

Roi Naveiro

TERNURE TRACK ASSISTANT PROFESSOR · QUANTITATIVE METHODS DEPARTMENT, CUNEF UNIVERSITY

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Education

PhD in Statistics and Operations Research. ICMAT - Institute of Mathematical Sciences from the Spanish Research Council and Complutense University of Madrid

Madrid, Spain

CUM LAUDE AND INTERNATIONAL DISTINCTIONS

2016 - 2020

- Advisors: Professor David Ríos Insua (ICMAT) and Professor David Gómez-Ullate (IE University)

Masters degree in theoretical physics. Complutense University of Madrid

Madrid, Spain

GPA: 9.2/10

2015 - 2016

- Thesis title: *Fraud Detection in Electronic Payments*.
- Thesis advisor: David Gómez-Ullate Oteiza (University of Cádiz & Complutense University of Madrid)

Bachelor degree in physics. University of Salamanca

Salamanca, Spain

GPA: 9.07/10

2011 - 2015

- Thesis title: *Resolution of the Nucleon-Nucleon scattering problem using the N/D method*
- Thesis advisor: David Rodríguez Entem (University of Salamanca)

Professional Experience

2022- **Ternure Track Assistant Professor**, CUNEF University, Madrid

2021- **Scientific Advisor**, Aitenea Biotech S.L.

2020-2022 **Postdoctoral Fellow**, Institute of Mathematical Sciences from the Spanish Research Council (ICMAT-CSIC)

2016-2020 **PhD Student**, Institute of Mathematical Sciences from the Spanish Research Council (ICMAT-CSIC)

2015 **Research Assistant**, Astrophysical Institute of the Canary Islands, Tenerife, Canary Islands, Spain

2014-2015 **Undergraduate Research Assistant**, Institute of Fundamental Physics and Mathematics, Salamanca, Spain

Research Stays

2023 Jan – **Middlebury College, Middlebury, Vermont USA**, Working with Prof. Becky Tang. Middlebury, VT, USA

2022 Mar – **Texas State University, Austin, Texas, USA**, Working in project “Poisoning Hidden-Markov-Model Inferences on Batch Data” with Prof. Tahir Ekin. Funded by *European Office of Aerospace Research and Development (EOARD)*. Austin, TX, USA

2021 Apr – **Statistical and Applied Mathematical Sciences Institute (SAMSI) and Department of Statistical Science, Duke University**, Working in research programs on Deep Learning and Games, Decisions, Risk and Reliability. Durham, NC, USA

2018 Aug – **Department of Statistical Science, Duke University**, Working with Prof. David L. Banks. Durham, NC, USA

Publications

* *equal contribution*

PUBLISHED PAPERS

Adversarial Machine Learning: Bayesian Perspectives (2023). Ríos Insua, D.*, **Naveiro, R.***, Gallego, V.*, & Poulos, J. *Journal of the American Statistical Association*. <https://doi.org/10.1080/01621459.2023.2183129>

Augmented Probability Simulation Methods for Sequential Games (2023). Ekin, T., **Naveiro, R.***, Insua, D. R.*, & Torres-Barrán, A.* *European Journal of Operational Research*. <https://doi.org/10.1016/j.ejor.2022.06.042>

