Curriculum Vitæ Idriss Mazari (Last update: September 22, 2022)

Personal data

Date and place of birth 6th of March, 1994, Rouen (Normandie, France),
Institutional address CEREMADE, Université Paris Dauphine - PSL Place du Maréchal De Lattre de Tassigny 75016 PARIS
E-mail address mazari@math.cnrs.fr or mazari@ceremade.dauphine.fr
Personal webpage https://www.ceremade.dauphine.fr/~mazari/
OrcID & List of publications 0000-0002-6779-6731

Professional experience & Education

Since September 2021: *Maître de conférences* (permanent position as assistant professor), Université Paris Dauphine, au CEREMADE.

September 2020-August 2021: Post-doctoral researcher in the Research Group Multiscale Calculus of Variations and PDEs (Leader: E. Davoli), Institute of Analysis and Scientific Computing, TU Wien (funded by the Austrian Science Fund FWF).

September 2017-August 2020: PhD student (Laboratoire Jacques-Louis Lions, Paris Sorbonne Université, Paris) under the supervision of G. Nadin and Y. Privat. My PhD *Shape optimization & Spatial heterogeneity in reaction-diffusion equations* was defended on the 6th of July, 2020. Funding: École Normale Supérieure de Lyon doctoral grant for Normaliens students (*Bourse normalien*).

September 2013-August 2017: Normalien student (status obtained after a competitive exam), École normale supérieure de Lyon in Advanced Mathematics (Master's degree in partial differential equations obtained in Université Paris Jussieu, *with highest honors* in 2016). The year 2016-2017 was spent on a research internship under the supervision of G. Nadin and Y. Privat, Université Paris Jussieu.

Distinctions, grants, projects

- 2021: I was awarded one of the two PHD prizes from the PGMO program (Programme Gaspard Monge pour l'Optimisation, with the ROADEF and the SMAI Group MODE). Two PGMO PHD awards a year are given, for "significant contributions in optimisation and operational research".
- 2021: I was a laureate of a Lise Meitner Research post-doctoral fellowship (164k€) of the Austrian FWF, for the research project " Optimal control & design problems for piezoelectric materials" (co-applicant: Elisa Davoli). This project was declined when I obtained a permanent position in Paris Dauphine Université.

Research interests

PDE constrained shape optimization and control theory of PDEs. Key achievements: optimization of non-energetic functionals in reaction-diffusion equations; study of (in)stability properties of optimal shapes under perturbations of the models; controllability of spatially heterogeneous reaction-diffusion models; quantitative

inequalities for optimal control problems and spectral optimization of Schrödinger eigenvalues, game theory, mean-field games.

List of publications

Publications in international peer-reviewed journals

1. I. Mazari, D. Ruiz-Balet. Quantitative stability for eigenvalues of Schrödinger operator, Quantitative bathtub principle & Application to the turnpike property for a bilinear optimal control problem.

   SIAM Journal on Mathematical Analysis 54(3):3848–3883, 2022.
   DOI:10.1137/21M1393121

2. I. Mazari, A note on the rearrangement of functions in time and on the parabolic Talenti inequality.

   Annali dell'Universita di Ferrara, 2022.
   DOI: 10.1007/s11565-022-00392-y

3. I. Mazari, D. Ruiz-Balet, E. Zuazua. Constrained controls of gene-flow models.

   Annales de l'Institut Henri Poincaré-C-Analyse Non-Linéaire, 2022.
   DOI: 10.4171/AIHPC/52

4. I. Mazari, Some comparison results and a partial bang-bang property for two-phases problems in balls.

   Mathematics in Engineering, Special Issue *Calculus of Variations and Nonlinear Analysis: Advances and Applications*, 2023.
   DOI: 10.3934/mine.2023010

5. I. Mazari, G. Nadin, Y. Privat, Optimisation of the total population size for logistic diffusive equations: bang-bang property and fragmentation rate.

   Communications in Partial Differential Equations, 2022.
   DOI:10.1080/03605302.2021.2007533

6. I. Mazari, G. Nadin, Y. Privat. Shape optimization of a weighted two-phase Dirichlet eigenvalue.

   Archive for Rational Mechanics and Analysis, 2021.
   DOI:10.1007/s00205-021-01726-4

7. I. Mazari. Quantitative estimates for parabolic optimal control problems under L^∞ and L^1 constraints.

   Nonlinear Analysis, 215, 2022.
   DOI:10.1016/j.na.2021.112649

8. A. Isis Toledo Marrero, I. Mazari, G. Nadin, Optimisation of the total population size with respect to the initial condition for semilinear parabolic equations: Two-scale expansions and symmetrisations.

   Nonlinearity, 34, 2021.
   DOI:10.1088/1361-6544/ac23b9

9. I. Mazari, D. Ruiz-Balet. A fragmentation phenomenon for a non-energetic optimal control problem: optimisation of the total population size in logistic diffusive models.

