Luca Nenna

Personal Information

Born on September, 18, 1988 in Brescia.
Italian and French citizen
https://lucanenna.github.io
Laboratoire de Mathématiques d'Orsay Bâtiment 307
Faculté des Sciences d'Orsay Université Paris-Saclay
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Research Interests

Optimal Transport, Calculus of Variations, Numerical Analysis, Mathematical Physics, Mathematical Economics.

Current position

Septembre 2018-now

- Maître de conférences at Université Paris-Saclay (LMO) .
- January 2023- June 2023 on leave (délégation) at Inria-Paris (Matherials team).
- January 2024- June 2024 on leave (délégation) at Inria-Paris (Matherials team).
- January 2024-now member of the Inria-Saclay and LMO team ParMa.
- June 2024-now co P.I. with T. Gallouet of the joint team KarMa between ParMa and the Kantorovich Initiative (PIMS).
- Octobre 2025- September 2030 Junior member of the Institut Universitaire de France.

September 2017-August 2018

- Post-doc (CNRS) under the supervision of Mathieu Lewin.

October 2016-August 2017,

- Ater at **Université Paris-Dauphine**, Paris.

Education

University Paris-Saclay, Paris, France

H.D.R., Mathematics, 6th March 2024

- Thesis: *On some generalisation of Optimal Transport problem*
- Referees: Prof. Y. Bernier (CNRS and U. Paris-Saclay), Prof. G. Peyré (CNRS and ENS Paris) and Prof. Y.-H. Kim (UBC)
- Dissertation committee: Y. Brenier, G. Peyré, Y.-H. Kim, J. Delon, J.-M. Mirebeau and S. Rota-Nodari.

Université Paris-Dauphine and **I.N.R.I.A.**, Paris, France

Ph.D., Mathematics, 5th December 2016

- Thesis: *Numerical methods for Multi-Marginal Optimal Transportation*
- Advisors: Jean-David Benamou and Guillaume Carlier
- Referees: Prof. Alfred Galichon (NYU) and Prof. Dejan Slepčev (CMU)
- Dissertation committee: J-D. Benamou, G. Carlier, Y. Brenier, M. Lewin, C. Léonard, V. Ehrlacher and D. Slepčev.

Politecnico di Milano, Milan, Italy

Master Degree in Mathematical Engineering (*110/110*), April 2013

- Thesis Topic: Finite element discretization for large eddy simulation of turbulent flows
- Advisor: Lorenzo Valdettaro

Bachelor in Mathematical Engineering, September 2010

- (Reading course) Topic: *Tornadogenesis*
- Advisor: Paolo Biscari

Publications

1. Benamou, Jean-David and Carlier, Guillaume and Cuturi, Marco and **Nenna, Luca** and Peyré, Gabriel, *Iterative bregman projections for regularized transportation problems*, SIAM Journal on Scientific Computing, 37, 2, A1111—A1138, 2015, Society for Industrial and Applied Mathematics.

2. Benamou JD., Carlier G., **Nenna L.** (2016) A Numerical Method to Solve Multi-Marginal Optimal Transport Problems with Coulomb Cost. In: Glowinski R., Osher S., Yin W. (eds) Splitting Methods in Communication, Imaging, Science, and Engineering. Scientific Computation. Springer, Cham .

3. Di Marino, S., Gerolin, A., **Nenna, L.** (2017). 9. Optimal transportation theory with repulsive costs. Topological Optimization and Optimal Transport (pp. 204-256). Berlin, Boston: De Gruyter. Retrieved 30 Jan. 2018, from https://www.degruyter.com/view/books/9783110430417/9783110430417-010/9783110430417-010.xml

4. Blanchet, A., Carlier, G. , **Nenna, L.** Vietnam J. Math. (2018) 46: 15. https://doi.org/10.1007/s10 017-0255-x

5. M. Seidl, S. Di Marino, A. Gerolin, **L. Nenna**, K. Giesbertz , P. Gori-Giorgi, *The strictly-correlated electron functional for spherically symmetric systems revisited*, ¡hal-01469822¿, to appear on Physical Review A.

