

## PROFESSIONAL SUMMARY

I am currently a Marie Curie Research Fellow and serve as an Applied Skills Support Advisor at the Alan Turing Institute. I am passionate about predictive modelling and its impact on society. I have worked around the different steps of the ML pipeline: data collection [1], data quality [2], preprocessing [3, 4], modeling [5], and monitoring [6, 7].

At the moment, I am researching model monitoring (distribution shift and xAI) and AI alignment (ethics and political philosophy). I am fortunate to have pursued my passions at world-class research and public institutions. In the past, I have also been a statistician at the European Central Bank, a consultant at Deloitte, and an industry researcher at BBC, BSC, CSIC, Schufa, and AEMET, and a professional swimmer. Since 2017, I have won numerous data science competitions (see 4), ranked Top 2 of 2020 in *DataScienceStackExchange*, contributed to large-open source Python packages `category_encoders` and developed my own `skshift`.

## EXPERIENCE

- **The Alan Turing Institute** London, United Kingdom  
*Applied Skill Team* *April 2022 - Now*
  - **Principal Investigator:** Publication about data quality for research projects at NeurIPS'23 Datasets track [1]
  - **Advisory Support:** I provide academic and industry advisory support in the Applied Skill Team for the Turing Data Study Groups and Turing Internship Network. With a focus on research and industry collaboration, I contribute to the development and implementation of cutting-edge projects between academia and industry.
- **Marie Curie Research Fellow** Southampton, United Kingdom  
*University of Southampton* *Feb 2021 - Now*
  - **Phd candidate:** Fellowship granted by the European Commission to the Innovative Training Network of NoBias.
  - **Publications:** NeurIPS'23 [1], AAAI'23 [5], AIES'23 [4], NeurIPS'23 (w) [6], NeurIPS'22 (w) [7], ECMLPKDD'21 (w) [2], IFC [8], MDAI 21 [3], EWAf'23 [9]
  - **Schufa Research Visitor:** Publication at NeurIPS'22 Workshop [7]
  - **University of Pisa Research Visitor:** Publication at AIES'23 [4]
  - **BBC DataLab:** Aligning and monitoring BBC sounds RecSys with editorial values
  - **Senior Tutor:** Teaching courses on Data Science and ML for industry professionals, consultants and startups
- **European Central Bank** Frankfurt, Germany  
*Statistician - Directorate of Statistics* *Jan 2020 - Jan 2021*
  - **Statistician:** Monitoring the quality of statistics on the balance of payments and international investment position, as well as methods and sources in the EU Member States
  - **Machine Learning Engineer:** Developed multiclassification neural network for the National Central Banks and European System of Central Banking
  - **Consulting Management:** End to end management of an applied ML consulting project.
- **Barcelona SuperComputing Center** Barcelona, Spain  
*Applied Learning Methods* *April 2019 - Aug 2019*
  - **Research Data Scientist:** My research focused on machine learning software development for data center optimization and cancer genomics.
- **CSIC-IIIa** Barcelona, Spain  
*National Research Council - Artificial Intelligence Institute* *Jan 2019 - July 2019*
  - **Deep Learning Research Assistant:** Improving and applying Generative Adversarial Networks (GANs) to approach large scale combinatorial optimization problems.
- **Deloitte Robotics** Madrid, Spain  
*Technological Consultant* *Dec 2017 - August 2018*
  - **Team Leader:** Coordinated a team of two developers, a machine learning engineer, and two data analysts applying Cognitive Automation (CA) to the Audit Process. Implementing ML to the extraction (OCR) and the classification of unstructured data. I took part in the delivery of the project where we were able to improve the efficiency and effectiveness of their operations by a 70%.
  - **UiPath Trainer:** UiPath trainer to the international Deloitte's team of Belgium and Netherlands.
  - **Naoqi Developer:** Developing functions for the robots of SoftBank Pepper and Nao for commercial and marketing purposes.
  - **Uipath Developer:** Developer for a leading national banking company where we automated two processes. In the delivery of the project, we obtained automation of 100% and 80% respectively.
- **AEMET** Madrid, Spain  
*National Meteorological Agency* *Sept 2017 - Dec 2017*
  - **Internship:** at the Prediction and Modelling Department with a University collaboration, where I modelled and predicted the atmospheric pollution of the northern side of Italy.

## EDUCATION

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- **University of Southampton** Southampton, UK  
*Phd on Model Monitoring and AI Ethics* *Feb. 2021 – current*
  - : Model Monitoring in the absence of ground truth data via feature attribution explanations.  
Supervised by Steffen Staab
- **Universitat Autònoma de Barcelona** Barcelona, Spain  
*Msc in Mathematical Modelling* *Sept. 2018 – Jul 2019*
- **Universidad Complutense de Madrid** Madrid, Spain  
*Bsc in Physics* *Sept. 2013 – Feb 2018*
- **Saint Paul Preparatory High School** Minnesota, US  
*Internationale baccalaureate*
  - **Honor International Student at Saint Paul Preparatory:** Received a Scholarship for international students with an excellent curriculum (€10,000).

