Renzo Massobrio

Curriculum Vitæ

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My research centers on using data analysis and artificial intelligence to tackle complex urban problems. To achieve this, I combine methods from operations research, machine learning, network science, high-performance computing and geographic information systems. I specialize in urban mobility, with a focus on service operations and control, topological assessment of public transport networks, accessibility and equity, and passenger demand analysis.

Education

May 2021 **Ph.D. in Computer Science**, *Universidad de Cádiz*, Spain.
Advisors: Prof. Bernabé Dorronsoro and Prof. Sergio Nesmachnow
Thesis: "Learning for Optimization with Virtual Savant"

Dec 2018 **M.Sc. in Computer Science**, Universidad de la República, Uruguay.
Advisor: Prof. Sergio Nesmachnow
Thesis: "Urban mobility data analysis in Montevideo, Uruguay"

Sep 2015 **Engineer in Computer Science**, *Universidad de la República*, Uruguay.
Advisor: Prof. Sergio Nesmachnow
Project: "Taxi sharing optimization using evolutionary algorithms"

Academic appointments

Jan 2024 –present **Principal Research Fellow**, *Modelling for Sustainability group, Department of Electronics-ICT, University of Antwerp*, Belgium.
Manager: Prof. Peter Hellinckx

Jan 2022 –Dec 2023 **Postdoctoral researcher**, *Smart Public Transport Lab, Transport & Planning Department, Delft University of Technology*, the Netherlands.
Manager: Prof. Oded Cats
Topic: Network analysis for the comparative assessment of public transport networks

Jun 2016 –Dec 2023 **Teaching and Research Assistant**, *Department of Transportation, Faculty of Engineering, Universidad de la República*, Uruguay.

Dec 2014 –Jun 2016 **Teaching and Research Assistant**, *Computer Science Institute, Faculty of Engineering, Universidad de la República*, Uruguay.

Publications

*Complete list of publications available at `www.massobrio.com`.

*In conference publications, the presenting author is underlined.

Refereed journal articles

Z. Wang, K. Huang, R. Massobrio, A. Bombelli, and O. Cats. Quantification and comparison of hierarchy in public transport networks. *Physica A: Statistical Mechanics and its Applications*, 634:129479, 2024.

S. Nesmachnow, R. Massobrio, S. Guridi, S. Olmedo, and A. Tchernykh. Big data analysis for travel time characterization in public transportation systems. *Sustainability*, 15(19):14561, 2023.

R. Massobrio, S. Nesmachnow, J. Muraña, and B. Dorronsoro. Learning to optimize timetables for efficient transfers in public transportation systems. *Applied Soft Computing*, 119:108616, 2022.

R. Massobrio, S. Nesmachnow, F. Palomo-Lozano, and B. Dorronsoro. Virtual savant as a generic learning approach applied to the basic independent next release problem. *Applied Soft Computing*, 108:107374, 2021.

R. Massobrio and S. Nesmachnow. Urban Mobility Data Analysis for Public Transportation Systems: A Case Study in Montevideo, Uruguay. *Applied Sciences*, 10(16):5400, 2020.

D. Hernandez, M. Hansz, and R. Massobrio. Job accessibility through public transport and unemployment in Latin America: The case of Montevideo (Uruguay). *Journal of Transport Geography*, 85:102742, 2020.

D. Peña, A. Tchernykh, S. Nesmachnow, R. Massobrio, A. Feoktistov, I. Bychkov, G. Radchenko, A. Y. Drozdov, and S. N. Garichev. Operating cost and quality of service optimization for multi-vehicle-type timetabling for urban bus systems. *Journal of Parallel and Distributed Computing*, 133:272–285, 2019.

S. Nesmachnow, R. Massobrio, E. Arreche, C. Mumford, A. C. Olivera, P. J. Vidal, and A. Tchernykh. Traffic light synchronization for Bus Rapid Transit using a parallel evolutionary algorithm. *International Journal of Transportation Science and Technology*, 8(1):53–67, 2019.