- Design of new dispersants using machine learning and visual analytics (2023). Jimena, M.*, **Naveiro, R.*** et. al. *Polymers*. <https://doi.org/10.3390/polym15051324>
- Deep learning for novel drug development (2023). **Naveiro, R.***, Martínez, M. J., Soto, A., Ponzoni, I., Ríos Insua, D. & Campillo, N. E. *Cheminformatics, QSAR and Machine Learning applications for Novel Drug Development*. Elsevier (To appear).
- Statistical Challenges in Automated Driving Systems (2023). Caballero, W.*, **Naveiro, R.***, & Ríos Insua, D.* *Applied Stochastic Models in Business and Industry*. (To appear).
- Augmented probability simulation for adversarial risk analysis in general security games (2022). **Naveiro, R.**, Insua, D. R., & Camacho, J. M. *Defense and Homeland Security Simulation Workshop*. I3M. <https://www.cal-tek.eu/proceedings/i3m/2022/dhss/002/pdf.pdf>. **Best Paper Award**.
- Evaluation of female sexual health in routine gynaecological practice (2022). Fuentes, M. N., Villena, R. B., **Naveiro, R.**, Sánchez, M. H., Roca, L. C., & Parra, J. F. *Clínica e Investigación en Ginecología y Obstetricia*, 49(3), 100768. <https://doi.org/10.1016/j.gine.2022.100768>
- Managing Driving Modes in Automated Driving Systems (2022). Ríos Insua, D.*, Caballero, W.*, & **Naveiro, R.*** *Transportation Science*, 0(0). <https://doi.org/10.1287/trsc.2021.1110>
- Modeling Ethical and Operational Preferences in Automated Driving Systems (2022). Caballero, W., **Naveiro, R.** & Ríos Insua, D. *Decision Analysis*, 19(1):21–43. <https://doi.org/10.1287/deca.2021.0441>. **Finalist of the 2022 Clemen-Kleinmuntz Decision Analysis Best Paper Award**
- Towards Acceptance of Automated Driving Systems (2021). Jamson, S. L., Risvas, K., **Naveiro, R.**, et. al. *5th Int. Conf. on Computer-Human Interaction Research and Applications (CHIRA 2021)*, 232–239. <https://www.scitepress.org/Papers/2021/107213/107213.pdf>.
- Challenge 8: Smart Cybersecurity (2021). Arroyo Guardado, D., Brox Jiménez, P., Godoy, J. A., Villagra, J., Mueller, H., Gallego, V., Kosgodagan, A., **Naveiro, R.**, et. al. *White Papers. CSIC Scientific Challenges: Towards 2030*, vol. 11.
- Adversarial attacks against Bayesian forecasting dynamic models (2021). **Naveiro, R.** *22nd European Young Statisticians Meetings (EYSM 2021)*. <https://www.eysm2021.panteion.gr/publications.html>
- AI in drug development: a multidisciplinary perspective (2021). Gallego, V., **Naveiro, R.**, Roca, C. et al. *Molecular Diversity*, 25(3):1461–1479. <https://doi.org/10.1007/s11030-021-10266-8>
- Perspectives on Adversarial Classification (2020). Ríos Insua, D.*, **Naveiro, R.***, & Gallego, V.* *Mathematics*, 8(11):1957. <https://doi.org/10.3390/math8111957>
- Adversarial Risk Analysis (Overview) (2020). Banks, D.*, Gallego, V.*, **Naveiro, R.***, & Ríos Insua, D.* *WIREs Comput Stat*, e1530, 1–16. <https://doi.org/10.1002/wics.1530>
- Hydroxicloroquine for pre-exposure prophylaxis for SARS-CoV-2 (2020). Lopez de la Iglesia, J., Cubelos, N., **Naveiro, R.**, et. al. *Current Trends in Medicine*, 2(1):9–18. <https://doi.org/10.47726/ctm.1003>
- Adversarial Classification: An adversarial Risk Analysis approach (2019). **Naveiro, R.**, Redondo, A., Insua, D. R., & Ruggeri, F. *International Journal of Approximate Reasoning*, 113: 133–148. <https://doi.org/10.1016/j.ijar.2019.07.003>
- Large Scale Automated Forecasting for Monitoring Network Safety and Security (2019). **Naveiro, R.**, Rodríguez, S., & Ríos Insua, D. *Applied Stochastic Models in Business and Industry*, 35: 431–447. <https://doi.org/10.1002/asmb.2436>
- Gradient Methods for Solving Stackelberg Games (2019). **Naveiro, R.**, & Ríos Insua, D. In: Pekeč S., Venable K.B. (eds) *Algorithmic Decision Theory. Lecture Notes in Computer Science*, 11834: 126–140. Springer, Cham.
- Reinforcement Learning under Threats. (2019). Gallego, V., **Naveiro, R.**, & Ríos Insua, D. *Proceedings of the AAAI Conference on Artificial Intelligence*, 33(01): 9939–9940. <https://doi.org/10.1609/aaai.v33i01.33019939>

PUBLISHED BOOKS

¿Qué sabemos de Análisis de Riesgos? (2022). Ríos Insua D. & **Naveiro R.** *CSIC-La Catarata*. ISBN: 978-84-1352-458-0.

