

UNIVERSITÀ DEGLI STUDI DI MILANO

Procedura di selezione per la chiamata a professore di I fascia da ricoprire ai sensi dell'art. 18, commi 1 e 4, della Legge n. 240/2010 per il settore concorsuale 01/A3, (settore scientifico-disciplinare MAT/05 - Analisi Matematica) presso il Dipartimento di Matematica "Federigo Enriques", Codice concorso 5301.

Fabio Cavalletti

Curriculum Vitae

SISSA
Mathematics Area
Via Bonomea 265, Trieste, 34136 (Italy)
Home-page: <http://people.sissa.it/~cavallett>

Personal

Born in Rome, 8th February 1983.
Citizenship: Italian.

Current Position

Associate Professor at SISSA, since December 2019.

Previous Positions

Assistant Professor (RTD di tipo b) at SISSA
December 2016 - November 2019.

Assistant Professor (RTD di tipo a) at Dipartimento di Matematica of Università di Pavia.
April 2015 - December 2016.

Postdoc at Centro De Giorgi of Scuola Normale Superiore of Pisa.
October 2014 - April 2015.

Postdoc at RWTH, Mathematics Institute of Aachen in the group of Prof. Michael Westdickenberg.
October 2012 - September 2014.

Hausdorff Center Postdoc at University of Bonn in the group of Prof. Karl-Theodor Sturm.
September 2011 - September 2012.

Education

Ph.D. in Mathematics September 3, 2011 at SISSA, Trieste (Italy). Supervisor: Prof. Stefano Bianchini.
November 2007 - August 2011.

MSc in Mathematics, University of Roma "Sapienza", final mark: 110/110 cum laude.
October 2005 - July 2007.

BSc in Mathematics, University of Roma "Sapienza", final mark: 110/110 cum laude.
October 2002 - July 2005.

Fundings, Fellowships and Academic Distinctions

PRIN 2022 - National PI. 187.065 Euro.

Project title: Optimal Transport: new challenges across analysis and geometry.

Awarded on June 5, 2023.

ERC 2020-Consolidator grant finalist.

ERC 2018-Starting grant finalist.

FFABR Italian grant. 3.000 Euro.

Finanziamento annuale individuale delle attività base di ricerca.

Period: February, 2018 - December, 2020.

Italian qualification (i.e. “Abilitazione a Professore di Prima Fascia in Analisi”) to become **full professor**, since April 2018.

Bourbaki seminar: 14th January 2017.

Professor Cedric Villani gave a Bourbaki Seminar on my joint work with A. Mondino on sharp Levy-Gromov isoperimetric inequality in non-smooth spaces.

Cours de l’IHES: 2015-2016.

Professor Cedric Villani gave a course at the IHES on synthetic notions of curvature in non-smooth spaces; the last lectures were devoted to discuss my joint work with A. Mondino on Levy-Gromov isoperimetric inequality in non-smooth spaces.

HCM Fellow: July 2014.

Fellowship of the Hausdorff Center for Mathematics and of University of Bonn for the Trimester Program “Optimal Transportation”.

Premio di Studio: July 2003, July 2004, July 2005.

Scholarship of the Department of Mathematics of University of Rome “Sapienza” assigned on a merit base.

Papers

Preprints

- Optimal transport between algebraic hypersurfaces (with P. Antonini and A. Lerario).
Submitted arXiv:2212.10274.
- Rigidities of Isoperimetric inequality under nonnegative Ricci curvature (with D. Manini).
Submitted, arXiv:2207.03423.
- Geometry of Grassmannians and optimal transport of quantum states (with P. Antonini).
Submitted, arXiv:2104.02616.
- Optimal transport in Lorentzian synthetic spaces, synthetic timelike Ricci curvature lower bounds and applications (with and A. Mondino).
Submitted, arXiv:2004.08934.

Publications

1. A review of Lorentzian synthetic theory of timelike Ricci curvature bounds (with A. Mondino)
General Relativity and Gravitation volume 54, Article number: 137 (2022).
2. Isoperimetric inequality in noncompact MCP spaces (with D. Manini).
Proc. Amer. Math. Soc., 150 (2022), 3537–3548 DOI: <https://doi.org/10.1090/proc/15945>.