J. C. de la Torre, R. Massobrio, P. Ruiz, S. Nesmachnow, and B. Dorronsoro. Parallel virtual savant for the heterogeneous computing scheduling problem. *Journal of Computational Science*, 39:101048, 2019.

R. Massobrio, S. Nesmachnow, A. Tchernykh, A. Avetisyan, and G. Radchenko. Towards a cloud computing paradigm for big data analysis in smart cities. *Programming and Computer Software*, 44(3):181–189, 2018.

S. Nesmachnow, S. Baña, and R. Massobrio. A distributed platform for big data analysis in smart cities: combining Intelligent Transportation Systems and socioeconomic data for Montevideo, Uruguay. *EAI Endorsed Transactions on Smart Cities*, 2(5):1–18, 2017.

R. Massobrio, S. Nesmachnow, J. Toutouh, and E. Alba. Infrastructure deployment in vehicular communication networks using a parallel multiobjective evolutionary algorithm. *International Journal of Intelligent Systems*, 32(8):801–829, 2017.

R. Massobrio, G. Fagúndez, and S. Nesmachnow. Multiobjective evolutionary algorithms for the taxi sharing problem. *International Journal of Metaheuristics*, 5(1):67–90, 2016.

Book chapters

D. Peña, R. Massobrio, B. Dorronsoro, S. Nesmachnow, and P. Ruiz. Designing a Sustainable Bus Transport System with High QoS Using Computational Intelligence. In *Reference Module in Earth Systems and Environmental Sciences*, pages 1–14. Elsevier, 2022.

R. Massobrio, S. Nesmachnow, and J. Toutouh. Multiobjective evolutionary algorithms for smart placement of roadside units in vehicular networks. In N. Nedjah, L. D. M. Mourelle, and H. S. Lopes, editors, *Evolutionary Multi-Objective System Design: Theory and Applications*, pages 1–36. Chapman & Hall/CRC Computer and Information Science Series, 2017.

Selected conference contributions

R. Massobrio and O. Cats. A topological analysis of recoverability in metro networks. In *Transportation Research Board (TRB) Annual Meeting*, 2024.

Renzo Massobrio and O. Cats. A typology of metro network system characteristics and topology. In *25th Euro Working Group Transportation (EWGT)*, pages 1–3, 2023.

Renzo Massobrio and O. Cats. Topological analysis of public transport networks' recoverability. In *15th Conference on Advanced Systems in Public Transport (CASPT)*, pages 1–5, 2022.

Renzo Massobrio, S. Nesmachnow, and B. Dorronsoro. Virtual Savant: learning for optimization. In *34th Conference on Neural Information Processing Systems (NeurIPS 2020). Learning Meets Combinatorial Algorithms (LMCA) workshop.*, pages 1–5, 2020.

Renzo Massobrio. Urban mobility data analysis in Montevideo, Uruguay. In *XLV Latin American Computing Conference*, pages 1–18, 2019.

Renzo Massobrio, S. Nesmachnow, and B. Dorronsoro. Support Vector Machine Acceleration for Intel Xeon Phi Manycore Processors. In E. Mocskos and S. Nesmachnow, editors, *High Performance Computing*, pages 277–290, Cham, 2018. Springer International Publishing.

Awards and Honors

2022 **Ph.D. thesis award**, Universidad de Cádiz, Spain.

2021 **Ph.D. thesis award**, *Ph.D. thesis contest*, National Academy of Engineering, Uruguay.

2021 **Best paper award**, *Travel time estimation in public transportation using bus location data*, IV Ibero-american Congress of Smart Cities, Cancún, México.

2021 **Masters thesis award**, *Master thesis contest*, PEDECIBA-Informática, Uruguay.

2019 **Promising Young Researcher Award**, Ministry of Education and Culture, Uruguay.

2019 **Best masters thesis award**, *XXVI Latin American Contest of Master Thesis*, Latin American Center for Computational Studies (CLEI).

2015 **Best undergraduate thesis award**, *Faculty of Engineering*, Universidad de la República, Uruguay.