UNDER REVIEW

Adversarial Risk Analysis for Heterogeneous Traffic Management (2022). Caballero, W.*, **Naveiro, R.*** & Ríos Insua, D.

Poisoning Hidden-Markov-Model Inferences on Batch Data (2022). Camacho, J. M.*, Caballero, W.*, Ekin, T., & **Naveiro, R.***

Protecting Classifiers from Attacks. A Bayesian Approach (2021). Gallego, V.*, **Naveiro, R.***, Ríos Insua, D.*, & Ruggeri, F. *arXiv preprint arXiv:2004.08705*.

Data Sharing Games (2020). Gallego, V.*, **Naveiro, R.***, Ríos Insua, D.*, & Rozas W. *arXiv preprint arXiv:2101.10721*.

Opponent Aware Reinforcement Learning (2019). Gallego, V., **Naveiro, R.**, & Ríos Insua, D. *arXiv preprint arXiv:1809.01560*.

Research and Transference Projects

AS PRINCIPAL INVESTIGATOR

Jan 2023 – Jul 2023	Development and identification of new MILLAD-type clarifying molecules. , Industrial Partners: Altenea Biotech and Repsol.	5,000 €
Jun 2022 – Nov 2022	TECA Project. , Industrial Partner: DISID CORPORATION.	21,945.6 €
Oct 2021 – Feb 2022	Unit risk modeling and risk accumulation derived from cybersecurity for the development of version 4 of the DeRISK product. , Industrial Partner: DENEXUS TECH, S.L.	37,382 €
Jan 2021 – Dec 2021	Machine Learning for dispersants discovery. , Industrial Partners: Altenea Biotech and Repsol.	10,000 €
Mar 2021 – Oct 2021	Adversarial Risk Analysis for competitive decision making. , Industrial Partners: EVERIS Spain SLU y CaixaBank.	60,000 €

AS INVESTIGATOR

Jan 2023 – Dec 2025	A new paradigm for Adversarial Machine Learning. , Funding Entity: MICINN. Spanish Ministry of Science, Innovation and Universities.	62,000 €
Sep 2021 – Aug 2023	Robust Command and Control under Adversarially Perturbed Data. Acronym: RC2APD. , Funding Entity: EOARD. Reference: 13324227.	58.700 \$
Jul 2021 – Jul 2023	Hardening JADC2 to Adversarial Data: Theory, Algorithms and Applications. , Funding Entity: Air Force Office of Scientific Research (AFOSR).	260.000 \$
Apr 2020 – Apr 2022	Adversarial Machine Learning: Methods, Computations and Applications to Malware, Fake News and Autonomous Vehicles. , Funding Entity: BBVA Foundation.	100,000 €
May 2019 – Jul 2022	TRUSTONOMY. Building acceptance and trust in autonomous mobility. , Program: Horizon 2020: Smart, Green and Integrated Transport. Ref: 815003. European Commission.	3,920,000 €
Sep 2019 – Sep 2021	Content Recommender Based on a User's Digital Profile. , Industrial Partner: XEERPA MARKETING SOLUTIONS, SL.	90,750 €
Jan 2018 – Dec 2021	Advances in Risk Analysis for Security. , Funding Entity: MICINN. Spanish Ministry of Science, Innovation and Universities. Reference: MTM2017-86875-C3-1-R.	32,186 €
Oct 2018 – Dec 2018	Innovative platform for Proximity Marketing and Payments at the Point of Sale, based on Bluetooth LE technology, which communicates with the user in a personalized way, in real time, in the right moment of the purchase decision and in the right place. , Industrial Partner: SIEM, Software & Security Services, SL.	30,000 €
May 2017 – Apr 2019	Explora JUDIES: Stochastic Differential Games: Breaking Fifty Years of the Paradigm. , Funding Entity: MICINN. Spanish Ministry of Science, Innovation and Universities. Reference: MTM2015-72907-EXP.	25,000 €
Jan 2017 – Jul 2017	Cyber-risks evaluation. , Industrial Partner: LEAP IN VALUE, SL.	31,127.25 €
Sep 2014 – Aug 2022	Adversarial Risk Analysis. , Funding Entity: AXA RESEARCH FUND.	1,176,000 €

