Nicolás J. Hernández Banadik

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RESEARCH INTERESTS

Statistical inference and Machine Learning for high-dimensional and functional data; Functional Time Series forecasting, uncertainty quantification and outlier detection. Areas of application: the environment, demography, energy, economics, business, finance, health and genetics.

ACADEMIC BACKGROUND

Ph.D. in Statistics 2019
University Carlos III of Madrid, Spain

- Dissertation title: "Statistical learning methods for functional data with applications to prediction, classification and outlier detection" - Cum Laude Honours.
- Advisor: Alberto Muñoz García.

M.Sc. in Business and Quantitative Methods 2015
University Carlos III of Madrid, Spain.

- Dissertation Topic: "Deep Bootstrap Predictions for Univariate, Multivariate and Functional Time Series".
- Advisor: Juan Romo Urroz.

B.Sc. in Economics 2011
https://www.ort.edu.uy/University ORT, Uruguay

- GPA: 8.8/Top 5%

EMPLOYMENT HISTORY

Semior Rsearch Fellow 2021 - Present
Department of Statistical Science, UCL, London, UK

- Research project: "Statistical Inference for High-Dimensional and Functional Data", Institute of Mathematical and Statistical Science (IMSS) Grant.
- Group Leader: "High-Dimensional and Functional Data" research group

Research Associate 2019 - 2021
MRC-BSU, University of Cambridge

- Research associate on Statistical–OMICS
- Post-doc supervisor: Dr. Jennifer Asimit

Teaching & Research Assistant 2013 - 2019
University Carlos III of Madrid, Spain

Senior Research Analyst 2010 - 2013
CPA Ferrere, Uruguay.
Projects:

- Fraud detection models for the National Customs Agency of Uruguay
- Development of an econometric model to estimate the likelihood of underreported income by employees in the manufacturing sector, through the processing of the National Household Survey.

- Estimation of econometric models to develop a Fiscal Risk Map to detect fraudulent companies for the Government Taxation Office (DGI).
- Design of the sample for the survey of net energy consumption in the industrial sector for the Ministry of Industry and Energy.
- Impact analysis on financial inclusion of banking policies.
- Socio–economic impact assessment of a great economic significance iron mining project in Uruguay.
- Estimation of housing demand for low income households of the Institute of Social Security Housing Program.
- Technical Report of the Credit Card Market, analysing the regulatory, efficiency and equity aspects

Research Assistant 2009
CIU (Uruguayan Chamber of Industry), Uruguay
- RA in the Business Development Department.
- Processing and analysis of surveys and monitoring of companies.

Research Assistant 2008 - 2009
ANII (National Research and Innovation Agency, Uruguay), Uruguay
- RA in the oversight and evaluation office.
- Evaluation of research and innovation programmes designed and executed by ANII.

SPECIAL ACHIEVEMENTS

Awards
- *Early Career Development Travel Grant.* Faculty of Mathematical Physical Science, UCL, 2022. £600
- *Doctoral research stay grant (PPI).* Universidad Carlos III de Madrid, 2018. €4000
- *Scholarship for the CRoNoS Summer Course on Functional Data Analysis (Iasi , 2018).* CRoNoS, IASC-ISI, €500
- *Scholarship for the CRoNoS Summer Course on Multivariate Data Analysis (Cyprus, 2018).* CRoNoS, IASC-ISI, €500
- *Scholarship for Doctoral studies (PIF).* Universidad Carlos III de Madrid, 2015 - 2019. €20000 per year.
- *Scholarship for postgraduate studies.* Universidad Carlos III de Madrid, 2013 - 2015. €20000 per year.

Invited Talks (selection)
- "Simultaneous predictive bands for functional time series using minimum entropy sets". Torcuato Di Tella (Argentina), Mathematics and Statistics seminar series (Online talk), December 2022.
- "Domain selection for Gaussian Processes". ERIC Lab, University Lyon 2, France - 05/2021
- "Predictive confidence bands using minimum entropy sets. ERCIM, Pisa, Italy - 12/2018.

