

Curriculum Vitae

Goldman Michael

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French Nationality
Born 05/03/1985 in Paris.

Positions

2022– : Junior CNRS researcher at CMAP, Polytechnique.

2021– : Professeur Chargé de Cours à temps partiel, CMAP, Polytechnique.

2014–2022 : Junior CNRS researcher in the Laboratoire Jacques-Louis Lions, Université Paris 7.

2012–2014 : Von Humboldt Post-Doc fellow at the Max Planck Institute in Leipzig (Germany) in the group of F. Otto.

Spring 2012 : Post-Doc stay at the University of Carnegie Mellon (USA) under the supervision of I. Fonseca and G. Leoni.

Education

2018 : Habilitation, Université Paris 7.

2009–2011 : PhD at the Ecole Polytechnique (France) under the supervision of A. Chambolle.

Papers

Preprints:

1. **An exterior optimal transport problem**, with J. Candau-Tilh and B. Merlet, submitted.
2. **On the concave one-dimensional random assignment problem and Young integration theory**, with D. Trevisan, submitted.

3. **From energy bounds to dimensional estimates in a branched transport model for type-I superconductors**, with G. De Philippis and B. Ruffini, submitted.
4. **Tensor rectifiable G -flat chains**, with B. Merlet, submitted.
5. **A deformation theorem for tensor flat chains and applications (complement to “Tensor rectifiable G -flat chains”)**, with B. Merlet, submitted.
6. **Set-decomposition of normal rectifiable G -chains *via* an abstract decomposition principle**, with B. Merlet, submitted.
7. **Optimal transport methods for combinatorial optimization over two random point sets**, with D. Trevisan, submitted.
8. **Uniform $C^{1,\alpha}$ -regularity for almost-minimizers of some nonlocal perturbations of the perimeter**, with B. Merlet and M. Pegon, submitted.

Published Journal Papers:

1. **Existence and regularity of minimizers for a liquid drop model with strong repulsion**, with M. Novaga and B. Ruffini, accepted in JEMS.
2. **Compactness and structure of zero-states for unoriented Aviles–Giga functionals** with B. Merlet, M. Pegon and S. Serfaty, accepted in the J. Inst. Math. Jussieu.
3. **On the quadratic random matching problem in two-dimensional domains**, with L. Ambrosio and D. Trevisan, Electronic Journal of Probability (2022), vol. 27, 1–35.
4. **Existence and stability results for an isoperimetric problem with a non-local interaction of Wasserstein type**, with J. Candau-Tilh, accepted at ESAIM COCV.
5. **A fluctuation result for the displacement in the optimal matching problem**, with M. Huesmann, Annals of Probability (2022), vol. 50, no 4, p. 1446-1477.
6. **Reifenberg flatness for almost-minimizers of the perimeter under minimal assumptions**, with M. Novaga et B. Ruffini, Proc. AMS. (2022), vol. 150, no 03, 1153–1165.
7. **Convergence of asymptotic costs for random Euclidean matching problems**, with D. Trevisan, Prob. and Math. Phy. (2021), vol. 2, no 2, 341–362.
8. **An ε -regularity result for optimal transport maps between continuous densities**, Atti Accad. Naz. Lincei Rend. Lincei Mat. Appl. 31 (2020), no. 4, 971–979.
9. **Quantitative linearization results for the Monge-Ampère equation**, with M. Huesmann and F. Otto, Com. Pure and Appl. Math. (2021), vol. 74, no 12, 2483–2560.
10. **Non-convex functionals penalizing simultaneous oscillations along independent directions: rigidity estimates** with B. Merlet, Ann. Sc. Norm. Super. Pisa Cl. Sci. (5) 22 (2021), no. 3, 1473–1509.