Scholarships

2022–2023 **Postdoctoral scholarship**, *Margarita Salas fund for young doctors*, European Union–NextGenerationEU.

2016–2021 **Ph.D. scholarship**, *Fundación Carolina*, Spain.

2016–2019 **Ph.D. scholarship**, *National Agency of Research and Innovation*, Uruguay.

Research Experience

Principal Investigator in Research Projects

2022–2023 **Walking accessibility to the public transport network of Montevideo**.
Grants: "Ing. Oscar Maggiolo" Montevideo City Government - Universidad de la República

2020–2022 **Territorial, universal, and sustainable accesibility: characterizing the intermodal transportation system in Montevideo**.
Grants: National Agency of Research and Innovation, Uruguay

2019–2020 **Study of mobility by public transport in the metropolitan area of Maldonado and accesibility to public services**.
Grants: Office of Planning and Budget, Uruguay

Research stays

Sep 2019 **Centro Nacional de Alta Tecnología (CeNAT)**.
Urban mobility data analysis in Costa Rica

Dec 2018–Mar 2019 **Institut national de recherche en informatique et en automatique (Inria)**.
Optimization and machine learning for the permutation flowshop problem

Jul 2016 **Computer Science Department, CICESE Research Center**.
Transport planning in smart cities

Feb – Mar 2016 **School of Computer Science & Informatics, Cardiff University**.
Optimization of urban transit and related smart city problems using computational intelligence

Oct 2015 **Superior Technical School of Informatics, Universidad de Málaga**.
Infrastructure location for vehicular networks

Sep – Oct 2015 **Superior School of Engineering, Universidad de Cádiz**.
SAVANT: Automatic Generation of Parallel Approximation Algorithms for Low-power Architectures Based on Machine Learning

Teaching experience

Graduate and Postgraduate Courses

2017–2023 **Foundations of urban informatics: data analysis and processing**, *Postgraduate course*, Universidad de la República, (Module leader).

2023–2023 **Public Transport Demand and Network Planning and Operations**, *Masters module*, TU Delft, (Teaching Assistant).

2015–2020 **Evolutionary algorithms**, *Graduate and postgraduate course*, Universidad de la República, (Module co-leader).

2016 **Distributed and Cloud Computing**, *M.Sc. module*, School of Computer Science and Informatics, Cardiff University, (Teaching Assistant).

Masters Thesis Supervision

2024–present **Combating Ensemble Fatigue in Climate Change Impact Assessments through Machine Learning Analysis of Big Data**, Master of Science in Electronics and ICT Engineering Technology, University of Antwerp, Student: Odemar Martens.

2022–present **Walking accessibility to the public transport network in Montevideo**, Masters in Operational Research, Universidad de la República, Student: Sara Perera.

2022–2023 **Roadmap towards an unified European high-speed rail network**, M.Sc. in Transport, Infrastructure and Logistics, TU Delft, Student: Filippo Borgogno.

2022–2023 **Quantification and Comparison of Hierarchy in Unimodal Public Transport Networks**, M.Sc. in Transport, Infrastructure and Logistics, TU Delft, Student: Ketong Huang.

2022–2022 **Topological Comparative Assessment of Metro Networks**, M.Sc. in Transport, Infrastructure and Logistics, TU Delft, Student: Sam Vijlbrief.

Bachelors Final Project Supervision

2021–present **Evolutionary algorithms and neural networks for sewer network design in Latinamerica**, Computer Science Engineering, Universidad de la República, Students: Nicolás Herrera and Lucas Barbachan Rodríguez.

2018–present **Public transport optimization in smart cities**, Computer Science Engineering, Universidad de la República, Student: Andrés García.

2022–2023 **Passenger flow control strategy optimization in an urban rail transit network under epidemic conditions**, *Joint BSc in Traffic and Transportation*, Beijing Jiaotong University and TU Delft, Student: Yike Hu.

2017–2018 **Machine learning for automatic program generation**, Computer Science Engineering, Universidad de la República, Students: Mauro Picó and Marccio Silva.

