

LUCA BENATTI

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Curriculum Vitae et Studiorum

Current position

Feb 2024 - Current **Postdoctoral Researcher**, *University of Pisa*, Pisa (I), Principal Investigator: Prof. Giovanni Alberti.

Previous positions

- Feb 2023 - Jan 2024 **Postdoctoral Researcher**, *University of Pisa*, Pisa (I), founded at 50% by Starting Grant ERC “Variational approach to the regularity of the free boundaries”. Principal Investigator: Prof. Bozhidar Velichkov.
- Oct 2022 - Nov 2022 **Long term visitor of the Thematic Program on Nonsmooth Riemannian and Lorentzian Geometry**, *Fields Institute*, Toronto (CA)
- Nov 2018 - Jun 2022 **Ph.D. student with research fellowship**, *University of Trento*, Trento (I)

Education

- Nov 2018 - Jun 2022 **Ph.D. in Mathematics**, *University of Trento*, Trento (I), *Ottimo cum Laude*. Advisor: Prof. Lorenzo Mazziere. Title: Monotonicity Formulas in Nonlinear Potential Theory and their geometric applications.
- Oct 2016 - Sep 2018 **Master’s degree in Mathematics**, *University of Trieste*, Trieste (I), *110/110 cum Laude*. Thesis advisor: Prof. Nicola Gigli. Thesis Title: A review of differential calculus on metric measure spaces via L^0 -normed modules.
- Sep 2013 - Jul 2016 **Bachelor’s degree in Mathematics**, *University of Modena and Reggio Emilia*, Modena (I), *110/110 cum Laude*. Thesis advisor: Prof. Gian Paolo Leonardi. Thesis Title: Corpi galleggianti con equilibrio indifferente e una congettura di Auerbach.

Invited talks

- Sep 2024 **The Riemannian Penrose inequality**, *Pisa-Freiburg school in Applied Analysis*, Pisa (I), Lecture (2h) in Alessandra Pluda’s course.
- Feb 2024 **Nonlinear potential theory through the looking-glass and the Penrose inequality we found there**, *Recent Advances in Comparison Geometry*, Hangzhou (CN)
- Sep 2022 **Isoperimetric concept of mass in manifolds with nonnegative scalar curvature**, *University of Milano-Bicocca*, Milano (I)
- Sep 2022 **Bertie Bott’s every flavour mass concepts in General Relativity**, *Another Pisan workshop in Geometric Analysis*, Pisa (I)
- Aug 2022 **Various concepts of mass in General Relativity**, *Three days between Analysis and Geometry in Trento*, Trento (I)
- Oct 2021 **From PDE’s to Geometry: a new path towards the Minkowski**, *MAP Seminar*, Pisa (I)
- Jun 2018 **Differential calculus on metric measure spaces**, *University of Modena and Reggio Emilia*, Modena (I)

Contributed talks

- Feb 2024 **Isoperimetric concept of mass in manifolds with nonnegative scalar curvature**, *XXXIII Convegno Nazionale di Calcolo delle Variazioni*, Riccione (I)
- Jun 2022 **Minkowski Inequality in Riemannian manifolds with nonnegative Ricci curvature**, *Shape optimization, related topics and applications*, Roscoff (FR)
- Oct 2021 **Minkowski Inequality in Riemannian manifolds with nonnegative Ricci curvature**, *9th GAMM-Workshop on Analysis of Partial Differential Equations*, Freiburg im Breisgau (DE)
- Sep 2021 **Minkowski Inequality in Riemannian manifolds with nonnegative Ricci curvature**, *Geometric theory of PDE's and sharp functional inequalities*, Accademia Nazionale dei Lincei (Zoom Talk)

Organisation of events

- Sep 2024 **The Pisan workshop saga. Ep. V - Geometric analysis strikes back.**, Pisa (I), with M. Fogagnolo e A. Pluda.
- Sep 2023 **Guess what? A Pisan workshop in Geometric Analysis**, Pisa (I), with M. Fogagnolo e A. Pluda.