   SIAM Journal on Applied Mathematics, 81-1 (2021), pp. 153-172.
   DOI:10.1137/20M132818X

10. I. Mazari, A. Henrot, Y. Privat. Shape optimization of a Dirichlet type energy for semilinear elliptic partial differential equations.

    ESAIM: Control, Optimisation and Calculus of Variations, 27 (2021) S6,
    DOI:10.1051/cocv/2020052

11. I. Mazari. A quantitative inequality for the first eigenvalue of a Schrödinger operator.

    Journal of Differential Equations Vol. 269 (2020), pp 10181-10238.
    DOI:10.1016/j.jde.2020.06.057

12. I. Mazari, G. Nadin, Y. Privat. Optimal location of resources maximizing the total population size in logistic models.

    Journal de Mathématiques Pures et Appliquées 134 (2020), pp. 1-35.
    DOI:10.1016/j.matpur.2019.10.008.

13. I. Mazari. Trait selection and rare mutations: The case of large diffusivities.

    Discrete and continuous dynamical systems, Series B 24 (2019), pp. 6693-6724.
    DOI:10.3934/dcdsb.2019163.

Proceedings

14. I. Mazari, G. Nadin, Y. Privat. Optimal control of resources for species survival.

    Proceedings in Applied Mathematics and Mechanics 18 (Special Issue: 89th Annual Meeting of GAMM) (2018).
    DOI:0.1002/pamm.201800086.

Submitted articles

15. I. Mazari, D. Ruiz-Balet, Spatial ecology, optimal control and game theoretical fishing problems.

16. L. Girardin, I. Mazari, Generalized principal eigenvalues of space-time periodic, weakly coupled, cooperative, parabolic systems. Submitted, 2021.
    ArXiv:2109.09578 .

17. E. Davoli, I. Mazari, U. Stefanelli, Spectral optimization of inhomogeneous plates. Submitted, 2021.
    ArXiv:2107.11207

18. I. Mazari, Y. Privat, Qualitative analysis of optimisation problems with respect to non-constant Robin coefficients. Submitted, 2021.
    ArXiv:2110.05930

19. I. Mazari, The bang-bang property in some parabolic bilinear optimal control problems *via* oscillatory methods and two-scale asymptotic expansions. Submitted, 2021.
    ArXiv:2111.04796

20. I. Mazari, G. Nadin, Optimality conditions for optimal control problems with respect to the initial condition via a Laplace type method and two-scales like expansions
    ArXiv:2205.11847

21. F. Auricchio, M. Marino, I. Mazari, U. Stefanelli, Analysis of a combined filtered/phase-field approach to topology optimization in elasticity.
ArXiv:

Book chapters

22. I. Mazari, G. Nadin, Y. Privat Some challenging optimisation problems for logistic-diffusive equations and numerical issues.

    Accepted for publication, *Handbook of Numerical Analysis and Control Theory* (Editors: E. Trélat and E. Zuazua), 2021.

Advisorship

- 2022: Supervision of the third year internship of T. Brun (ENS de Lyon), six weeks. Topic: "Sur l'inégalité isopérimétrique".

Presentations, talks, conferences, research stays

Invited talks at conferences

1. *Parabolic and kinetic models in population dynamics*, Institut de Mathématiques de Toulouse, (ANR Indyana), September 2022,
2. CANUM 2020, June 2022 (minisymposium *Geometric properties for elliptic PDEs*, organised by C. Nitsch, F. Chiacchio, F. Della Pietra),
3. Meeting of the ANR ShapO, April 2022,
4. Society of Mathematical Biology Annual Meeting, July 2021,
5. Paris Dauphine University, *Mathematical biology day*, December 2018,
6. Grenoble University, *Shape optimization (ShaPo project of the French research agency)*, December 2018,
7. Poitiers University, *Shape optimization day*, Octobre 2018,
8. Chambéry University, *Reaction-diffusion (ReaDi project of the French research agency)*, Chambéry, February 2018,
9. KTH Stockholm, *Mini-conference in PDEs*, December 2017.

Invited seminars

1. Séminaire de Mathématiques Appliquées, Collège de France, January 2022,
2. Séminaire Analyse-EDP, Dauphine, January 2022,
3. PDE seminar, University of Tennessee, Knoxville, October 2021,

4. Vienna Seminar on Calculus of Variations, May 2021,
5. Groupe de travail Calcul des Variations (CalVa), March 2021,
6. Séminaire du groupe de contrôle et modélisation, Strasbourg, February 2021,
7. Séminaire de l'IECL, Nancy, February 2021,
8. Séminaire du LAMA, Chambéry, February 2021,
9. Séminaire MACS, Lyon, January 2021,
10. Séminaire de math-bio, Toulouse, January 2021
11. Münster-München-Wien research group on calculus of variations, December 2020,
12. Laboratoire de Mathématiques d'Aix-Marseille Université (visioconférence), Novembre 2020,
13. PDE Afternoon (University of Vienna) (visioconférence), Novembre 2020,
14. University of Western Australia (videoconference), June 2020,
15. Friedrich Alexander Universität, Erlangen, February 2020,
16. Chair of computational mathematics, DeustoTech, September 2019,
17. Jacques-Louis Lions laboratory, *PhD students' seminar*, Avril 2019,
18. Mathematics laboratory of the Catholic University of Brescia, Italy, February 2019,
19. Applied mathematics laboratory of Compiègne, February 2018,
20. Nantes University, *PhD students' seminar*, February 2018,
21. Jacques-Louis Lions laboratory, *PhD students' seminar*, October 2017.