3. Quantitative Obata's Theorem (with A. Mondino and D. Semola).
Accepted for publication on **Anal. PDE**, arXiv:1910.06637.
4. Indeterminacy estimates and the size of nodal sets in singular spaces (with S. Farinelli).
Advances Math., 389 (2021) 107919. <https://doi.org/10.1016/j.aim.2021.107919>.
5. The Globalization Theorem for the Curvature Dimension Condition (with E. Milman).
Inventiones Math., 226(1), (2021), 1–137. <https://doi.org/10.1007/s00222-021-01040-6>.
6. Independence of synthetic Curvature Dimension conditions on transport distance exponent (with A. Akdemir, A. Colinet, R.J. McCann and F. Santarcangelo).
Trans. Amer. Math. Soc., 374 (2021), 5877–5923. <https://doi.org/10.1090/tran/8413>.
7. Displacement convexity of Entropy and the distance cost Optimal Transportation (with N. Gigli and F. Santarcangelo).
Annales de la Faculté des sciences de Toulouse:Mathématiques, Série 6, Tome 30 (2021) no. 2, 411–427. DOI : 10.5802/afst.1679.
8. New formulas for the Laplacian of distance functions and applications (with A. Mondino).
Anal. PDE, Vol. 13, No. 7, (2020) <https://doi.org/10.2140/apde.2020.13.2091>.
9. Isoperimetric inequality under Measure- Contraction property (with F. Santarcangelo).
J. Funct. Anal., 277 (2019), 2893–2917
10. Quantitative isoperimetry à la Levy-Gromov (with F. Maggi and A. Mondino).
Comm. Pure Appl. Math., LXXII (2019), 1631–1677.
11. A variational time discretization for the compressible Euler equations (with M. Sedjro and M. Westdickenberg).
Trans. Amer. Math. Soc., 371 (2019), 5083–5155.
12. Almost euclidean Isoperimetric Inequalities in spaces satisfying local Ricci curvature lower bounds (with A. Mondino).
Int. Math. Res. Not., 2020 (2020), 1481–1510.
13. Rigidity for critical points in the Levy-Gromov inequality (with F. Maggi and A. Mondino).
Math. Z., (2018) 289: 1191.
14. An overview of L^1 optimal transportation on metric measure spaces.
Measure Theory in Non-Smooth Spaces, book chapter, edited by N. Gigli, De Gruyter Open, <https://doi.org/10.1515/9783110550832-003>.
15. Optimal maps in essentially non-branching spaces (with A. Mondino).
Commun. Contemp. Math., 06 (2017) 19.
16. Isoperimetric inequalities for finite perimeter sets under lower Ricci curvature bounds (with A. Mondino).
Rendiconti Lincei Matematica e Applicazioni, Volume 29, 3 (2018) 413–430.
17. Sharp geometric and functional inequalities in metric measure spaces with lower Ricci curvature bounds (with A. Mondino).
Geom. Topol., 21 (2017) 603–645.
18. Tangent lines and Lipschitz differentiability spaces (with and T. Rajala).
Anal. Geom. Metr. Spaces, 4 (2016) 85–103.
19. Sharp and rigid isoperimetric inequalities in metric-measure spaces with lower Ricci curvature bounds (with A. Mondino).
Inventiones Math., 208 (2017) 803–849.

20. Measure rigidity of Ricci curvature lower bounds (with A. Mondino).
Advances Math., 286 (2016) 430–480.
21. A simple proof of global existence for the 1D Pressureless Gas Dynamics Equations (with M. Sedjro and M. Westdickenberg).
SIAM J. Math. Anal., 47 (2015), no. 1, 66–79.
22. The polar cone of the set of monotone maps (with and M. Westdickenberg).
Proc. Amer. Math. Soc., 143 - 2 (2015), 781–787.
23. Decomposition of geodesics in the Wasserstein space and the globalization problem.
Geom. Funct. Anal., Vol. 24 (2014) 493–551.
24. Monge problem in metric spaces with Riemannian curvature-dimension condition.
Nonlinear Analysis, 99 (2014), 136–151.
25. A note on a residual subset of Lipschitz functions on metric spaces.
Proceedings of Edinburgh Math. Society., Volume 58, Issue 3, 631–636.
26. Self-Intersection of Optimal geodesics (with M. Huesmann).
Bull. London Math. Soc., 46 (2014) 653–656.
27. Existence and uniqueness of optimal transport maps (with M. Huesmann).
Ann. I. H. Poincaré AN, 32 (2015) 1367–1377.
28. Local Curvature-Dimension condition implies Measure-Contraction property (with K.-T. Sturm).
J. Funct. Anal., 262 (2012), 5110–5127.
29. The Monge problem for distance cost in geodesic spaces (with S. Bianchini).
Commun. Math. Phys., 318 (2013), 615–673.
30. Optimal transportation with branching distance costs and the obstacle problem.
SIAM J. Math. Anal., Vol. 44 (2012), No. 1, 454–482.
31. The Monge problem in the Wiener space.
Calc. Var and PDE, Vol. 45 (1-2) (2012), 101–124.