11. **A Ginzburg-Landau model with topologically induced free discontinuities**, with B. Merlet and V. Millot, *Ann. Inst. Fourier (Grenoble)* 70 (2020), no. 6, 2583–2675.
12. **A two-point function approach to connectedness of drops in convex potentials** with G. De Philippis, *Com. Anal. Geom.* 30, No. 4 (2022).
13. **On the optimality of stripes in a variational model with non-local interactions**, with E. Runa, *Calc. Var. and PDE*, 58, 103 (2019).
14. **A variational proof of partial regularity for optimal transportation maps**, with F. Otto, *Annales de l'ENS*, volume 53, issue 5 (2020).
15. **A gradient flow approach to relaxation rates for the multi-dimensional Cahn-Hilliard equation**, with L. De Luca et M. Strani, *Math. Annalen*, 374 (2019).
16. **Quantitative estimates for bending energies and applications to non-local variational problems**, with M. Novaga and M. Röger, *Proc. Roy. Soc. Edimburgh*, 150, 1 (2020).
17. **Self-similar minimizers of a branched transport functional**, *Indiana Univ. Math. J.* 69 (2020), no. 4, 1073–1104.
18. **A branched transport limit of the Ginzburg-Landau functional**, with S. Conti, F. Otto and S. Serfaty, *J. École Polytechnique*, 5:317–375 (2018).
19. **On minimizers of an isoperimetric problem with long-range interactions and convexity constraint**, with M. Novaga and B. Ruffini, *Analysis and PDEs*, 11(5):1113–1142 (2018).
20. **Phase segregation for binary mixtures of Bose-Einstein Condensates**, with B. Merlet, *SIAM J. Math. Anal.* 49 (2017), no. 3, 1947–1981.
21. **New bounds for the inhomogenous Burgers and the Kuramoto-Sivashinsky equations**, with M. Josien and F. Otto, *Comm. Partial Differential Equations* 40 (2015), no. 12, 2237–2265.
22. **Study of island formation in epitaxially strained films on unbounded domains**, with P. Bella and B. Zwicknagl, *ARMA*, 218, (2015), no. 1, 163–217.
23. **Sharp interface limit for two components Bose-Einstein condensates**, with J. Royo-Letelier, *ESAIM COCV* (2015), no.3 603-624.
24. **Nucleation barriers at corners for a cubic-to-tetragonal phase transformation**, with P. Bella, *Proc. Roy. Soc. Edimburgh*, 145 A (2015), 715-724.
25. **Existence and stability for a non-local isoperimetric model of charged liquid drops**, with M. Novaga and B. Ruffini, *ARMA*, 217 (2015), no. 1, 1–36.
26. **Fine properties of the subdifferential for a class of one-homogeneous functionals**, with A. Chambolle and M. Novaga, *Adv. Calc. Var*, vol. 8 n. 1 (2015), 31-42.
27. **Scaling law and reduced models for epitaxially strained films**, with B. Zwicknagl, *SIAM J. Math. Analysis*, 46 (2014), no. 1, 1–24.

28. **The Γ -limit for singularly perturbed functionals of Perona-Malik type in arbitrary dimension**, with G. Bellettini and A. Chambolle, M3AS, vol. 24, Issue 6 (2014).
29. **Plane-like minimizers and differentiability of the stable norm**, with A. Chambolle and M. Novaga, J. Geometric Analysis, vol. 24, Issue 3 (2014).
30. **Representation, relaxation and convexity for variational problems in Wiener spaces**, with A. Chambolle and M. Novaga, J. Math. Pures Appl, vol. 99 (2013), 419-435.
31. **A geometric approach for convexity in some variational problem in the Gauss space**, Rend. Sem. Mat. Padova, vol. 129 (2013).
32. **Approximation and relaxation of perimeter in the Wiener space**, with M. Novaga, Annales IHP - Analyse Non linéaire, vol. 29, (2012), 525-544.
33. **Volume-constrained minimizers for the prescribed curvature problem in periodic media**, with M. Novaga, Calc. Var. and PDE, vol. 44, Issue 3 (2012), 297-318.
34. **Continuous Primal-Dual Methods for Image Processing**, SIAM Journal of Imaging Science vol. 4, no. 1, (2011).

Conference Proceedings and Review Papers:

1. **Recent results on non-convex functionals penalizing oblique oscillations**, with B. Merlet, Rend. Sem. Mat. Torino (2019).
2. **A variational approach to regularity theory in optimal transportation**, Séminaire Laurent Schwartz, Exposé n. XIII, 1-14 (2019).
3. **Equilibrium shapes of charged droplets and related problems: (mostly) a review**, with B. Ruffini, Geometric flows, vol. 2, 1 (2017).
4. **Existence and qualitative properties of isoperimetric sets in periodic media**, with A. Chambolle and M. Novaga, "Geometric Partial Differential Equations", Edizioni della Normale, CRM Series, vol. 15, (2013).