6. JD Benamou, G. Carlier, **L. Nenna**, *Generalized incompressible flows, multi-marginal transport and Sinkhorn algorithm*, Numerische Mathematik 142 (1), 33-54, 2019.

7. JD Benamou, G. Carlier, S. Di Marino, **L. Nenna**, *Quadratic Mean Field Games and Entropic Minimization*, Mathematical Models and Methods in Applied Sciences 29 (08), 1553-1583, 2019.

8. **L. Nenna** and B. Pass, *Variational problems involving unequal dimensional optimal transport*, Journal de Mathématiques Pures et Appliquées, 2020.

9. **L. Nenna** and B. Pass, *Transport type metrics on the space of probability measures involving singular base measures*, Applied Mathematics and Optimization , 2022.

10. **L. Nenna**, B. Pass, *A note on Cournot-Nash equilibria and unequal dimension*, in Optimal Transport Statistics for Economics and Related Topics. Vol. 483. Studies in Systems, Decision and Control, 2023.

11. H. Ennaji, Q. Mérigot, **L. Nenna**, B. Pass, *Robust risk management via multi-marginal optimal transport*, Journal of Optimization Theory and Applications (2024): 1-28.

12. **L. Nenna**, B. Pass, *An ODE characterisation of multi-marginal optimal transport for pair-wise cost*, submitted, 2022.

13. S. Di Marino, A. Gerolin, **L. Nenna**, *Universal diagonal estimates for minimizers of the Levy-Lieb functional*, in Letters in Mathematical Physics , 2023.

14. V. Ehrlacher, **L. Nenna**, *A sparse approximation of the Lieb functional with moment constraints*, submitted, 2023.

15. **L. Nenna**, P. Pegon, *Convergence rate of entropy-regularized multi-marginal optimal transport costs*, in Canadian Journal of Mathematics, 2023.

16. Hiew, J. Z. G., **Nenna, L.**, Pass, B. *An ordinary differential equation for entropic optimal transport and its linearly constrained variants.* arXiv preprint arXiv:2403.20238, 2024.

17. L. De Pascale and **L. Nenna**. *A variational formulation of a Multi-Population Mean FieldGames with non-local interactions.* In:arXiv preprint arXiv:2408.03118, 2024.

18. S. Di Marino, M. Lewin, and **L. Nenna**. *The ground state energy is not always convex in the number of electrons.* The Journal of Physical Chemistry A ,2024.

19. J. D. Benamou, G. Carlier, M. Cuturi, **L. Nenna** and G. Peyré. *A numerical method for regularized transportation problems.* Proceedings, Frontiers of Science Award summary paper.

20. S. Di Marino, M. Lewin, **L. Nenna**, *Grand Canonical Optimal Transport*, Arch. Rat. Mech. Anal., 2025.

21. J.B. Casteras, L. Monsaingeon, **L. Nenna**, *Large deviations for sticky-reflecting Brownian motion with boundary diffusion.* preprint https://inria.hal.science/hal-04895784.

22. **L. Nenna**, D. Omarov, B. Pass, *Characterizing and computing solutions to regularized semi-discrete optimal transport via an ordinary differential equation.* arXiv preprint arXiv:2504.03030.

23. **L. Nenna**, P. Pegon, L. Tocquec, *Convergence rates for regularized unbalanced optimal transport: the discrete case*, arXiv preprint arXiv:2507.07917.

Papers in Preparation

1. J.B. Casteras, L. Monsaingeon, **L. Nenna**, *Gradient flows and the Sticky-Schödinger problem.*

2. E. Bonnet-Weill, V. Ehrlacher, **L. Nenna**, *Reduced-order modeling for parametrized optimal transport problems.*

3. V. Ehrlacher, R. Lelotte, **L. Nenna**, *Improvements of the GenCol algorithm for the multimarginal optimal transport.*

4. L. De Pascale, **L. Nenna**, I. Pinheiro, *Diagonal estimates for moment constraint optimal transport.*

5. **L. Nenna**, B. Pass, *Regularity results for some multi-marginal optimal transport problems.*