2016–2018 **Big data processing for urban mobility**, Computer Science Engineering, Universidad de la República, Student: Jonathan Denis.

2016–2018 **Computational intelligence applied to urban transport optimization problems**, Computer Science Engineering, Universidad de la República, Student: Enzo Fabbiani.

Service to Profession

Management Activities

2022–present **Young Member Coordinator**, *Standing Committee on Transit Data, Transportation Research Board.*

Memberships/Affiliations

2023–present **Latin American Chapter of the International Network for Transport and Accessibility in Low Income Communities (INTALInC-LAC)**.

2018–2021 **Thematic Network: "Totally integral, efficient, and sustainable smart cities (CITIES)"**.

2017–2021 **Iberoamerican Network for High Performance Computing**.

Editor in journals

2023 **Cities**, *Elsevier*, Guest editor.

Journal Manuscript Reviews

PLOS One, *Public Library of Science.*

Travel Behaviour and Society, *Elsevier.*

Sustainable Cities and Society, *Elsevier.*

Journal of Public Transportation, *Elsevier.*

Physica A: Statistical Mechanics and Its Applications, *Elsevier.*

Journal of Rail Transport Planning and Management, *Elsevier.*

European Journal of Transport and Infrastructure Research, *TU Delft.*

Annals of Operations Research, *Springer.*

Applied Soft Computing, *Elsevier.*

International Journal of Metaheuristics, *Inderscience Publishers.*

Abstract and Applied Analysis, *Hindawi.*

Swarm and Evolutionary Computation, *Elsevier.*

Event Organization

2019-2022 **Public Transport and mobility seminar**, *Faculty of Engineering, Universidad de la República*, Montevideo, Uruguay.

2015 **International workshop: transport planning and smart cities**, *Faculty of Engineering, Universidad de la República*, Montevideo, Uruguay.

Session Organization/Chair in Conferences

2023 **Special session: Computational intelligence for smart cities**, *International Conference in Optimization and Learning*, Málaga, Spain.

2021–2022 **Special session: Urban Informatics, Big Data, Data Management, Analytics and Artificial Intelligence for Smart Cities**, *Ibero-American Congress on Smart Cities*.

2022 **Special session: Optimization in public transport (Mobility and Traffic stream)**, *International Conference on Operations Research (OR 2022)*, Karlsruhe, Germany.

Technical Program Committee Member in Conferences

2018–2024 **1^{st}–7^{th} Ibero-American Congress on Smart Cities**.

2023 **16^{th} International Conference on Computational Intelligence in Security for Information Systems**, *Salamanca, Spain*.

2021–2024 **International Conference in Optimization and Learning**.

2020 **8^{th} International Conference on Metaheuristics and Nature Inspired Computing**, *Marrakech, Morocco*.

2019–2020 **International Workshop on the Synergy of Parallel Computing, Optimization and Simulation**.

2020 **2^{nd} International Workshop on Parallel Optimization using/for Multi- and Many-core High Performance Computing**, *Barcelona, Spain*.

2019 **International Conference in Optimization and Learning**, *Cádiz, Spain*.

2017–2018 **High Performance Computing Latin America**.

Reviews for conferences

2023–2024 **11^{th}–12^{th} Symposium of the European Association for Research in Transportation (hEART)**.

2023 **LV Simpósio Brasileiro de Pesquisa Operacional**, *São José dos Campos, Brazil*.

2022 **15^{th} International Conference on Advanced Systems in Public Transport (CASPT)**, *Tel Aviv, Israel*.

2018 **The 21^{st} IEEE International Conference on Intelligent Transportation Systems**, *Maui, Hawaii, USA*.

Department/University Service

Masters thesis assessments

2024 **AI-driven document understanding**, M.Sc. in Electronics and ICT Engineering, University of Antwerp, Student: Sam Elevitsky.

2023 **Roadmap towards an unified European high-speed rail network**, M.Sc. in Transport, Infrastructure and Logistics, TU Delft, Student: Filippo Borgogno.

