# Samuel Lozano Iglesias

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## Positions

**Research Associate** September 2024 - Present
***Faculty of Physical Sciences*, Universidad Complutense de Madrid** Madrid, Spain
Human Frontier Science Programme (HFSP) project: *The Emergence of Collective Intelligence: Understanding Human Behavior through AI Agents*, coordinated by Dr. Miguel Ruiz García (UCM).
This project is in collaboration with Dr. Andrew Saxe (University College London), Dr. Erin Teich (Wellesley College) and Dr. Markus Spitzer (Martin Luther University Halle-Wittenberg). The research focuses on understanding the principles behind the emergence of collective intelligence (CI) in human and biological systems using reinforcement learning models inspired by cognitive science.

## Education

**Universidad Alfonso X El Sabio** Madrid, Spain
**MSc. in Artificial Intelligence**. GPA: 9.20 out of 10. September 2024 - June 2025
Final Master Thesis:

- *Dynamics of Cooperation in Multiagent Systems: An Approach Based on Reinforcement Learning.* Supervised by Juan Agustín Fraile Nieto.

**Universidad Complutense de Madrid** Madrid, Spain
**Double Degree in Mathematics and Physics**. GPA: 9.10 out of 10. September 2019 - June 2024
Obtained eleven Honours, with an outstanding performance in Algebra, Geometry and Topology (9.57 on average).
Final Degree Projects:

- *Application of Machine Learning Techniques for Water Turbidity Prediction*: theoretical study of predictive models with Machine Learning, going deeper into LSTM networks and successfully applying them to the prediction of water turbidity in desalination plants operated by ACCIONA. Supervised by Ángel González Prieto and Miguel Ruiz García. GPA: 9.8 out of 10.
- *Chaos and statistical physics in quantum systems*: study of a chaotic quantum system with Random Matrix Theory. Supervised by Armando Relaño Pérez. GPA: 9.9 out of 10.

**Université de Genève** Geneva, Switzerland
**Exchange year in Mathematics and Physics**. Average grade: 5.65 out of 6. September 2021 - June 2022
Obtained three Honours, with special interest in the subject *Random Matrices at Finite N*.

## Grants & Interships

**Mathematical Sciences Institute, ICMAT (CSIC)** Madrid, Spain
Recipient of a grant from the Severo Ochoa Research Introduction Program. June 2024 - July 2024
Study of Kolmogorov-Arnold networks and differential equations, with Professor Rafael Orive.

**Theoretical Physics Institute, IFT (CSIC)** Madrid, Spain
Educational stay: Introduction to research in particle physics. March 2017 - April 2017

## Relevant Work Experience

**ACCIONA** Madrid, Spain
**Data Scientist and Machine Learning** September 2023 – May 2024

- Development of predictive models with Machine Learning focused on the needs of the different business units, using LSTM networks and programming in Python (Keras).
- Study of cause-effect relationships and possible opportunities for improvement in project planning through the analysis of large volumes of data.

**Redsys Servicios de Procesamiento S.L.** Madrid, Spain
**Financial Data Analyst** July 2022 – January 2023

- Development with SQL of ETL processes for the optimization of data processing in the BIZUM service.

## Publications & Awards

***Towards a curriculum for neural networks to simulate symbolic arithmetic.*** February 2025
S. Lozano, M. Spitzer, Y. Strittmatter, K. Moeller, M. Ruiz-Garcia.
Under review at the Cognitive Science Society Conference (CogSci 2025).

**Historia de España: 2º Bachillerato** November 2021
Compilation of the History of Spain divided into sections and aimed at preparing for the Spanish university entrance exam (EvAU). ISBN: 979-8768042295 (Link)

**Triple winner of the Spring Mathematics Competition** Madrid, Spain
Complutense University of Madrid: editions XVI, XIX and XXIII. 2012, 2015 and 2019

## Talks & Posters

**University College London (London, UK)** 20/02/2025
One-week research stay at UCL, where I gave a talk titled *Towards a Curriculum for Neural Networks to Simulate Symbolic Arithmetic.*

**2nd Spanish Soft Matter 1 1/2 Day (Benasque, Spain)** 05/11/2024
Presented a poster titled *Water Turbidity Prediction in Desalination Plants Using Machine Learning-Based Models.*

## Skills & Interests

**Technical Skills:** Programming in Python (JAX and TensorFlow), MATLAB and SQL.

**Languages:** Spanish (native), English (C1 - CAE), and French (B1).

**Research Interests:** Machine Learning (Reinforcement Learning), mathematical modeling and optimization. Particularly interested in the intersection of AI and physics, including information processing in neural networks, statistical physics approaches to learning and emergent intelligence in complex systems.