6. M. Seidl, S. Di Marino, A. Gerolin, **L. Nenna**, K. Giesbertz , P. Gori-Giorgi, *The strictly-correlated electron functional for spherically symmetric systems revisited II: SGS CONJECTURE.*

Presentations

Talks and Poster

- International Conference in Basic Science, Benjing, July 2025.
- Analysis seminar, LMB, Besançon, March 2025.
- MACS seminar, ICJ, Lyon, February 2025.
- PNR Kanotrovich seminar+PDE seminar+Math Phys Semianr+Prob seminar, UBC, Vancouver, August 2024.

- Kantorovich initiative meeting, UBC, Vancouver, August 2024.
- International Conference in Basic Science, Benjing, July 2024.
- 4th Italian Meeting on Probability and Mathematical Statistics, Rome, June 2024.
- EMC2 seminar, Sorbonne university, February 2024.
- Kick-off meeting ANR SOCOT, January 2024.
- ANEDP seminar, Université de Nice, January 2024.
- Numerical methods for optimal transport problems, mean field games and multi-agent dynamics, Universidad Federico Santa María, Valparaiso, Chile, January 2024.
- PGMO days, EDF Lab, Palaiseau, November 2023.
- Numerical Analysis seminar, U. de Lille, October 2023.
- Summer school on Optimal Transport, TU Dortmund, Dortmund, September 2023.
- Computational Optimal Transport, FOCM23, Paris, June 2023.
- Emerging topics in applied optimal transport, ETH, Zürich, June 2023.
- Optimization and control in Burgundy, U. de Bourgogne, May 2023.
- GFM seminar, University of Lisbon, Lisbon, April 2023.
- Journée transport optimal, U. of Évry, Évry, February 2023.
- interpolations of Measures, Lagrange center, Paris, January 2023.
- PGMO days, EDF Lab, Palaiseau, November 2022.
- SAMM seminar, Paris, U. Paris 1 Panthéon-Sorbonne, October 2022.
- Numerical Analysis and PDE seminar, Orsay, October 2022.
- Analysis Seminar, Durham, January 2022.
- Lab Seminar, Mulhouse (UHA), December 2021.
- Schrödinger Problem and Mean-field PDE Systems: Computational and Theoretical Advances, CIRM, November 2021
- Seminar CalVa, University of Paris, Paris, October 2021.
- Schrödinger's problem and Optimal Transport, Lisbon, September 2021.
- Entropic Optimal Transport, Banff, June 2021.
- Seminar at School of Applied Mathematics, FGV, Rio, December 2020.
- Analysis Seminar at TUM, Munich, July 2020.
- FGS'19, Nice, September 2019.
- People in Optimal Transportation and Applications, Cortona, June 2019.
- SPO seminar, IHP, Paris, April 2019.
- Optimal Transport tools in Density Functional Theory, BIRS, Banff, February 2019.
- MokaMeeting. Inria-Paris January 2019.
- From Stochastic Geometric Mechanics to Mass Transportation problems, University of Lisbon, Lisbon, 3 septembre 2018.
- Seminar CalVa, University Paris-Sud, Orsay, 26 mars 2018.
- Session on Mean Field Games, PgmoDays, Paris, 14 November 2017.
- Mean Field Games, IPAM (UCLA), Los Angeles, 29 August 2017.
- Seminar of Applied Mathematics, University of Alberta, Edmonton, 21 July 2017.
- Optimal Transport meets Density Functional Theory, University of Jyväskylä, Jyväskylä, 1-7 June 2017.
- Optimal Transport and PDEs, GSSI, L'Aquila, 6-7 April 2017.
- Numerical Analysis Seminar, CERMICS, École des Ponts, Paris, 17 November 2016.
- MAD-Stat Seminar, Toulouse School of Economics, Toulouse, 3 November 2016.
- Computational Optimal Transportation, CRM, Montréal, July 2016.
- Smai-MODE congress, ENSEEIHT, Toulouse, March 2016.
- Numerical Analysis and PDEs seminar, Université Paris Sud-Orsay, Orsay, February 2016.
- Ceremade Young Researchers seminar, Université Paris-Dauphine, Paris, February 2016.
- Workshop Optimal Transport: Aspects Numériques et Applications, IMB, Bordeaux, October 2015.
- Young Researchers Summer School, Raveau, September 2015.

