

Daniele Semola

Personal information

Language Italian (native), English (fluent).
Citizenship Italian citizen.
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Research interests

Analysis and Geometry of metric measure spaces, Geometric Analysis under lower curvature bounds, Geometric Measure Theory, Optimal Transport, Functional inequalities.

Current position

Jan. 23 - **Hermann Weyl Instructor**, *FIM-ETH, Zürich*, (Switzerland).
Supervisor Prof. Urs Lang.

Previous positions

Sept. 22 - Dec. 22 **Marsden Postdoctoral Fellow**, *Fields Institute, Toronto*, (Canada).
Supervisor Prof. Robert McCann.
Oct. 20 - Aug. 22 **Postdoctoral Research Fellow**, *University of Oxford*, (United Kingdom).
Supervisor Prof. Andrea Mondino.

Education

2017-2020 **PhD in Mathematics**, *Scuola Normale Superiore*, cum laude.
PhD thesis: "Recent developments about Geometric Analysis on $RCD(K,N)$ spaces".
Advisors: Prof. Luigi Ambrosio, Prof. Andrea Mondino.
2012-2017 **Student in Mathematics**, *Scuola Normale Superiore*, Pisa.
2015-2017 **Master degree in Mathematics**, *Università di Pisa*, 110/110 cum laude.
Master thesis: "An optimal transport approach to Lévy-Gromov inequality".
Advisor: Prof. Luigi Ambrosio.
2012-2015 **Bachelor degree in Mathematics**, *Università di Pisa*, 110/110 cum laude.
Bachelor thesis "Optimal transport, manifolds and isoperimetric inequalities".
Advisor: Prof. Luigi Ambrosio.

Honors

2022 "Gioacchino Iapichino Prize" of the Accademia Nazionale dei Lincei.
2019 "Benedetto Sciarra Prize" of the Scuola Normale Superiore of Pisa.

Research

Published/Accepted papers

- 1 A. Mondino, E. Bruè, D. Semola, *The metric measure boundary of spaces with Ricci curvature bounded below*, (2022) accepted for publication by Geom. Funct. Anal., preprint arXiv:2205.10609v1.
- 2 E. Bruè, E. Pasqualetto, D. Semola, *Constancy of the dimension in codimension one and locality of the unit normal on $RCD(K, N)$ spaces*, (2021), accepted for publication by Ann. Sc. Norm. Sup. Cl. Sci., preprint arXiv:2109.12585.
- 3 F. Cavalletti, A. Mondino, D. Semola, *Quantitative Obata's theorem*, (2019), accepted for publication by Analysis & PDE, preprint arXiv:1910.06637.
- 4 E. Bruè, E. Pasqualetto, D. Semola, *Rectifiability of the reduced boundary for sets of finite perimeter over $RCD(K, N)$ spaces*, J. Eur. Math. Soc. (JEMS) (2022), doi: 10.4171/JEMS/1217.
- 5 E. Bruè, A. Naber, D. Semola, *Boundary regularity and stability for spaces with Ricci bounded below*, Invent. Math., 228 (2022), no. 2, 777–891.
- 6 E. Bruè, Q. Deng, D. Semola, *Improved regularity estimates for Lagrangian flows on $RCD(K, N)$ spaces*, Nonlinear Analysis, Volume 214, (2022), 112609.
- 7 E. Bruè, E. Pasqualetto, D. Semola, *Rectifiability of $RCD(K, N)$ spaces via δ splitting maps*, Ann. Fenn. Math. 46 (2021), 465–482.
- 8 N. De Ponti, A. Mondino, D. Semola, *The equality case in Cheeger's and Buser's inequalities on RCD spaces*, J. Funct. Anal. 281 (2021), no. 3.
- 9 E. Bruè, D. Semola, *Constancy of the Dimension for $RCD(K, N)$ Spaces via Regularity of Lagrangian Flows*, Comm. Pure Appl. Math. 73 (2020), no. 6, 1141–1204.
- 10 E. Bruè, D. Semola, *Regularity of Lagrangian flows over $RCD^*(K, N)$ spaces*, J. Reine Angew. Math. 765 (2020), 171–203.
- 11 A. Mondino, D. Semola, *Polya-Szego inequality and Dirichlet p -spectral gap for non-smooth spaces with Ricci curvature bounded below*, J. Math. Pures Appl. (9) 137 (2020), 238–274.
- 12 G. Antonelli, E. Bruè, D. Semola, *Volume Bounds for the Quantitative Singular Strata of Non Collapsed RCD Metric Measure Spaces*, Anal. Geom. Metr. Spaces 7 (2019), no. 1, 158–178.
- 13 L. Ambrosio, E. Bruè, D. Semola, *Rigidity of the 1-Bakry-Émery inequality and sets of finite perimeter in RCD spaces*, Geom. Funct. Anal. 29 (2019), no. 4, 949–1001.

Books

- 1 L. Ambrosio, E. Bruè, D. Semola, *Lectures on Optimal Transport*, UNITEXT, Springer, Cham, ISSN 2038-5714. Pages IX, 250.

Preprints

- 1 G. Antonelli, E. Pasqualetto, M. Pozzetta, D. Semola, *Asymptotic isoperimetry on non collapsed spaces with lower Ricci bounds*, (2022), arXiv:2208.03739.