Proceedings

- F. Cavalletti and S. Bianchini. The Monge problem in geodesic spaces. *The IMA Volumes in Mathematics and its Applications*, Vol. 153, 217–234.

Invitations

Invited talks at International Conferences

- Workshop “Non-regular Spacetime Geometry”, ESI- Vienna, March 2023.
- Workshop “Mathematical Relativity, Scalar Curvature and Synthetic Lorentzian Geometry”, Fields Institute, University of Toronto, October 2022.
- Conference “Optimal Transportation and Applications” Pisa, Italy, October 2022.
- BIRS Workshop “Metric measure spaces and Lower Ricci Curvature Bounds”, Oaxaca, Mexico, August 2022.
- Conference “From Dirichlet forms to Wasserstein geometry” on the occasion of Theo Sturm’s 60th birthday, Bonn, February 2022.

- Conference "Calculus of Variations and PDEs: recent developments and future directions", ETH - Zurich, June 2021.
- Workshop "Singularity theorems, causality, and all that. A tribute to Roger Penrose", online, June 2021.
- Conference "Optimal Transportation and Applications", Pisa, April 2021.
- Conference "Optimal Transport and Geometric Analysis", Warwick University-Venice, 2019.
- Workshop "Optimal Transport: from Geometry to Numerics", ESI, Wien, 2019.
- Workshop "Optimal transport and applications", CIMI, Toulouse, 2019.
- Conference "Geometry and Probability, Fukuoka University, Japan, 2019.
- Workshop "Optimal Transportation and Applications", Centro De Giorgi, Pisa, 2018.
- Summer school "Stochastic and geometric analysis group", Bonn, 2018.
- Workshop "Recent Advances in Geometric Analysis", Centro De Giorgi, 2018
- Workshop "Partial Differential Equations-MFO", Oberwolfach, 2017.
- Conference "Metric Measure Spaces and Ricci Curvature", Max-Planck-Institute, Bonn, 2017.
- Workshop on "Recent Trends in the Analysis of PDEs", Pavia, Italy, 2016.
- HIM Follow-up Workshop to JTP "Optimal Transportation", Bonn, Germany, 2016.
- CMC conference on "Analysis, Geometry, and Optimal Transport", KIAS, Seoul, 2016.
- British Mathematical Colloquium, Bristol, UK, 2016.
- "Brussels-London seminar", Brussels, Belgium, 2015.
- Workshop "Optimal transport and Geometry", Montpellier, France, 2015.
- Workshop "IperGSSI2015", L'Aquila, Italy, 2015
- European Young Probabilists, Eurandom, Eindhoven, 2014
- Winter school on Optimal transportation, Regen - Germany, 2014.
- Conference "Analysis on Metric Spaces", UCLA - Los Angeles (US), 2013.

Department Seminars

- Politecnico of Milano, Italy, 2023.
- University of Trento, Italy, 2022.
- Columbia University, US, 2021.
- University of Toronto, Canada, 2020.
- University of Oxford, UK, 2019.
- University of Munster, Germany, 2019
- University of Munich, TUM, Germany, 2019.
- Università di Napoli, Italy, 2019
- Università di Roma "Sapienza", Italy, 2018.
- Convegno Nazionale di Calcolo delle Variazioni, Levico Terme, Trento, 2017.
- Politecnico di Milano, Italy, 2017.
- Università di Bologna, Italy, 2016.
- Università di Bologna, Italy, 2016.
- SISSA, Trieste, Italy, 2016.

- UT-Austin, US, 2016.
- Università Statale, Milano, Italy, 2015.
- Università Bicocca, Milano, Italy, 2015.
- Università di Roma "Sapienza", Italy, 2015.
- Penn State University, University College - PA, US, 2014.
- XV International Conference on Hyperbolic Problems, IMPA, Rio de Janeiro, 2014.
- Two days on Hyperbolic PDEs, Geometric Measure Theory and Optimal Transport, SISSA, 2013.
- University of Jyväskylä, Finland, 2013.
- University of Roma "Sapienza", Italy, 2013.
- Convegno Nazionale di Calcolo delle Variazioni, Levico Terme (Trento), 2013.
- RWTH, University of Aachen, Germany, 2012.
- Winter school on Optimal transportation, Regen - Germany, 2012.
- Hausdorff center for Mathematics, University of Bonn - Germany, 2011.

