Víctor Toscano Durán

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Victor Toscano-Duran
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About me

I am a data scientist and researcher with a strong background in artificial intelligence, statistics, and mathematics. I hold a Bachelor's degree in Statistics and a Master's degree in Logic, Computation, and AI. I am currently a researcher at the University of Seville, working on the REXASI-PRO European project, as well as a PhD student focusing on the intersection between AI and topological data analysis. With over three years experience in data science and artificial intelligence, I am passionate about leveraging AI for impactful applications in fields such as medicine. I am committed to staying at the forefront of innovation and continuous learning in order to contribute to scientific and technological progress.

Work Experience

12/2023 - now **Researcher.** Department of Applied Mathematics I, University of Seville. Predoctoral researcher contracted by the European project REXASI-PRO (HORIZON-CL4-HUMAN-01). My work focuses on optimizing energy consumption in machine learning models for pedestrian detection through data reduction techniques, reducing input data while preserving performance, achieving the preservation of model performance (such as YOLO for person and wheelchair detection), while using only 25% of the training data, resulting in substantial reductions in computation time, cost, and energy consumption. Additionally, I contribute to improving the behavior of robot fleets through topological methods, using persistent entropy for predicting safe scenarios in robotic simulations using eXplainable AI techniques. Finally, I contribute to the project's dissemination and communication.

04/2025 - 06/2025 **Research Stay.** AIDOS Lab, University of Fribourg, between April 07 and June 06, 2025 visiting Prof. Dr. Bastian Rieck and his team. Main objective was to use topological tools, such as the Euler Characteristic Transform, in the context of computational healthcare, more specifically in molecule learning tasks.

10/2024 - 10/2024 **Research Stay.** Consiglio Nazionale delle Ricerche, Istituto di Elettronica e di Ingegneria dell'Informazione e delle Telecomunicazioni (CNR-IEIIT, Genova), between October 01 and October 31, 2024 visiting Dr. Maurizio Mongelli and his team. Main objective was to mix both fields, Topological Data Analysis and Explainable Artificial Intelligence, resulting on a paper in collaboration [1].

12/2022 - 12/2023 **Data Scientist.** Glucube (Previously named Igluco Tech). My role focuses on the development of deep learning models for blood glucose prediction for a non-invansive device. I also worked on data analysis and creating reports and visualizations.

09/2022 - 12/2022 **Software Developer.** Solera. Software and test development in Java and Python

01/2022 - 03/2022 **Data Scientist Internship.** FISEVI. My work focuses on performing data analysis applying statistical techniques to clinical data, including the elaboration of reports and visualizations for medical doctors.

Education

2024 – now **PhD in Mathematics and AI**, University of Seville. Thesis main objective is about exploring how to effectively integrate TDA at different levels of the machine learning process, from feature extraction to the design and evaluation of machine learning techniques and especially neural networks.

06/2025 **Statistical Optimal Transport** summer graduate workshop, Simons Laufer Mathematical Sciences Institute (SLMath), between June 09 and June 20, in Berkeley, California. Granted by SLMath.

06/2024 **GATMAID (Geometric, Algebra and Topology in Machine learning, Artificial Intelligence and Big data) EMS summer school**, Centre de Recerca Matemàtica, between June 25 and June 29, in Barcelona, Spain.

2022 – 2023 **Master's Degree in Logic, Computation and Artificial Intelligence.** University of Seville. Thesis title: *Applications of artificial intelligence in predicting blood glucose levels using non-invasive techniques.*

2018 – 2022 **Bachelor's Degree in Statistics.** University of Seville
Thesis title: *Statistical indicators associated to the living conditions survey.*

Skills

Engineering Machine Learning algorithms (e.g., decision trees), Deep Learning algorithms (e.g., neural networks), topological data analysis, statistical methods, data import, cleaning, and debugging.

Languages Python, R, Java, Javascript.

Tools Tensorflow, Keras, Pytorch, Dash, Git, Shiny, VScode, Jupyter, Excel, SPSS, LaTeX.

Databases MySQL, PostgreSQL.

Languages

Spanish Native.

English Overall B2 Listening C Reading B2 Writting B2 Speaking B2.

Achievements

Participation in "II Jornadas de Topología de Datos" (TDA2025) with a talk titled "Interpolation and Function Approximation Using Neural Networks and Barycentric Coordinates". Certificate.

Seminar titled "Topological Data Analysis for data analysis and AI in robotics" in Scuola di Robotica, Genova. Certificate.

Participation in the Centre for Topological Data Analysis 2024 conference, organized by the University of Oxford. A poster titled "Representative measure approach to assess decision trees reliability" was presented.

Participation in The 2nd World Conference on eXplainable Artificial Intelligence. Oral presentation on the paper published in this conference [3], and in consortium with poster.

Participation in the GATMAID EMS Summer School, organized by the Centre de Recerca Matemàtica from June 25 to 29, 2024. A poster titled "Representative measure approach to assess decision trees reliability" was presented.

Participation in the ETSII Research Days (JIETSII 2024) with the talk titled "Topological Data Analysis for Trustworthy Artificial Intelligence".

Achievements (continued)

NVIDIA DLI Certificate - "Fundamentals of Accelerated Data Science". Credential ID Jkg8E3DnSZu7hLnQfgBLDQ.

NVIDIA DLI Certificate - "Fundamentals of Deep Learning". Credential ID ToLN84tLTUKly-6eRmtGqA.

Research Projects

12/2023 – now **Researcher of the "REliable & eXplAinable Swarm Intelligence for People with Reduced mObility" european project (REXASI-PRO, GRANT AGREEMENT NO.101070028).** University of Seville.

02/2023 – 11/2024 **Member of the work team of the "Topología Computacional para el ahorro de energía y la optimización de métodos de aprendizaje profundo para alcanzar soluciones verdes de Inteligencia Artificial" project (TED2021-129438B-I00).** University of Seville.

Research Teams

2023 – now **Team member of the Combinatorial IMage Analysis research group (CIMAgroup)**

2025 – now **Team member of the AIDOS Lab**.

Publications

Please check my publications on Google Scholar.

1. **V. Toscano-Duran**, S. Narteni, A. Carlevaro, R. Gonzalez-Diaz, M. Mongelli, and J. Guzzi, "Safe and efficient social navigation through explainable safety regions based on topological features," *arXiv preprint arXiv:2006.16824*, Mar. 2025, Submitted and accepted at The 3rd World Conference on eXplainable Artificial Intelligence. DOI: 10.48550/arXiv.2503.16441.

2. J. Perera-Lago, **V. Toscano-Duran**, E. Paluzo-Hidalgo, R. Gonzalez-Diaz, M. A. Gutiérrez-Naranjo, and M. Rucco, "An in-depth analysis of data reduction methods for sustainable deep learning," *Open Research Europe*, vol. 4:101, Sep. 2024. DOI: 10.12688/openreseurope.17554.2.

3. J. Perera-Lago, **V. Toscano-Duran**, E. Paluzo-Hidalgo, S. Narteni, and M. Rucco, "Application of the representative measure approach to assess the reliability of decision trees in dealing with unseen vehicle collision data," in *World Conference on Explainable Artificial Intelligence*, L. Longo, S. Lapuschkin, and C. Seifert, Eds., Springer Nature Switzerland, Jul. 2024, pp. 384–395, ISBN: 978-3-031-63803-9. DOI: 10.1007/978-3-031-63803-9_21.