Awards, Fellowships, & Grants

- 2023 **Finalist of the 2022 Clemen–Kleinmuntz Decision Analysis Best Paper Award. Paper: Modeling Ethical and Operational Preferences in Automated Driving Systems**, INFORMS
- 2022 **Award for best doctoral thesis on basic research in artificial intelligence**, AIHUB from the Spanish National Research Council
- 2022 **Best paper award. Paper: Augmented probability simulation for adversarial risk analysis in general security games.**, Int. Defense and Homeland Security Simulation Workshop
- 2019 **Funding for research stay at the SAMSI and Department of Statistical Science, Duke University, Durham, NC, USA.**, SAMSI and NSF
- 2018 **Funding for short term research scholarship for a research stay at Duke University, Durham, North Carolina, USA.**, Spanish Ministry of Education
- 2016 **FPU scholarship for PhD studies.**, Spanish Ministry of Education
- 2015 **Research scholarship for a research stay at the Astrophysical Institute of the Canary Island, Tenerife, Spain.**, Astrophysical Institute of the Canary Island
- 2014 **Research scholarship for a research stay at the Institute of Fundamental Physics and Mathematics, Salamanca, Spain.**, Spanish Ministry of Education

Presentations

INVITED TALKS

- July 6th 2022 EURO Conference. *Scalable methods for solving games in Adversarial Machine Learning*. Helsinki, Finland.
- June 24th 2022 Advances in Decision Analysis Conference. *Decision Analytic Support in Non-Cooperative Sequential Games*. Arlington, Virginia, USA.
- June 9th 2022 Spanish Society of Statistics and Operations Research National Congress. *An application of Bayesian methods in materials discovery*. Granada, Spain.
- Abril 25th 2022 Young Online Seminar Series Machine Learning NeEDS Mathematical Optimization. *Adversarial attacks against Bayesian dynamic forecasting systems*.
- Marzo 31st 2022 Texas State University. *Adversarial Machine Learning*. Texas State University, San Marco, Texas, USA.
- March 22nd 2022 Workshop: The Mathematics of Living Matter. Life-Hub CSIC. *Machine Learning for Molecular Design*. ICMAT-CSIC. Madrid, Spain.
- January 22nd 2022 Indoamérica Technological University. *Adversarial Machine Learning: Bayesian perspectives*. Indoamérica Technological University, Quito, Ecuador.
- November 1st 2021 IMI-DSC Conference: Decision, Optimization and Data Science. *Adversarial Machine Learning: a probabilistic approach*. Complutense University of Madrid. Madrid, España.
- September 7th 2021 22nd European Young Statisticians Meeting EYSM 2021. *Protecting classifiers from attacks*. Bernoulli Society for Mathematical Statistics and Probability. Athens, Greece.
- July 7th 2021 WEBINAR: Applications of AI in the discovery of intelligent materials and in the improvement of processes in the chemical industry. *Artificial Intelligence in Lubricant Design*. PET MSO-ED, SusChem-España y Materplat.
- May 28th 2021 Twelfth Workshop on Bayesian Inference in Stochastic Processes. *Bayesian forecasting dynamic models under attacks*. Discussant: Professor Mike West. CNR-IMATI, Milano, Italia.
- November 1st 2019 Institute for Integrating Statistics in Decision Sciences. Dept. of Decision Sciences. George Washington University. *Security Games in the New Paradigm: Solution Techniques*. GWU, Washington D.C., USA.
- June 13th 2019 Eleventh Workshop on Bayesian Inference in Stochastic Processes. *Reinforcement Learning Under Threats*. Royal Academy of Sciences, Madrid, España.