Funded projects

- 2022 **GNAMPA Project: “Problemi al bordo e applicazioni geometriche”**, Joint project with V. Agostiniani, L. Benatti, S. Borghini, L. Mazzieri, F. Oronzio and A. Pinamonti.

Teaching experience

- Spring 2023 **Ph.D. Course (12 h): “Monotonicity formulas in nonlinear potential theory and their geometric applications”**, *University of Pisa*, Pisa (I), Department of Mathematics
- Winter 2021 **Grader for Mathematical Analysis II**, *University of Trento*, Trento (I), Department of Civil, Environmental and Mechanical
- Spring 2021 **TA for Geometric Analysis**, *University of Trento*, Trento (I), Department of Mathematics
- Winter 2020 **Grader for Mathematical Analysis II**, *University of Trento*, Trento (I), Department of Civil, Environmental and Mechanical
- Spring 2020 **TA for Geometric Analysis**, *University of Trento*, Trento (I), Department of Mathematics
- Autumn 2019 **TA for Mathematical Analysis I**, *University of Trento*, Trento (I), Department of Industrial Engineering
- Summer 2019 **Grader for Geometry and Linear Algebra**, *University of Trento*, Trento (I), Department of Industrial Engineering
- Spring 2019 **L^AT_EX mini-course**, *University of Trento*, Trento (I), Department of Mathematics

Schools

- Sep 2024 **Pisa-Freiburg school in Applied Analysis**, *University of Pisa*, Pisa (I)
- Lug 2024 **Bridging PDE and Geometric Flows – An LMS-HIMR Research School**, *University of Cardiff*, Cardiff (UK)
- Lug 2024 **BIGW V – Mathematical General Relativity**, Birmingham (UK)
- Aug 2023 **Three days between Analysis and Geometry in Trento, 2° edition**, *University of Trento*, Trento (I)
- Aug 2022 **Three days between Analysis and Geometry in Trento**, *University of Trento*, Trento (I)

- Sep 2021 **Convex Geometry**, *CIME*, Cosenza (I)
 Sep 2019 **Geometric Measure Theory and Applications**, *CIME*, Cosenza (I)
 Jul 2019 **Geometry and Gravity**, *ICTP*, Trieste (I)

Workshops

- Jun 2024 **Regularity Theory for Free Boundary and Geometric Variational Problems IV**, Trento (I)
 Jun 2024 **CHANGE - CHallenges in ANalysis and GEometry**, Zürich (CH)
 Apr 2024 **Workshop Calculus of Variations and Free Boundary Problems VIII**, Pisa (I)
 Feb 2024 **Recent Advances in Comparison Geometry**, Hangzhou (CN)
 Feb 2024 **XXXIII Convegno Nazionale di Calcolo delle Variazioni**, Riccione (I)
 Dec 2023 **Mathematical Relativity: Past, Present, Future**, Wien (AT)
 Dec 2023 **Curvature-driven geometric problems**, Pisa (I)
 Jun 2023 **Regularity Theory for Free Boundary and Geometric Variational Problems III**, Trento (I)
 Jun 2023 **Calculus of Variations & Geometric Measure Theory**, Pisa (I)
 May 2023 **Geometric Measure Theory**, Bressanone (I)
 Nov 2022 **Workshop on Aspects of Ricci Curvature Bounds**, Toronto (CA)
 Oct 2022 **Workshop on Mathematical Relativity, Scalar Curvature and Synthetic Lorentzian Geometry**, Toronto (CA)
 Sep 2022 **Another Pisan workshop in Geometric Analysis**, Pisa (I)
 Jun 2022 **Isoperimetric problems**, Pisa (I)
 Jun 2022 **Shape optimization, related topics and applications**, Roscoff (FR)
 May 2022 **XXXI Convegno Nazionale di Calcolo delle Variazioni**, Levico (I)
 Oct 2021 **A Pisan workshop in Geometric Analysis**, Pisa (I)
 Oct 2021 **9th GAMM-Workshop on Analysis of Partial Differential Equations**, Freiburg im Breisgau (DE)
 Sep 2021 **Geometric theory of PDE's and sharp functional inequalities**, Zoom workshop
 Feb 2020 **XXX Convegno Nazionale di Calcolo delle Variazioni**, Levico (I)
 Feb 2019 **XXIX Convegno Nazionale di Calcolo delle Variazioni**, Levico (I)
 Jun 2019 **Geometric Analysis and General Relativity. A conference in honour of G. Huisken's 60th**, Zürich (CH)
 Jan 2019 **Alessio Figalli, Fields Medallist 2018**, Pisa (I)
 Feb 2018 **XXVIII Convegno Nazionale di Calcolo delle Variazioni**, Levico (I)