- Mini-workshop: DFT and optimal transport with Coulomb cost, VU university, Amsterdam, August 2015.
- SMAI congress, poster "OPTIMAL TRANSPORT AND DENSITY FUNCTIONAL THEORY", Les Karellis, June 2015.
- Matinée des doctorants, Université Paris-Dauphine, Paris, May 2015.
- Inria's Junior Seminar, I.N.R.I.A., Rocquencourt, March 2015
- Optimal Transport in the Applied Sciences, Ricam (JKU), Linz, December 2014.
- MokAlien 1st Meeting, McGill University, Montreal, October 2014.
- Numerical Optimal Transport, Université Paris-Dauphine, Paris, September 2014.

Research Visits

- University of Alberta, Edmonton, 07/06-07/07 2025 (collaborator: Brendan Pass).
- University of Alberta, Edmonton, 28/03-13/04 2025 (collaborator: Brendan Pass).
- University of Alberta, Edmonton, 24/08-31/08 2024 (collaborator: Brendan Pass).
- University of Lisbon, Lisbon, 03/05-15/05 2024 (collaborator: Leonard Monsaigeon).
- University of Lisbon, Lisbon, 21/06-30/06 2023 (collaborator: Leonard Monsaigeon).
- University of Lisbon, Lisbon, 16/04-23/04 2023 (collaborator: Leonard Monsaigeon).
- University of Alberta, Edmonton, 01/07-17/07 2022 (collaborator: Brendan Pass).
- University of Alberta, Edmonton, 24/08-08/09 2019 (collaborator: Brendan Pass).
- University of Alberta, Edmonton, 05/07-15/07 2018 (collaborator: Brendan Pass).
- University of Alberta, Edmonton, 09/07-30/07 2017 (collaborator: Brendan Pass).
- MFO, Oberwolfach , 22/01 - 04/02 2017, "Research in Pairs" program with Simone Di Marino and Augusto Gerolin.

Ph.D. students

- Adrien Cancés (co-supervised with Quentin Mérigot), 2022-ongoing.
- Louis Tocquec (co-supervised with Paul Pegon), 2024-ongoing.
- Elise Weill (co-supervised with Virginie Ehrlacher), 2024-ongoing.

Master students

- Louis Tocquec (2024 M2 MVA), Malkiel Riveline (2023 M1), Médard Govoeyi (2023 M2), Thibault Caillet (2021 M2), Amine Souiri (2021 M1), Timothe Morval (2021 M1) , Jouris Ploux (2021 M2), Jordan Barthoumieu (2020 M2 Agreg), Roméo Leylekian (2020 M1), Celian Charleau (2020 M1) .

Awards and Funding

- Young Research prize 2017 (Fondation Paris Dauphine and Accuracy).
- PEDR 2020-2024
- PEPS CNRS (2021), 5k €
- PEPS CNRS (2022), 5.5k €
- PGMO (2022-2023), 6k €
- PGMO (2023-2024), 7k €
- PGMO (2024-2025), 7k €
- H-code Paris-Saclay (2022-2023), 7.72k €
- H-code Paris-Saclay (2023-2024), 12k €
- ANR GOTA (2023-2027), 253k €
- Frontiers of Science Award (2024).
- RIPEC C3 2024-2027.
- IUF Junior 2025-2030.

Other Activities

Article reviewing for: Journal Of Optimization Theory and Applications, SIAM Journal on Mathematical Analysis, Mathematics of Operations Research, Journal of Global Optimization, SIAM Journal on Scientific Computing, ESAIM: Mathematical Modelling and Numerical Analysis, M3AS, JAMS, JFA, etc.

Project reviewing for: DFG (German Research Foundation).