Talks

Workshops and conferences:

- Workshop 'Geometric Measure Theory and applications', Cortona, (2024).
- Workshop 'Optimal Transport and the Calculus of Variations', ICMS, Edinburgh (2023).
- Conference for the 60th birthday of S. Bobkov, Toulouse (2023).
- BIRS Workshop on "Compensated Compactness and Applications to Materials" (2023).

- Workshop 'Théorie de la mesure géométrique et Calcul des variations', Nancy (2022).
- Workshop 'Optimal Transport and Uncertainty', Naples, Italy (2022).
- Workshop 'Nonlinear meeting in Bologna', Bologna, Italy (2022).
- BIRS Workshop 'Stochastic Mass Transports', Banff, Canada (2022).
- Workshop 'Calculus of Variations in Lille - 3rd edition', Lille, France (2022).
- Workshop 'Encounters in Analysis on singular spaces', Münster, Germany (2021).
- Workshop 'Calculus of Variations and Applications in Trani', Trani, Italy (2019).
- Workshop 'Modeling of crystalline Interfaces and Thin Film Structures: a Joint Mathematics-Physics Symposium', ESI Vienna, Austria (2019).
- Workshop 'Analysis and Applications. Contributions from young researchers', Politecnico di Torino, Italy (2019).
- ANR Shapo starting conference, Université Grenoble Alpes, France (2018).
- Workshop on kinetic and fluid Partial Differential Equations, Université Paris Diderot, France (2018).
- Workshop 'Curves and Networks in Geometric Analysis', Centro De Giorgi, Pisa, Italy (2017).
- Workshop 'Transport problems in Zurich', University of Zurich, Switzerland (2017).
- Workshop 'Geometric Measure Theory, Shape Optimisation and Free Boundaries', SISSA, Trieste, Italy (2016).
- Mini-Symposium, 9th European Conference on Elliptic and Parabolic Problems, Gaeta, Italy (2016).
- Mini-Symposium, British Applied Maths Colloquium, Oxford, UK (2016).
- Journée ANR GEOMETRYA, Nice, France (2014).
- Workshop 'Trends in Non-Linear Analysis', IST Lisbon, Portugal (2014).
- Workshop 'Isoperimetric Problems between Analysis and Geometry', Centro De Giorgi, Pisa, Italy (2014).
- Workshop 'Geometric PDEs', Centro De Giorgi, Pisa, Italy (2012).
- Mini-Symposium, ISMP International Conference, Berlin, Germany (2012).
- Contributed talk, The 5th Symposium on Analysis & PDEs, Purdue University, USA (2012).
- Contributed talk, PICO International Conference, École Polytechnique, France (2012).
- Joint day of GdR Isis and MSPC, IHP, France (2010).

Seminar talks:

- Munich (2021), Erlangen (2014), Würzburg (2014), Leipzig (2012, 2015, 2017, 2019, 2022, 2023), Bonn (2013, 2016), Séminaire du LJLL (2015, 2023), IMJ (2022), P5 (2022), CalVa X/Orsay/Paris VI/Paris Dauphine (2010, 2012, 2013, 2019, 2021), AN-EDP Paris 6/Paris 7/ENS (2015), GT EDP Sophie Germain (2022), Séminaire Laurent Schwartz (2019), CMAP (2021), INRIA MOKAPLAN (2021), Orsay (2013, 2018×2), Creteil (2017), Nantes (2022), EHESS (2016), Physique Mathématique IHP (2016), Grenoble (2012, 2016), Lyon (2012, 2022), Marseille (2012), Toulon (2013), Carnegie Mellon (2012), Padova (2011), Pisa (2011, 2016, 2017), SISSA (2018), Vito Volterra seminar (2024), Lisbon online seminar (2020).

Long research visits

- 6 months at the UMI Fibonacci, Pisa (2020).
- 5 months in the Scuola Normale Superiore di Pisa (2011).

Fundings and awards

- Thesis Prize from the Ecole Polytechnique.
- PI of a CNRS project PEPS Jeunes Chercheur-e-s (2016). Co-PI of two CNRS project PEPS Jeunes Chercheur-e-s (2017 and 2018).
- Member of the project “Connexions Optimales, Calcul et Approximations” funded by the PGMO program, (2016-2018).
- Member of the ANR project Shapo (2019-2023).
- Member of the project “Optimisation et interaction de structures” funded by the PGMO program, (2020-2021).

