Ignacio David Lopez Miguel

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Education

2022 — present **Ph.D. Logic in Computer Science**, TU Wien *Vienna, Austria*
- Researching explanation and testing of RL models via rule learning.
- Developed a neuro-symbolic RL algorithm by extending DQN to integrate symbolic plans from ASP (answer set programming) as expert demonstrations.
- Explained, tested, and improved discrete RL models.
- Validated algorithms on diverse environments, including Farama Gymnasium/MuJoCo, traffic scenarios (SUMO-RL, highwayEnv), and custom simulators.

2024 — 2024 **Visiting researcher**, National Institute of Informatics *Tokyo, Japan*
- Investigated ethical AI frameworks for autonomous driving using ASP.

2019 — 2021 **M.Sc. Artificial Intelligence**, Int. Univ. Menendez Pelayo GPA: *9.5/10* *Online, Spain*
- Including reinforcement learning, and deep learning for computer vision.

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

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 & Automation Eng.**, Univ. Valladolid GPA: *8.7/10* *Valladolid, Spain*
- Including courses on classical computer vision, control theory, and modeling.

Professional experience

2020 — 2022 **Formal Verification Engineer,** CERN *Geneva, Switzerland*
- Maintained and extended the PLCverif tool for the formal verification of PLC programs, successfully applying it to real-world safety-critical projects at CERN and GSI.
- Improved performance by resolving bugs and optimizing model-checking algorithms.

2017 — 2019 **Model Validation Specialist,** Deutsche Bank *Frankfurt am Main, Germany*
- Performed statistical analysis and validation of machine learning and natural language models for credit scoring.
- Achieved top 5% in Data Science competitions.

2015 — 2017 **Quantitative Consultant,** GMS Management Solutions SL *Madrid, Spain, and London, UK*
- Developed supervised and unsupervised machine-learning models for banks.
- Automated processes using VBA.

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

Skills

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

Technical skills — Python (Pandas, Scikit-learn, PyTorch, Stable Baselines3,...), C, R, Java, SQL, VBA, Git.

Soft skills — Teamwork and collaboration, problem-solving, adaptability and flexibility, stress management, proactive approach, fast learning.

Selected Research Publications

1. **Lopez-Miguel, I. D.** et al. (2025). OFTEN-DEEPRL: On-the-Fly Teaching of Ethical Norms to Deep Reinforcement Learning Agents. In *28th European Conference on Artificial Intelligence (ECAI)*.
2. Tappler, M., **Lopez-Miguel, I. D.** et al. (2025). Rule-Guided Reinforcement Learning Policy Evaluation and Improvement. In *34th International Joint Conference on Artificial Intelligence (IJCAI)*.
3. **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 (NFM)*.
4. Soldà, D., **Lopez-Miguel, I. D.** et al. (2023). Progression for Monitoring in Temporal ASP. In *26th European Conference on Artificial Intelligence (ECAI)*.
5. **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 (EANN)*.
6. 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 (NFM)*.

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

Martin Tappler, Postdoc at TU Wien

Ezio Bartocci, Professor at TU Wien