Lucas De Lara

Postdoctoral researcher at Institut Elie Cartan de Lorraine

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My research focuses on trustworthy artificial intelligence, more precisely algorithmic fairness and explainable machine learning, using tools from optimal-transport theory and causal inference.

Positions

since 2024 **Postdoctoral researcher**, *Université de Lorraine*, Nancy, France

2023-2024 **Research and teaching assistant (ATER)**, *Université Paul Sabatier*, Toulouse, France

Education

2020-2023 **PhD in applied mathematics**, *Université Paul Sabatier*, Toulouse, France
"Counterfactual models for fair and explainable machine learning: a mass-transportation approach" under the supervision of Jean-Michel Loubes, Laurent Risser and Nicholas Asher

2019-2020 **M2 "Statistics and Machine Learning"**, *Université Paris-Saclay*, Orsay, France, *Highest honors*

2016-2020 **Engineering degree**, *École polytechnique*, Palaiseau, France, *GPA: 3.85/4*
Major in applied mathematics

2013-2016 **"Classes préparatoires"**, *Lycée Saint-Louis*, Paris, France
Intensive training in mathematics, physics and chemistry for national competitive exams

Internships

2020 **M2 internship**, *Université Paul Sabatier*, Toulouse, France
Pre-doctoral internship under the supervision of Jean-Michel Loubes and Laurent Risser

2019 **Research internship**, *Center for Mathematical Modeling*, Santiago, Chile
Applied research projects for a public hospital of Santiago

2018 **Business internship**, *Locarise*, Tokyo, Japan
Development of backend web APIs using Django REST Framework (Python)

2017-2018 **Personal-development internship**, *International Faculty of Engineering*, Lodz, Poland
Assistance to students international mobility
Tutoring physics, math and french to faculty and high-school students

Publications

2024 **Transport-based counterfactual models**, *Journal of Machine Learning Research*, Lucas De Lara, Alberto González-Sanz, Nicholas Asher, Laurent Risser and Jean-Michel Loubes

2023 **Diffeomorphic registration using Sinkhorn divergences**, *SIAM Journal on Imaging Sciences*, Lucas De Lara, Alberto González-Sanz and Jean-Michel Loubes

2022 **Counterfactual models for fair and adequate explanations**, *Machine Learning and Knowledge Extraction*, Nicholas Asher, Lucas De Lara, Soumya Paul and Chris Russell

Preprints

2024 **A clarification on the links between potential outcomes and do-interventions**, *arXiv:2309.05997*, Lucas De Lara
Under review

2024 **On the nonconvexity of push-forward constraints and its consequences in machine learning**, *arXiv:2403.07471*, Lucas De Lara, Mathis Deronzier, Alberto González-Sanz, Virgile Foy
Accepted

2022 **GAN estimation of Lipschitz optimal transport maps**, *arXiv:2202.07965*, Alberto González-Sanz, Lucas De Lara, Louis Béthune and Jean-Michel Loubes

2021 **A consistent extension of discrete optimal transport maps for machine learning applications**, *arXiv:2102.08644*, Lucas De Lara, Alberto González-Sanz and Jean-Michel Loubes

Talks

2024 **Counterfactual inference**, *SuPerGRandMa seminar of the IMO*, Orsay, France

2024 **When causality meets optimal transport**, *APTIKAL team seminar of the LIG*, Grenoble, France

2024 **On the nonconvexity of push-forward constraints**, *SiMul team seminar of the CRAN*, Nancy, France

2024 **On the nonconvexity of push-forward constraints**, *Seminar on de probabilities and statistics of the IECL*, Nancy, France

2023 **When causality meets optimal transport**, *Colloquium on When causal inference meets statistical analysis*, Paris, France

2022 **Transport-based counterfactual models**, *ANITI Workshop on Explainable AI*, Toulouse, France

2021 **Transport-based counterfactual explanations**, *Journées de la statistique française*, France

2021 **Transport-based counterfactual explanations**, *Seminar on statistics and operations research of the University of Valladolid*, Valladolid, Espagne

Teaching

2023-2024 **Functions and Calculus 1**, *L1*, Tutorials, 58hrs

	Linear Algebra 1, *L1*, Tutorials, 48hrs
	Linear Algebra 1, *L1*, Computer sessions, 4hrs
	Statistics, *M1*, Computer sessions, 12hrs
	Fundamentals of Mathematics, *L1*, Tutorials, 56hrs
	Set Theory 1, *L1*, Tutorials, 28hrs
2022-2023	**Functions and Calculus 1**, *L1*, Tutorials, 56hrs
2021-2022	**Maths with Python**, *L1 CUPGE*, Computer sessions, 48hrs
	Mathematics 1, *L1 CUPGE*, Tutorials, 30hrs
2020-2021	**Maths with Python**, *L1 CUPGE*, Computer sessions, 48hrs
	Image Analysis, *M2 MapI3*, Computer sessions, 4hrs
	Discrete Mathematics, *L1*, Computer sessions, 6hrs

Languages

English, *Professional proficiency*

Spanish, *Fluent*