CONTRIBUTED PRESENTATIONS

November 10th 2021 New Bridges between Mathematics and Data Science. *Augmented probability simulation for optimization in adversarial machine learning*. Spanish Network of Industrial Mathematics (Math-In) and University of Valladolid. Valladolid, España.

September 2nd 2021 4th International Congress on Transportation Research ICTR 2021. *Towards ethical decision support in automated driving systems*. Hellenic Institute of Transportation Engineers. Rhodes, Greece.

July 14th 2021 63rd ISI World Statistics Congress, *Managing driving modes in Automated Driving Systems*. International Statistical Institute (ISI).

June 9th 2021 2021 Workshop of the Spanish Society of Statistics and Operations Research *Protecting Classifiers From Attacks*.

October 26th 2019 Algorithmic Decision Theory. *Gradient Methods for Solving Stackelberg Games*. Duke Fuqua School of Business. Duke University, Durham, NC, USA.

August 6th 2019 Games, Decisions, Risk and Reliability Opening Workshop. *Augmented Probability Simulation Methods for Non-cooperative Games* (poster). Statistical and Applied Mathematical Sciences Institute. NC State University, Raleigh, NC, USA.

30 Julio 2019 Second Conference on Risk Analysis in the Digital Era. *Augmented Probability Simulation Methods for Non-cooperative Games* (poster). Society for Risk Analysis. University at Buffalo. Buffalo, NY, USA. Spanish Society of Statistics and Operations Research

30 Mayo 2018 XXXVII Spanish Society of Statistics and Operations Research National Congress. *Adversarial Classification: An Adversarial Risk Analysis approach*. SEIO. Oviedo, Spain.

November 14th 2017 1st Spanish Young Statisticians and Operational Researchers Meeting (SYSORM). *Adversarial Classification: An Adversarial Risk Analysis approach*. Spanish Society of Statistics and Operations Research y University of Granada. Granada, Spain.

June 14th 2017 Bayesian Inference in Stochastic Processes (BISP10). *Monitoring for anomalous behaviour in massive traffic time series*. Bocconi University and International Society for Bayesian Analysis (ISBA). Milano, Italy.

June 8th 2017 Games and Decisions in Risk and Reliability Conference (GD RR). *Fraud detection in electronic payments*. Royal Academy of Sciences. Madrid, Spain.

October 27th 2016 Mathematical Solutions for Industry: Success Stories and perspectives. *Random Forest Algorithm in Fraud Detection* (poster). Institute of Mathematical Sciences (ICMAT-CSIC) y Spanish Network of Industrial Mathematics (Math-In). Madrid, Spain.

Teaching Experience

Fall 2022	Data Analysis for second year undergraduates students of the degree on Economics (60h) , Lecturer. Lecture notes at: https://roinaveiro.github.io/CU-analisis-datos/	CUNEF University
Fall 2022	Introduction to Statistics for first year undergraduates students of the degree on Mathematical Engineer (60h) , Lecturer.	CUNEF University
2021 Jun – 2021 Jul	Course on Bayesian Methods in Artificial Intelligence for last year undergraduate students and master students (10h) , Lecturer. Lecture notes at: https://roinaveiro.github.io/curso-Bayes-JAE/	ICMAT-CSIC, Madrid, Spain
2021 Jun – 2021 Jul	Course on Machine learning: Foundations, Computations and Applications for last year undergraduate students and master students (10h) , Lecturer. Lecture notes at: https://roinaveiro.github.io/curso-ml-JAE/	ICMAT-CSIC, Madrid, Spain
Fall 2020	Probability for undergraduate students in the second year of the degree in Mathematics (15h) , Teaching Assistant	Complutense University

Spring 2019 and 2020	Applications of Stochastic Processes for undergraduate students in the last year of the degree in Mathematics (60h) , Lecturer. Lecture notes available at: https://roinaveiro.github.io/files/apres.pdf	Complutense University
Spring 2019	Machine Learning with R targeted to researchers from the Instituto Nacional de Estadística (National Statistical Institute) (15h) , Lecture notes at: https://github.com/roinaveiro/curso-ml-R	INE, Madrid, Spain
Spring 2018	XII Modelling Week for master students of the Master in Mathematical Engineering (30h) , Teaching assistant	Complutense University

