Ignacio David Lopez Miguel

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Employment History

2020 – 2022 **Formal Verification Engineer,** CERN *Geneva, Switzerland*
- Development and maintenance of the tool PLCverif to formally verify PLC programs.
- Optimization of model-checking algorithms.

2017 – 2019 **Model Validation Specialist,** Deutsche Bank *Frankfurt am Main, Germany*
- Validation of machine-learning models for credit scoring, including analyses such as assumption validation, sensitivity testing, robustness checks, and bias assessment
- Validation of models for credit scoring of enterprises based on natural language.
- Participation in Data Science competitions.

2015 – 2017 **Quantitative Consultant,** Management Solutions *Madrid, Spain, and London, UK*
- Development of supervised and unsupervised machine-learning models for banks.
- Design and development of VBA-based prototypes to automate processes.

2015 – 2015 **Research Engineer,** Ifak e.V *Magdeburg, Germany*
- Analysis of empirical data to characterize fluids via acoustic waves.

2014 – 2015 **LEGO Robotics Teacher,** San Jose School *Valladolid, Spain*

Education

2022 – present **Ph.D. Logic in Computer Science**, TU Wien *Vienna, Austria*
- Explanation of black-box machine-learning models via rule learning.
- Rule-guided deep reinforcement learning (neuro-symbolic AI).

2024 – 2024 **Visiting researcher**, NII *Tokyo, Japan*
- Logic reasoning with answer set programming.
- Ethical AI applied to autonomous driving cars, including reasoning about norms.

2019 – 2021 **M.Sc. Artificial Intelligence Research**, UIMP GPA: *9.5/10* *Spain*
- Including a course on deep learning applied to computer vision.

2016 – present **B.Sc. Mathematics**, National Univ. of Distance Education GPA: *8.7/10* *Spain*
- Including courses on algebra, probability, and optimization.

2015 – 2017 **M.Sc. Business Consulting**, ICADE Business School GPA: *8.4/10* *Madrid, Spain*
Thesis title: *Machine Learning Applied to Credit Scoring*.

2011 – 2015 **B.Sc. Ind. Electronics and Automation Eng.**, UVa GPA: *8.7/10* *Valladolid, Spain*
- Including a course on classical computer vision.

Selected Research Publications

1. **Lopez-Miguel, I. D.**, Adiego, F. et al. (2025). Formal Verification of PLCs as a Service: A CERN-GSI Safety-Critical Case Study. In *17th NASA Formal Methods Symposium*.
2. Tappler, M., **Lopez-Miguel, I. D.** et al. (2025). Rule-Guided Reinforcement Learning Policy Evaluation and Improvement (under review). In *34th International Joint Conference on Artificial Intelligence*.
3. Soldà, D., **Lopez-Miguel, I. D.** et al. (2023). Progression for Monitoring in Temporal ASP. In *26th European Conference on Artificial Intelligence*.
4. **Lopez-Miguel, I. D.** et al. (2023). Verification of neural networks meets PLC code: An LHC cooling tower control system at CERN. In *24th Int. Conf. on Engineering Applications of Neural Networks*.

5 Ádám, Z., **Lopez-Miguel, I. D.** et al. (2023). From Natural Language Requirements to the Verification of PLCs: Integrating FRET into PLCverif. In *15th NASA Formal Methods Symposium*.

6 **Lopez-Miguel, I. D.** (2023). Stop at red? Engineering meets ethics. In *Int. Conf. on Computer Ethics*.

Skills

Languages Spanish (mother tongue), English (fluent), German (intermediate), French (basic).

Coding Python, Java, C, R, SQL, VBA

References

Borja Fernandez Adiego, Automation Engineer at CERN

Juan A. Rodriguez-Aguilar, Research Professor at Artificial Intelligence Research Institute (IIIA-CSIC)

Jean-Charles Tournier, Software Engineer at CERN and Lecturer at EPFL

Ezio Bartocci, Full Professor at TU Wien