2022 **Quantification and Comparison of Hierarchy in Unimodal Public Transport Networks**, M.Sc. in Transport, Infrastructure and Logistics, TU Delft, Student: Ketong Huang.

2022 **Topological Comparative Assessment of Metro Networks**, M.Sc. in Transport, Infrastructure and Logistics, TU Delft, Student: Sam Vijlbrief.

Bachelors final project assessments

2023 **Process mining for urban mobility analysis**, *Computer Science Engineering, Universidad de la República*, Students: Bruno Rodao, Nicolás Carignani, Santiago Ferreira.

2021 **Computational intelligence and learning for the prediction of traffic incidents**, *Computer Science Engineering, Universidad de la República*, Students: Guillermo Gabrielli, Ignacio Ferreira, Pablo Dalchiele.

2020 **Computational intelligence for traffic data analysis and estimators learning**, *Computer Science Engineering, Universidad de la República*, Students: Juan Serra and Hernán Winter.

2020 **Feeder bus line generation for public transport systems**, Computer Science Engineering, Universidad de la República, Students: Matías Dornel and Nicolás Erlichman.

2017 **Neuroevolution applied to the automatic generation of artificial intelligence for videogame verification**, Computer Science Engineering, Universidad de la República, Students: Facundo Parodi and Sebastián Rodríguez.

2016 **Solving the clustering problem using evolutionary algorithms**, Computer Science Engineering, Universidad de la República, Students: Lucía Carozzi and María Eugenia Curi.

2016 **Scheduling in heterogeneous systems using hwloc**, Computer Science Engineering, Universidad de la República, Student: Diego Regueira.

2015 **Cloud computing over open source infrastructures and the application to embryonic development study**, Computer Science Engineering, Universidad de la República, Students: J. Martín, M. Escobar, G. Urrutia, S. Falero.

Participation in hiring committees

2022 **Open Call for Teaching and Research Assistant position**, *Structures and Transport Institute, Universidad de la República.*

2020–2022 **Three Open Calls for Teaching and Research Assistant positions**, *Computer Science Institute, Universidad de la República.*

Management activities

2021–present **Representative**, *Academic subcomission for civil engineering postgraduate affairs*, Faculty of Engineering, Universidad de la República.

Other professional activities

Academic appointments

Sep 2021 –present **Researcher**, *Basic Sciences Development Program (PEDECIBA), Uruguay.*
Research area: computer science

Jun 2019 –present **Researcher**, *National System of Researchers, Uruguay.*
Research area: Engineering and Technology

Consultancies

2022–present **Associate consultant in Artificial Intelligence**, *Inter-American Development Bank.*
Evolutionary methods and artificial intelligence for the analysis and massive processing of data for water and sanitation systems

2020–2021 **Associate consultant in mobility**, *Opción Consultores.*
Origin-destination matrix generation within the project "Promotion of Electric Urban Mobility in Uruguay" funded by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Further education

Short Courses

2022 **Coaching Individual Students and Project groups**, *TU Delft*, Delft, Netherlands.

2022 **Assessing Students and Master Thesis Projects**, *TU Delft*, Delft, Netherlands.

2019 **Planning Public Transport Services (PPTS)**, *TU Delft*, Amsterdam, Netherlands.

2017 **High-performance computing school (ECAR–HPC School)**, *Universidad de Buenos Aires*, Buenos Aires, Argentina.

2017 **Summer School on Machine Learning**, *Institute of New Imaging Technologies (INIT) Universitat Jaume I and Spanish Association of Pattern Recognition and Image Analysis (AERFAI)*, Benicássim, Spain.

2016 **Geospatial data analysis using QGIS–Quantum GIS**, *REDES center*, Buenos Aires, Argentina.

2015 **Research connect: communication skills for researchers**, *British Council*, Montevideo, Uruguay.

2014 **High-performance computing school (ECAR–HPC School)**, *Universidad Técnica Federico Santa María*, Valparaiso, Chile.

Languages

Spanish	Native	
English	C2, Certificate of Proficiency in English, University of Cambridge	*2009*
Dutch	A1, TU Delft	*2022*

References

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