Thesis Supervised

PHD THESIS SUPERVISED

2021-	José Manuel Camacho , PhD Student	ICMAT-CSIC, Madrid, Spain
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MASTERS AND UNDERGRADUATE THESIS SUPERVISED

2022-	Gustavo Rodríguez Rodríguez , MSc on Statistical and Computational Treatment of Information. Awarded with JAE Intro scholarship by the National Research Council.	Complutense University
2021-2022	Eduardo Arrabal López , Undergraduate student on Mathematics. Thesis title: Models for conflict management in heterogeneous traffic situations.	Complutense University
2020-2021	Montserrat Muñoz , MSc on Statistical and Computational Treatment of Information. Thesis title: Latent Dirichlet Allocation Models to characterize users in social networks.	Complutense University

Dissemination Activities

Podcast on Risk Analysis with the Spanish National Research Council (2022). Available at: www.ivoox.com/en/analisis-riesgos-roi-naveiro-audios-mp3_rf_99841809_1.html

The mathematics behind automated driving systems (2022). Ríos Insua, D., & **Naveiro, R.** Journal of the Spanish Royal Academy of Sciences (RACSAM). To appear.

Las matemáticas de las máquinas morales (2021). Ríos Insua, D., & **Naveiro, R.** Article in Café y Teoremas section of El País (Spanish main newspaper). www.elpais.com/ciencia/cafe-y-teoremas/2021-11-26/las-matematicas-de-las-maquinas-morales.html

Que no te den gato por liebre... ¿o sí? (2019). Gallego, V., Gordo, D. & **Naveiro, R.** Article in Café y Teoremas section of El País (Spanish main newspaper). www.elpais.com/elpais/2019/05/29/ciencia/1559146396_616900.html

¿Cómo se ha convertido Matemáticas en la carrera universitaria más popular? (2018). Capel, A., Ocariz, J., **Naveiro, R.**, Contreras, P. Article in Café y Teoremas section of El País (Spanish main newspaper). https://elpais.com/elpais/2018/06/25/ciencia/1529923839_750611.html?rel=mas

5 DIVULGATION TALKS

Outreach & Professional Development

ORGANIZED CONFERENCES

November 3rd 2021 – November 5th 2021. PhD Day organizer at the 7th International Conference on Algorithmic Decision Theory. University of Toulouse 1 Capitole. <https://www.irit.fr/ADT2021/>. Toulouse, France.

June 12th 2019 – June 14th 2019. 11th Workshop on Bayesian Inference in Stochastic Processes. Royal Academy of Sciences, Madrid, Spain.

May 20th 2019 – May 24th 2019. 2nd BYMAT Conference. Institute of Mathematical Sciences ICMAT-CSIC. *BYMAT Network and BBVA Foundation*. <https://www.icmat.es/congresos/2019/BYMAT/>. Madrid, Spain.

May 7th 2018 – May 9th 2018. Co-Founder of 1st BYMAT Conference: Bringing Young Mathematicians Together. ICMAT-CSIC. *BYMAT Network and BBVA Foundation*. Madrid, Spain. <https://www.icmat.es/congresos/2018/BYMAT/>

June 7th 2017 – June 9th 2017. 5th symposium on Games and Decisions in Reliability and Risk. Royal Academy of Sciences. Madrid. Spain.

STUDY GROUPS WITH INDUSTRY

May 15th 2017 – May 19th 2017. European Study Group with Industry: *ESGI 131*. Challenge: *Big Data in Sports: Predictive Models for Basketball Player's Performance*. Basque Centre for Applied Mathematics (BCAM) and Math-In. Bilbao, Spain.

Technical skills

Programming languages: Python, R and Bash.

Machine Learning frameworks: PyTorch, PyTorch Geometric, GPyTorch, TensorFlow, TensorFlow Probability, GPFlow, Graph Nets.

Scripting and markup languages: R Markdown, Quarto, LaTeX and Microsoft Office.

Operating systems: Advanced experience with most flavours of Linux and MacOS.

Databases: MongoDB.