Research Periods

- University of Oxford, October 2019. (Prof. A. Mondino).
- University of Texas-Austin. February-March 2016. (Prof. F. Maggi).
- Technion - Israel Institute of Technology, Haifa, September 2015. (Prof. E. Milman).
- Penn State University, November 2014. (Prof. A. Bressan).
- Department of Mathematics of Jyväskylä, Finland, August 2013. (Prof. T. Rajala).
- University of Bonn, February 2011. Joined the research group of Prof. K.-T. Sturm.

Teaching Activity

Courses

- Optimal Transport, Phd course (30 hours) SISSA, April - May 2022.
- Optimal Transport, Phd course (60 hours) SISSA, February - May 2021.
- Functional Analysis, Università di Trieste and SISSA, March - June 2020.
- Functional Analysis, Università di Trieste and SISSA, March - June 2019.
- L^1 Theory of Optimal Transportation, Phd course SISSA, March 2018 - June 2018.
- Topics of advanced analysis, SISSA, October 2017 - May 2018.
- Topics of advanced analysis, SISSA, April 2017 - May 2017.
- Mathematics for Biology, Università di Pavia, October 2016 - February 2017.
- Mathematics for Biology, Università di Pavia, October 2015 - February 2016.
- Mathematics for Biotechnology, Università di Pavia, October 2015 - February 2016.
- Teaching Assistant, PDEs, RWTH - Aachen, February 2014 - July 2014.
- Teaching Assistant, Analysis III, RWTH - Aachen, October 2013 - December 2013.
- Teaching Assistant, Analysis II, RWTH - Aachen, April 2013 - July 2013.

- Teaching Assistant, Analysis I, RWTH - Aachen, November 2012 - March 2013.

Supervision

Past and present PhD student at SISSA.

- Davide Manini (expected defence September 2023).
- Sara Farinelli (defended September 2022).
- Flavia Santarcangelo (defended September 2020)

Past and present Post-doc at SISSA.

- Daniela Di Donato (joint with N. Gigli, Dec. 2020 - Dec. 2022)
- Paolo Antonini (Jan. 2019 - Aug. 2020)

Services

University Committee and Administrative Responsibilities

Head of the “Consiglio dei docenti della SISSA per il Percorso Formativo Comune” within the joint program of SISSA with the University of Trieste for the Master degree in Mathematics.
September 2021 - March 2022.

Member of the Quality committee of SISSA “Referente della qualità per il dottorato in Analisi Matematica, Modelli ed Applicazioni della SISSA”.
October 2019 - Today.

Member of the Doctoral Faculty of SISSA “Membro del Collegio del Dottorato Analisi Matematica, Modelli e Applicazioni della SISSA”.
March 2017 - Today.

Organisation Activities

IperPavia 2017, yearly conference on hyperbolic equations and conservation laws, September 6 - 8, 2017, Pavia, Italy.

Junior session on hyperbolic conservation laws and related topics, AIMS 2016 meeting, July 1-5, 2017, Orlando, Florida, USA.

Winter School, HCM-University of Bonn, February 23 - 27, 2015.

Junior Trimester Program “Optimal Transportation” of Hausdorff Institute of Mathematics: Group “Global and local properties of metric measure spaces with synthetic Ricci curvature bounds”, January - April 2015, Bonn, Germany.

Reviewer of International projects

External reviewer for the program of the Austrian Science Fund (FWF), 2023.

External reviewer for the program of the French National Research Agency (ANR), 2023.

External reviewer for the program of the Austrian Science Fund (FWF), 2022.

External reviewer for the VQR 2015 - 2019, Italian evaluation of research, 2021.

External reviewer for the program of the Italian Science Fund (FIS), 2021.

Referee Activity

Referee activity for several international journals, including:

Inventiones Mathematicae; Memoirs AMS; Geom. Funct. Analysis; Communications in Pure and Applied Mathematics; JEMS; Crelle's Journal; Advances in Mathematics; Geometry and Topology; Journal of Functional Analysis; J. Diff. Geometry; Potential Analysis; Bulletin of the London Mathematical Society; Annals of Probability; Annali di Matematica Pura ed Applicata; Transactions of the AMS; ARMA; Forum Sigma.

June 7, 2023

Fabio Cavalletti