Languages

English (competent), **Italian** (native)

List of publications

- 2024 **Fine properties of nonlinear potentials and a unified perspective on monotonicity formulas**, joint with A. Pluda and M. Pozzetta, preprint
 DOI: 10.48550/arXiv.2411.06462. arXiv: 2411.06462
 2024 **A Note on Ricci-pinched three-manifolds**, joint with C. Mantegazza and F. Oronzio and A. Pluda, preprint
 DOI: 10.48550/arXiv.2409.05078. arXiv: 2409.05078

- 2024 **Second-order estimates for the p -Laplacian in RCD spaces**, joint with I. Y. Violo, preprint
arXiv: 2401.09982 [math]. URL: <http://arxiv.org/abs/2401.09982>
- 2024 **Minkowski inequality on complete Riemannian manifolds with nonnegative Ricci curvature**, joint with M. Fogagnolo and L. Mazziere, *Analysis & PDE*
DOI: 10.2140/apde.2024.17.3039
- 2023 **Isoperimetric sets in nonnegative scalar curvature and their role through various concepts of mass**, joint with M. Fogagnolo, Accepted: *Springer INdAM series*
DOI: 10.48550/arXiv.2305.03643. arXiv: 2305.03643 [math]
- 2023 **Nonlinear isocapacitary concepts of mass in 3-manifolds with nonnegative scalar curvature**, joint with M. Fogagnolo and L. Mazziere, *SIGMA. Symmetry, Integrability and Geometry. Methods and Applications*
DOI: 10.3842/SIGMA.2023.091
- 2022 **On the Isoperimetric Riemannian Penrose Inequality**, joint with M. Fogagnolo and L. Mazziere, Accepted: *CPAM*
DOI: 10.48550/arXiv.2212.10215. arXiv: 2212.10215 [math]
- 2022 **The asymptotic behaviour of p -capacitary potentials in asymptotically conical manifolds**, joint with M. Fogagnolo and L. Mazziere, *Mathematische Annalen*
DOI: 10.1007/s00208-022-02515-4
- 2022 **Monotonicity Formulas in Nonlinear Potential Theory and their geometric applications**, Ph.D. thesis
DOI: https://dx.doi.org/10.15168/11572_346959

Scholarships, awards and further information

- May 2023 Best Ph.D. Thesis in Mathematics of XXXIV cycle at University of Trento
- Nov 2018 - Jan 2022 Ph.D. Scholarship “Departments of Excellence”
- Oct 2016 - Sep 2018 SISSA scholarship
- Sep 2013 - Jul 2016 INdAM scholarship
- Since 2023 Reviewing activity for the following journals: Rendiconti Lincei, Mathematische Annalen, Journal of Differential Geometry.

Professional references

Nicola Gigli, *Mathematics Area*, SISSA
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Carlo Mantegazza, *Dipartimento di Matematica e Applicazioni “Renato Caccioppoli”*, Università degli studi di Napoli Federico II
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