Responsibilities

- 2023– Member of the ‘Vie de Labo’ committee.
- 2023– Elected member of the CMAP Lab council.
- 2019– Member of the Organization committee of the GDR Calva.
- Co-Organizer of the Workshop “Calculus of variations and applications”, Paris, 2023.
- Co-Organizer of the Workshop “Rencontre en Calcul des Variations”, Nancy, 2021.

- Co-Organizer of the Workshop "Variational methods and applications", Centro De Giorgi, 2021.
- Co-Organizer of the conference "Modélisation, analyse et simulation - Le Laboratoire Jacques-Louis Lions fête ses 50 ans", 2019.
- Co-Organizer of a Calculus of Variation day to celebrate the 50 years of the LJLL, 2019.
- Co-Organizer of the ANR SHAPO meeting in Paris-Diderot, 2019.
- Co-Organizer of the conference "Calculus of Variation at Paris-Diderot", 2018.
- Organizer of the "Journées internes du LJLL", 2015–2022.
- Organizer of the calculus of variations workgroup first in Polytechnique, 2010–2011 and then joint Orsay/Dauphine/LJLL 2015–2019.
- Co-Organizer of the CNA-PIRE Working Group on Variational methods for phase transitions and copolymers, Carnegie Mellon University, Pittsburgh, Spring 2012.
- Co-Organizer of a minisymposium on Variational models in elasticity and plasticity at the GAMM meeting 2014.
- Reviewer for: JAMS, JEMS, ARMA, SIAM J. Math. Anal., An. Appl. Prob., Inverse Problems and Imaging, Appl. Math. Optim., ESAIM COCV, J. École Polytechnique, Interfaces and free boundaries, Annales IHP, Adv. Calc. Var., J. Convex Analysis, Bul. London Math. Society, Manuscripta Math., Com. Contemp. Math., Lecture Notes SNS, Mathscinet.
- Member of Hiring committees for Maître de Conférence positions: Université Paris Diderot (2017), Université Paris Dauphine (2021).
- 2019–2022 : Member of the Scientific Committee of the Math. Department of the Université Paris Diderot.
- 2019: Referee for the PhD Thesis of G. Vescovo (SISSA).
- 2021: Referee for the PhD Thesis of A. Kubin (Sapienza).
- 2022: Referee for the PhD Thesis of F. Onoue (SNS Pisa).
- 2023: Referee for the PhD Thesis of R. Prunier (Sorbonne University).
- 2022 : Reviewer for the Dutch Research Council.

Teaching Experience and Mentoring

Advanced classes:

- 2024 : 'Recent progress on the optimal matching problem' (3h) at the Conference interactions PDE/Probabilities, CIRM.

- 2020 : 'A variational approach to regularity in optimal transport and applications to the optimal matching problem' at SNS Pisa (6h).
- 2013 : 'Introduction to Weak KAM theory and Hamilton-Jacobi equations' at MPI Leipzig (25h).

Undergraduate:

- 2021– : Instructor for the class Numerical methods for ODEs, Bachelor Program, Polytechnique.
- 2021– : TA for Optimization and Optimal control for 2nd year students from Polytechnique.
- 2014–2019 : TA for undergraduate and graduate courses Advanced Algebra and Analysis, Optimisation, Analysis, Université Paris Diderot.
- 2009–2012 : One course of Probability and one of Statistics to first year students in the IUT de Sceaux (64h per year).

Mentoring:

- April-July 2023: Master thesis advisor for A. Prade.
- May/June 2023 : Mentoring M. Koser, visiting PhD student, advisor: B. Zwicknagl (HU Berlin).
- 2022–: PhD advisor of A. Cosenza (co-advisor A. Zilio).
- 2022 : Advisor of the L3 thesis of E. Moulinier (ENS Lyon).
- 2021 : Advisor of the L3 thesis of S. Cherf (ENS Lyon).
- 2020– : PhD advisor of J. Candau-Tilh (co-advisor B. Merlet).
- Spring 2014 : Co-advisor together with F. Otto of the M1 thesis of M. Josien (École Polytechnique).
- Summer 2012 : Project Director for the Summer Undergraduate Applied Mathematics Institute of the University of Carnegie Mellon (mentoring 4 students).