Research Stays

1. TU Wien, Uni. Wien, (Austria), September 2021 (1 week), April 2022 (2 weeks), July 2022 (2 weeks), *at the invitation of E. Davoli, U. Stefanelli, K. Sturm*,
2. Erlangen (Germany), (1 week) February 2020, *at the invitation of E. Zuazua*,
3. Bilbao (Spain), September-December 2019, *at the invitation of E. Zuazua*,
4. Brescia (Italy), (1 week) February 2019, *at the invitation of D. Mazzoleni*

Reviewing activities

I am currently reviewing or have reviewed papers for the following journals:

Journal de Mathématiques Pures et Appliquées, *Journal of Geometric Analysis*, *SIAM Journal on Control and Optimization*, *Inverse Problems in Engineering*, *Journal of Differential Equations*, *SIAM Journal on Mathematical Analysis*, *Nonlinear Analysis*, *Discrete and Continuous Dynamical Systems-B*, *Journal of Mathematical Biology*, *Nonlinear Differential Equations and Applications NoDEA*, *ESAIM: Control, Optimization and Calculus of Variations*, *Handbook of Control Theory.*

Organization and responsibilities

- 2019: Scientific commissioner for the "L'X: l'équation du mérite" Exhibition, École Polytechnique, Palaiseau, (with J. Dhombres and F. Brechenmacher)
- 2018: Scientific comminssioner for the "Joseph Fourier, de la Révolution Française à la Révolution Numérique" Exhibition, Institut Henri Poincaré, Paris, (with J. Dhombres and A. Juhel)
- 2017-2018: Co-organizer of the PhD students' Seminar, Laboratoire Jacques-Louis Lions, Paris
- 2014-2015: Director of the Student's Mathematics' Journal, ENS de Lyon
- 2014-2015: Organizer of the Students' History of Science's Seminar, Lyon
- 2014: Local Organization Committe of the ISSMYS Summer School, Lyon

Teaching and Communication experience

Teaching Experience

- 2022-....:*tutorial classes on Optimization*, fourth year (M1),Paris Dauphine Université PSL
- 2021-...: *Numerical methods and optimisation*, third year (L3), Paris Dauphine Université PSL. Lectures, Python classes, Exercice classes.
- 2017-2020: *Exercices sessions,* Paris Sorbonne Université Analysis, Linear Optimization, Python, Series and Integrals
- 2017: *Teacher for the SummerIA Summer School,* Lyon
- 2017: *Teacher (One week course)*Pristina University, Kosovo, Optimization and calculus of variations
- 2015-2017: *Oral Examiner* Lycée Louis Le Grand,Paris
- 2016: *Teacher for the Mathsinfoly Summer School,* Lyon
- 2014-2015: *Oral Examiner,* Lycée Aux Lazaristes, Lyon

Science and History of Science Communication

- 2019: Production of written supports for the "L'X: l'équation du mérite" Exhibition, École Polytechnique, Palaiseau, (with J. Dhombres and F. Brechenmacher),
- 2019: Instructor for the Mathsinfoly Summer School, Lyon *In collaboration with P. Lafourcade, I was in charge of helping a group of high-school students design SAT-solvers*,
- 2018: Production of written supports for the "Joseph Fourier, de la Révolution Française à la Révolution Numérique" Exhibition, Institut Henri Poincaré, Paris, (with J. Dhombres and A. Juhel),
- 2018: *Meeting Joseph Fourier*, McGill Journal of Undergraduate Mathematics,
- 2017: Instructor for the SummerIA Summer School, Lyon *I was in charge of introducing high-school students to calculus of variations for applications to artificial intelligence*,
- 2017: *Le théorème de Birkhoff: géodésiques fermées des surfaces*, Journal de Mathématiques des élèves de l'ENS de Lyon,
- 2016-2017: Animatior at a stand at the Paris Mathematical Fair (Salon des jeux mathématiques)
- 2016: Instructor for the Mathsinfoly Summer School, Lyon *I was in charge of introducing high-school students to dynamical systems and to advise their mini-research project on billiards,*
- 2016: *Une balade en compagnie de Monge et Lagrange*, Journal de Mathématiques des élèves de l'ENS de Lyon,
- 2015: *L'inégalité isopérimétrique et l'inégalité de Faber-Krahn*, Journal de Mathématiques des élèves de l'ENS de Lyon,
- 2014: Scientific Assistant for the MOMISS Summer School in Lyon. *I was interacting with high-school students on scientific matters.*