Professional Activities

Reviewer for

- AISTAT 2023. Proceedings of Machine Learning Research - Artificial Intelligence and Statistics;
- Bayesian Analysis;
- Neurocomputing
- Journal of Applied Sciences;
- Entropy;
- ESANN 2019. Proceedings of the European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning.

RESEARCH FUNDING (@UCL)

Research @UCL focusses on machine learning and statistical methods for high-dimensional and functional data problems.

Institute of Mathematical and Statistical Science Fellowship 2021-2024

- Research project: "Statistical Inference for High-Dimensional and Functional Data".
- Role: PI

TEACHING

@UCL

- *Probability, Statistics and Inference.* *2022*

@University of Cambridge

- *Lecturer of the Cohort Analysis module in MPhil in Population Health Sciences.* *2020*
  25 students at master degree level.

@University Carlos III of Madrid

- *Lecturer in Quantitative Methods in Management.* *2015-2021*
  Rate 3.84/5. It was a 1 week introductory course of Statistics for management in the Master in Business Administration, approx 30 students (depending the year).

- *TA (practicals) in Statistics. Engineering Program for International Students and BSc in Business Studies.* *2015-2019*
  Rate 4.54/5. The course revolved around probability, discrete and continuous RV and probability models. 30 students (depending the year and degree). Undergraduate level.

- *Lecturer in Prediction Techniques and Time Series Analysis. BSc in Statistics; BA International Studies.* *2015-2019*
  Rate 4.86/5. 30 students approx, (depending the year and degree). Undergraduate level.

@University ORT

- *TA in Economics and Mathematical Economics.* *2009-2013*
  30 students approx, (depending the year and degree). Undergraduate level.

STUDENT SUPERVISION (@UCL)

- Sharon Schmidt-Burkhardt, 'Simulation, Estimation, Prediction methods for functional time series: a benchmark approach'. MSc in Data Science, 2022, Statistical Science, UCL - 1st Supervisor.

CONFERENCE CONTRIBUTIONS

1. "Domain Selection for Gaussian Processes" *24th International Conference on Computational Statistics*, University of Bologna, Italy. August, 2022.
2. "A Flexible and Shared Information Fine-mapping Approach with an application to 33 cardiometabolic traits from a Ugandan cohort". (ePoster). *Conference of the European Society of Human Genetics*, August, 2021.
3. "Forecasting Functional Time Series under a Reproducing Kernel Hilbert Space Model". *CM-Statistics – ERCIM*, Pisa, Italy, December, 2018.
4. "Domain selection For functional Data Classification". *CRoNoS Summer Course on Functional Data Analysis (FDA 2018)* , Iasi, Romania, August, 2018.
5. "A novel domain selection to boost classification problems in Functional Data". *1st CRoNoS International Workshop on Multivariate Data Analysis (MDA 2018)* , Limassol, Cyprus, April, 2018.
6. "Domain selection For functional Data Classification". *11th International Conference on Computational and Financial Econometrics (CFE 2017)*, London, UK, 2017.
7. "Kernel Depth Function for Functional Data" (Poster). *Statlearn'17 - 8th Statlearn workshop a conference of the French Society of Statistics (SFdS)*, Lyon, France, April 2017.
8. "Kernel Depth Functions for Functional Data with Application to Outlier Detection". *25th International Conference on Artificial Neural Networks*, Barcelona, Spain, September, 2016.

PUBLICATIONS

1. **Hernández, N.**, et al. "The flashfm approach for fine-mapping multiple quantitative traits." Nature Communications 12.1 (2021): 1-14.
2. Martos, G., **Hernández, N.**, Muñoz, A. Moguerza, J. M. (2018). "Entropy Measures for Stochastic Processes with Applications in Functional Anomaly Detection". Entropy, 20(1), 33.
3. Muñoz, A., **Hernández, N.**, Moguerza, J. M. Martos, G. (2018). "Combining entropy measures for anomaly detection". Entropy, 20(9), 698.
4. **N. Hernández**, A. Muñoz. (2016). "Kernel Depth Measures for Functional Data with Application to Outlier Detection". Lecture Notes in Computer Science, vol 9887, pp 235-242.