- 2 A. Mondino, D. Semola, *Lipschitz continuity and Bochner-Eells-Sampson inequality for harmonic maps from $RCD(K, N)$ spaces to $CAT(0)$ spaces*, (2022), arXiv:2202.01590.
- 3 G. Antonelli, E. Pasqualetto, M. Pozzetta, D. Semola, *Sharp isoperimetric comparison on non collapsed spaces with lower Ricci bounds*, (2022), arXiv:2201.04916.
- 4 A. Mondino, D. Semola, *Weak Laplacian bounds and minimal boundaries in non-smooth spaces with Ricci curvature lower bounds*, (2021), arXiv:2107.12344.

Seminars

Research seminars

- 07/02/2023 Séminaire d'analyse et géométrie, Sorbonne Université, Paris.
- 09/12/2022 Geometric Analysis and Topology seminar, Courant Institute, New York.
- 02/11/2022 Analysis & Mathematical Physics Seminar, IAS Princeton.
- 07/09/2022 Low Regularity Physics and Geometry Seminar, Fields Institute, Toronto.
- 16/03/2022 UCL Geometry Seminar, University College London.
- 25/02/2022 UCSB Differential Geometry Seminar, University of California Santa Barbara.
- 31/01/2022 Partial Differential Equations Seminar, University of Oxford.
- 28/01/2022 Geometric Analysis & Applications Seminar, Yale University (online).
- 11/11/2021 Analysis seminar, Mathematics Institute, University of Warwick, Coventry.
- 27/10/2021 Geometric Analysis seminar, UC San Diego (online).
- 01/06/2021 Analysis seminar, University of Trento (online).
- 21/10/2020 Analysis and/of PDEs seminar, University of Durham (online).
- 09/10/2020 Metric Measure Spaces and Convergence, (online).
- 30/06/2020 Forschungsseminars Variationsrechnung, Universität Hamburg (online).
- 16/12/2019 Séminaire de Géométrie, Institut de Mathématiques de Jussieu-Paris.
- 04/12/2019 Analysis seminar, University of Pisa.
- 24/10/2019 PDE CDT Lunchtime seminar, University of Oxford.
- 02/10/2019 Analysis seminar, University of Jyväskylä.
- 26/06/2019 Hausdorff Institute for Mathematics, Bonn.
- 28/02/2019 Analysis seminar, SISSA, Trieste.
- 14/02/2019 Analysis seminar, Mathematics Institute, University of Warwick, Coventry.
- 17/07/2018 SFB seminar, Bonn.
- 05/04/2018 Geometric Analysis seminar, SISSA, Trieste.

Talks at conferences

- 15/11/2022 Aspects of Ricci Curvature Bounds, Fields Institute, Toronto.
- 09/08/2022 Spaces with Symmetry and lower Ricci Curvature Bounds, BIRS (online).
- 22/06/2022 Isoperimetric Problems, University of Pisa.
- 27/05/2022 UMI PhD Conference, University of Padova.

- 10/11/2021 RCD spaces: Splitting theorems and applications, (online).
- 30/06/2021 Curvature Constraints and Spaces of Metrics, Institut Fourier, Grenoble.
- 01/04/2019 Optimal Transport and Geometric Analysis conference, Venezia.
- 24/03/2019 AMS meeting, University of Hawaii at Manoa, Honolulu, Hawaii.
- 07/02/2019 CDV conference, Levico Terme (Italy).
- 15/11/2018 Optimal Transport and Applications conference, Pisa.

Teaching

- 2021/2022 "Regularity theory of spaces with lower Ricci curvature bounds", topics course for graduate students at the University of Oxford, 12 hours.
- October 2021 "Optimal Transport and lower curvature bounds", lecture for graduate students at the University of Oxford.
- 2018/2019 Tutor for first year undergraduate students in Chemistry for the Scuola Normale Superiore course of Mathematics.
- 2017/2018 Tutor for first year undergraduate students in Mathematics for the Scuola Normale Superiore course of Mathematics.

Mentoring

- July-August 2021 Co-supervision with A. Mondino of the Summer Research Project of Mustafa Gunes (2nd year) and Julian Gonzales (3rd year) at the University of Oxford.

Services

Referee service for several journals, among the others: *Annales Scientifiques de l'École Normale Supérieure*, *Journal of Differential Geometry*, *Int. Math. Res. Not.*, *Geometry and Topology*, *Geometric and Functional Analysis*, *Advances in Mathematics*, *Transactions of the American Mathematical Society*, *Journal de Mathématiques Pures et Appliquées*, *ARMA*, *Analysis and PDE*.

Reviewer for *Mathematical Reviews* since October 2020.

Organization of a series of online seminars about metric measure spaces with curvature bounds from Fall 2021 to Spring 2022, in collaboration with R. Perales (UNAM, Oaxaca).

Referees

- Prof. Luigi Ambrosio, Scuola Normale Superiore, Pisa, Italy: luigi.ambrosio@sns.it
- Prof. Andrea Mondino, University of Oxford, United Kingdom, andrea.mondino@maths.ox.ac.uk
- Prof. Aaron Naber, Northwestern University, U.S.A.: anaber@math.northwestern.edu
- Prof. Vitali Kapovitch, University of Toronto, Canada: vtk@math.toronto.edu