Ph.D. committee:

- Rafaël Coyaud (2020), Xavier Bacon (2022).

Administratives responsibilities:

- Elected member of SMAI-MODE board (2021-2024);
- Erasmus co-coordinator at the Department of mathematics of Paris-Saclay University;
- Member of a maître de conférences hiring committee at LMO.

Organisation of Seminars, Workshop, etc:

- Workshop "Transport optimal généralisé et applications", Fondation des Treilles, September 2026.
- Optimal Transport session at PGMO days, November 2024.
- Moka10, June 2024.
- Optimal Transport session at Canum, May 2024.
- Optimal Transport session at PGMO days, November 2023.
- GdT Transport Optimal-EDP-Machine Learning, since September 2021 (with Quentin Mérigot).
- Journées ANR MAGA, Orsay, November 2019 (with Lenaic Chizat).
- Optimal Transport tools in Density Functional Theory, BIRS, Banff, February 2019 (with Mathieu Lewin, Paola Gori-Giorgi and Brendan Pass).

TEACHING EXPERIENCE

Université Paris-Saclay — A.Y. 2024–25
- Optimization (M1- Math I.A. CM+TD+TP);
- Introduction to Optimization (M2 CM+TD+TP);
- Calculus of Variations (M2 CM+TD+TP);
- Optimization (M2 MSV CM);

Université Paris-Saclay — A.Y. 2023–24
- Optimization (M1- Math I.A. CM+TD+TP);
- Introduction to Optimization (M2 CM+TD+TP);
- Introduction to Numerical Analysis for PDE (M2 CM+TD+TP);
- Optimization (M2 MSV CM);

Université Paris-Saclay — A.Y. 2022–23
- Numerical Analysis for EDO (3rd year CM);
- Optimization (M1- Math I.A. CM+TD+TP);
- Introduction to Optimization (M2 CM+TD+TP);

Université Paris-Saclay — A.Y. 2021–22
- Numerical Analysis for EDO (3rd year CM);
- Optimization (3rd year TD+TP);
- Optimization (M1-Ensta TD+TP);
- Optimization (M1-MA CM+TD+TP);
- Numerical Analysis for PDE (M1-MFA CM+TD+TP);
- Optimal Transport (M2-Optimization CM);

Université Paris-Saclay — A.Y. 2020–21
- Numerical Analysis for EDO (3rd year CM+TD+TP);
- Optimization (3rd year TD+TP);
- Optimization (M1-Ensta TD+TP);
- Optimization (M1-MA CM+TD+TP);
- Numerical Analysis for PDE (M1-MFA CM+TD+TP);
- Optimal Transport (M2-Optimization CM);

Université Paris-Sud — A.Y. 2019–20

- Numerical Analysis for EDO (3rd year TD+TP);
- Optimization (3rd year TD+TP);
- Optimization (M1-Ensta TD+TP);
- Optimization (M1-MA CM+TD+TP);
- Numerical Analysis for PDE (M1-MFA TD+TP);
- Optimal Transport (M2-Optimization);

Université Paris-Sud A.Y. 2018–19

- Numerical Analysis for EDO (3rd year CM+TD+TP);
- Optimization (3rd year TD+TP);
- Optimization (M1-Ensta TD+TP);
- Optimization (M1-MA CM+TD+TP);
- Numerical Analysis (M1-MFA TD+TP);

Teaching Assistant (Université Paris-Dauphine) A.Y. 2016–17

- Calculus II (1st year);
- Calculus III (2nd year);
- Numerical Analysis (2nd year);

Teaching Assistant (Université Paris-Dauphine) 2nd semester 2015–16

- Numerical Analysis (2nd year);
- Numerical Analysis: Optimization (3rd year)

Teaching Assistant (Université Paris-Dauphine) 2nd semester 2014–15

- Numerical Analysis (2nd year);
- Numerical Analysis: Optimization (3rd year)

Hardware and Software Skills

Computer Programming:

- C, C++, Matlab, Maple, FreeFem++, Julia, Python.

Languages

- Italian (Mother Tongue);
- English (Fluent);
- French (Fluent).