## OTHER RELEVANT INFORMATION

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- **Data Science Stack Exchange:** Top 2 user in 2020 and top 20 all time [Stack Exchange Profile](#)
- **Open Source Python Package Developer:** Main contributor of [category encoders](#) , Main developer of [skshift](#) and [explanationspace](#)
- **Machine Learning Competitions:** :1st BCG Gamma Datathon, 1st at Novartis 2021, 3rd Accenture Health Datathon, 2nd at SpainML Telco-churn and Bronze Medal at Kaggle IEEE-CIS Fraud Detection.
- **Volunteering with Refugees(Athens) - April 2017:** Volunteering experience working alongside war refugees trying to improve their environment
- **Elite Swimming Athlete 2013 -2017:** National recognition for athletes with an outstanding performance. Achievements: Finalist of the Spanish Olympic Trials 2016, 3<sup>rd</sup> Team in Spanish Honor Division, 2012 Minnesota State Champions as Individual & Team. Record holder of several state events.

## TALKS & PRESENTATIONS

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- **Royal Society for Spanish Math:** Beyond Demographic Parity: Redefining Equal Treatment, Jan 2024
- **NeurIPS:** How To Data in Datathons, December 2023
- **Regulatable ML Workshop - NeurIPS :** Necessity of Processing Sensitive Data, December 2023
- **AI Ethics and Society - Montreal:** Fairness Implications of Encoding Protected Attributes, September 2023
- **Bias Workshop - ECMLPKDD :** Fairness Implications of Encoding Protected Attributes, August 2023
- **University of Stuttgart:** Explanation Shift, June 2023
- **AAAI - Washington:** Monitoring Model Deterioration with Explainable Uncertainty Estimation via Non-Parametric Bootstrap, Jan 2023
- **European Central Bank:** Desiderata for Explainable AI at the European Central Bank, March 2022
- **International Finance Corporation (IFC) workshop on AI:** Desiderata for Explainable AI at the European Central Bank, Jan 2022

## REFERENCES

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- [1] Carlos Mougan, Richard Plant, Clare Teng, Marya Bazzi, Alvaro Cabregas Ejea, Ryan Sze-Yin Chan, David Salvador Jasin, Martin Stoffel, Kirstie Jane Whitaker, and Jules Manser. How to data in datathons. *Advances in Neural Information Processing Systems*, 2023.
- [2] Carlos Mougan, Georgios Kanellos, and Thomas Gottron. Desiderata for explainable AI in statistical production systems of the european central bank. In *Machine Learning and Principles and Practice of Knowledge Discovery in Databases - International Workshops of ECML PKDD 2021, Virtual Event, September 13-17, 2021, Proceedings, Part I*, volume 1524 of *Communications in Computer and Information Science*, pages 575–590. Springer, 2021.
- [3] Carlos Mougan, David Masip, Jordi Nin, and Oriol Pujol. Quantile encoder: Tackling high cardinality categorical features in regression problems. In Vicenç Torra and Yasuo Narukawa, editors, *Modeling Decisions for Artificial Intelligence*, pages 168–180, Cham, 2021. Springer International Publishing.
- [4] Carlos Mougan, Jose Alvarez, Salvatore Ruggieri, and Steffen Staab. Fairness implications of encoding protected categorical attributes. In *Proceedings of the 2023 AAAI/ACM Conference on AI, Ethics, and Society*, AIES '23, page 956–966, Montreal, Canada, 2023. Association for Computing Machinery.

- [5] Carlos Mougan and Dan Saattrup Nielsen. Monitoring model deterioration with explainable uncertainty estimation via non-parametric bootstrap. In *AAAI Conference on Artificial Intelligence*, 2023.
- [6] Carlos Mougan, Laura State, Antonio Ferrara, Salvatore Ruggieri, and Steffen Staab. Beyond demographic parity: Redefining equal treatment. In *First Workshop on AI meets Moral Philosophy and Moral Psychology. Neural Information Processing Systems*, 2023.
- [7] Carlos Mougan, Klaus Broelemann, Gjergji Kasneci, Thanassis Tiropanis, and Steffen Staab. Explanation shift: Detecting distribution shifts on tabular data via the explanation space. In *NeurIPS 2022 Workshop on Distribution Shifts: Connecting Methods and Applications*, 2022.
- [8] Carlos Mougan, Thomas Gottron, Georgios Kanellos, Johannes Micheler, and José Martínez. Introducing explainable supervised machine learning into interactive feedback loops for statistical production systems. In Bank for International Settlements, editor, *Data science in central banking: applications and tools*, volume 59. Bank for International Settlements, 2023.
- [9] Francisco Castillo-Eslava, Carlos Mougan, Alejandro Romero-Reche, and Steffen Staab. The role of large language models in the recognition of territorial sovereignty: An analysis of the construction of legitimacy. In *European Workshop of Algorithmic Fairness*, 2023.