.
- 2006. Departamento de Estadística e Investigación Operativa, Universidad de Santiago de Compostela, Santiago de Compostela, Spain. 6 February. Seminar: Estimadores robustos en modelos parcialmente lineales generalizados.
- 2006. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 15 February. Seminar: Robust tolerance regions.
- 2008. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 22 February. Seminar: Robust estimators in Generalized Partially Linear Models.
- 2008. Departamento de Estadística e Investigación Operativa, Universidad de Santiago de Compostela, Santiago de Compostela, Spain. 7 March. Seminar: Robust estimators in Generalized Partially Linear Models.
- 2008. Instituto de Matemática Aplicada del Litoral. Santa Fé, Argentina. 15 August. Seminar: Robust methods in Generalized Partially Linear Models.
- 2009. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 29 January. Seminar: Robust inference in Generalized Partially Linear Models.
- 2009. Departamento de Estadística e Investigación Operativa, Universidad de Santiago de Compostela, Santiago de Compostela, Spain. 16 July. Seminar: Robust estimators in functional principal component analysis.
- 2009. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 28 July. **Seminar:** Robust methods in semiparametric estimation with missing responses.
- 2009. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 21 October. Seminar: Robust estimators for functional principal components.

• 2009. Department of Statistics from the University of British Columbia, Canada. 24 November. van **Eeden Lecture**: Robust estimators in functional principal components.

- 2010. Departamento de Estadística e Investigación Operativa, Universidad de Santiago de Compostela, Santiago de Compostela, Spain. 18 February. Seminar: Robust methods in semiparametric estimation with missing responses.
- 2010. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 21 July. **Seminar:** Robust inference in generalized linear models with missing responses.
- 2010. Department of Statistics from the University of British Columbia, Canada. 23 November. Seminar: Robust Inference in Generalized Linear Models with Missing Responses.
- 2011. Departamento de Estadística e Investigación Operativa, Universidad de Santiago de Compostela, Santiago de Compostela, Spain. 24 February. **Seminar:** Robust Inference in Generalized Linear Models with Missing Responses.
- 2012. Departamento de Estadística e Investigación Operativa, Universidad de Santiago de Compostela, Santiago de Compostela, Spain. 23 February. Seminar: Robust estimators under a functional common principal components model.
- 2013. Instituto Superior Técnico, Universidad Técnica de Lisboa, Lisbon, Portugal. 28 February. Seminar: S-estimators for functional principal component analysis.
- 2013. Departament of Mathematics from the École Polytechnique de Lausanne, Lausanne, Switzerland. 8 March. Seminar: Robust inference for functional data.
- 2014. Departamento de Estadística e Investigación Operativa, Universidad de Santiago de Compostela, Santiago de Compostela, Spain. 4 June. Seminar: Functional robust principal components with S-estimators.
- 2014. Departamento de Estadística, Universidad de Padua, Italia. 11 December. **Seminar:** Robust inference and outlier detection in functional data analysis using S-estimators.
- 2016. Facultad de Ciencias Económicas y Empresariales, Universidad de Vigo, Spain. 9 March. Seminar: Robust inference procedures in functional data analysis
- 2017. Facultad de Ciencias Económicas y Empresariales, Universidad de Vigo, Spain. 31 March. **Seminar:** Marginal estimation under a general regression model with missing responses and covariates.
- 2019. Facultad de Ciencias Económicas y Empresariales, Universidad de Vigo, Spain. 7 February. Seminar: Robust logistic regression with sparse predictor variables.
- 2019. CEMAT y Departamento de Matemática, Universidad de Lisboa, Lisboa, Portugal. 6 March. Seminar: Robust logistic regression with sparse predictor variables.
- 2019. Departamento de Estadística. Universidad Carlos III de Madrid. 8 March. **Seminar:** Robust logistic regression with sparse predictor variables.
- 2019. Facultad de Ciencias Económicas y Empresariales, Universidad de Vigo, Spain. 20 November. Seminar: Robust B-splines estimators for semi-functional linear regression models.
- 2019. Departamento de Estadística, Análisis Matemático y Optimización, Universidad de Santiago de Compostela, Santiago de Compostela, Spain. 10 December. Seminar in the frame of the Workshop Innpar2D: Robust B-splines estimators in generalized partly linear regression under monotone constraints.

• 2020. Facultad de Ciencias Económicas y Empresariales, Universidad de Vigo, Spain. 12 March. **Seminar:** A robust approach to ROC curves with covariates.

- 2021. Facultad de Ciencias Económicas y Empresariales, Universidad de Vigo, Spain. 18 November. **Seminar:** Robust estimation in functional canonical correlation using penalizations.
- 2022. Facultad de Ciencias Económicas y Empresariales, Universidad de Vigo, Spain. 1 December. Seminar: Robust estimators in functional quadratic regression.
- 2023. Facultad de Ciencias Económicas y Empresariales, Universidad de Vigo, Spain. 16 November. **Seminar:** Threshold detection under a semiparametric regression model.
- 2024. CEMAT and Departamento de Matemática, Universidad de Lisboa, Lisboa, Portugal. 21 February. Seminar: Addressing robustness in covariate specific ROC curves.
- 2024. Departamento de Estadística, Análisis Matemático y Optimización de la Universidad de Santiago de Compostela, Santiago de Compostela, Spain. 5 March. Seminar: An overview on compositional data.
- 2024. Facultad de Ciencias Económicas y Empresariales, Universidad de Vigo, Spain. 16 March. Seminar: Robust estimation for functional logistic regression models based on basis expansions.

Collaborators since 2010

- 1. Claudio Agostinelli, Universitá di Trento
- 2. Agustín Alvarez, Universidad de General Sarmiento (Former PhD. Student)
- 3. Conceicao Amado, Universidad de Lisboa
- 4. Lucas Bali, Universidad Nacional de San Martín and YPF (Former PhD. Student)
- 5. Ana Bianco, CONICET and Universidad de Buenos Aires
- 6. Ricardo Cao, Universidad de la Coruña
- 7. Gonzalo Chebi, Universidad de Buenos Aires and ASAPP (Former PhD. Student)
- 8. Wenceslao González-Manteiga, Universidad de Santiago de Compostela
- 9. Nadia Kudraszow, CONICET and Universidad de La Plata
- 10. Juan Carlos Pardo-Fernández, Universidad de Vigo
- 11. Alejandra Martínez, Universidad Nacional de Luján and CONICET (Former PhD. Student)
- 12. Ana Perez-González, Universidad de Vigo
- 13. Isabel Rodrigues, Universidad de Lisboa
- 14. Daniela Rodriguez, CONICET and Universidad de Buenos Aires (Former PhD. Student)
- 15. Marcelo Ruiz, Universidad Nacional de Río Cuarto (Former PhD. Student)
- 16. Matías Salibián-Barrera, University of British Columbia
- 17. Mariela Sued, CONICET and Universidad de Buenos Aires

- 18. David Tyler, Rutgers University
- 19. Alejandra Vahnovan, Universidad de La Plata (Former PhD. Student)
- 20. Pablo Vena, Universidad de Buenos Aires and MUTT Data (Former PhD. Student)
- 21. Jane-Ling Wang, University of California at Davis
- 22. Rubén Zamar, University of British Columbia