MERLO ANDREA

Universidad del País Vasco
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Born in Valdobbiadene (TV, Italy), 01/08/1992.

EDUCATION AND POSITIONS

Ikerbasque research fellow *2024-present*
Tenure Track at Universidad del País Vasco.

Marie Skłodowska-Curie postoctoral fellowship *2022-2024*
Universidad del País Vasco.
Supervisor: Mihalis Mougoglou.

Post-doc *2022-2022*
Université de Fribourg.
Supervisor: Enrico Le Donne.

Post-doc *2020-2022*
Université Paris-Saclay.
Supervisor: Guy David.

PhD in Mathematics *2016- 2020*
Scuola Normale Superiore, cum Laude. Discussed the 17th June 2020.
Dissertation: *"Geometry of* 1*-codimensional measures in Heisenberg groups"*
Supervisors: Giovanni Alberti, Roberto Monti.

Scuola Galileiana di Studi Superiori *2011-2017*
University of Padua, Italy. 100/100 cum Laude.
Dissertation: *"Geometry of uniform measures in the Heisenberg group"*
Supervisor: Roberto Monti.

MSc in Mathematics *2014-2016*
University of Padua, Italy. 110/110 cum Laude.
Dissertation: *"Non-differentiability sets of typical Lipschitz functions"*
Supervisors: Roberto Monti, David Preiss.

Erasmus Program, University of Warwick. *2015-2016*

BSc in Mathematics *2011-2014*
University of Padua, Italy. 110/110 cum Laude.
Dissertation: *"Struttura di insiemi di misura nulla"*
Supervisor: Roberto Monti.

PUBLISHED PAPERS

1. *Intrinsically Lipschitz functions with normal target in Carnot groups*, published in Annales Fennici Mathematici, DOI: `https://doi.org/10.5186/aasfm.2021.4638` with G. Antonelli.
2. *Geometry of* 1*-codimensional measures in Heisenberg groups*, published in Inventiones Mathematicae, DOI: `https://doi.org/10.1007/s00222-021-01063-z`.

3. *On rectifiable measures in Carnot groups: representation*, published in Calculus of Variation and PDEs, DOI: https://doi.org/10.1007/s00526-021-02112-4, 2021 with G. Antonelli.

4. *Endpoint Fourier restriction and unrectifiability*, published in the Proceedings of the AMS, DOI: https://doi.org/10.1090/proc/15857 with G. Del Nin.

5. *On rectifiable measures in Carnot groups: existence of density*, published in the Journal of Geometric Analysis https://doi.org/10.1007/s12220-022-00971-7, 2022 with G. Antonelli.

6. *On rectifiable measures in Carnot groups: Marstrand-Mattila rectifiability criterion*, published in the Journal of Functional Analysis https://doi.org/10.1016/j.jfa.2022.109495, 2022 with G. Antonelli.

7. *Marstrand-Mattila rectifiability criterion for* 1*-codimensional measures in Carnot Groups*, published in Analysis and PDEs, DOI: https://doi.org/10.2140/apde.2023.16.927, 2023.

8. *On sets with unit Hausdorff density in homogeneous groups*, published in Forum of Mathematics, Sigma DOI:https://doi.org/10.1017/fms.2023.31, 2023, with A. Julia.

9. *Generic uniqueness for the Plateau problem*, https://doi.org/10.1016/j.matpur.2023.10.010, published in the Journal de Mathématiques Pures et Appliquées, 2023 with G. Caldini, A. Marchese and S. Steinbrüchel.

10. *Unextendable intrinsic Lipschitz curves*, published in Annali SNS, https://doi.org/10.2422/2036-2145.202107_017, 2021 with G. Antonelli.

11. *Characterization of rectifiability via Lusin type approximation*, published in Analysis and PDEs, 10.2140/apde.2024.17.2109, 2024, with A. Marchese.

12. *On the converse of Pansu's Theorem*, Pulished in ARMA https://doi.org/10.1007/s00205-024-02059-8, 2024 with G. De Philippis, A. Marchese, A. Pinamonti and F. Rindler.

13. *Carnot rectifiability and Alberti representations*, published in Proceedings of the London Math. Society, https://doi.org/10.1112/plms.70021, 2025 with G. Antonelli and E. Le Donne.

ACCEPTED PAPERS

1. *On the density problem in the parabolic space*, accepted for publication in Memoirs AMS, https://arxiv.org/pdf/2211.04222.pdf, 2022 with M. Mourgoglou and C. Puliatti.

2. *A simple proof of the* 1*-dimensional flat chain conjecture*, accepted for publication in Advances in Calc. Var. https://arxiv.org/pdf/2411.15019, 2024 with A. Marchese;

SUBMITTED PAPERS

1. *Full non-differentiability sets of typical Lipschitz functions*, https://arxiv.org/abs/1906.08366, 2019;

2. *Tangency sets of non-involutive distributions and unrectifiability in Carnot-Carathéodory spaces*, `https://arxiv.org/abs/2503.01373`, 2025, with G. Alberti, A. Massaccesi, 2025;

3. *Layer potentials for elliptic operators with DMO-type coefficients: big pieces Tb theorem, quantitative rectifiability, and free boundary problems*, `https://arxiv.org/abs/2505.23478`, with M. Mourgoglou and C. Puliatti, 2025;

4. *Frobenius theorem and fine structure of tangency sets to non-involutive distributions*, `https://arxiv.org/abs/2506.03715` with G. Alberti, A. Massaccesi, 2025.

TEACHING

1. Teaching assistant to the course Analysis 3 at the University of Pisa, Winter semester 2018-2019.

2. Tutor for the 107th orientation course of the Scuola Normale Superiore, held in Rome, July 8-13, 2019.

3. Tutor for the course of Analysis II at Université de Fribourg. Spring semester 2021-2022.

SELECTED TALKS

1. *Geometry of uniform measures in the Heisenberg group.* "XXVIII Convegno nazionale di calcolo delle variazioni", Levico Terme, February 12-16, 2018.

2. *Geometry of uniform measures in Heisenberg groups.* "A sub-Riemannian day in Padova", Padova, September 14, 2018.

3. *Geometry of* 1*-codimensional measures in Heisenberg groups.* Seminar at the Universidad Autónoma de Barcelona. Barcelona, February 25, 2019.

4. *Some extensions of the Frobenius Theorem, Part I.* "Some topics of Geometric Analysis and Geometric Measure Theory", Pisa, April 16-17, 2019.

5. *The Marstrand-Mattila rectifiability criterion in Carnot groups.* "Workshop on Geometric Measure Theory", Alba di Canazei, June 26-29, 2019.

6. *Preiss's rectifiability theorem in the first Heisenberg group.* Seminar at University of Warwick, online, March 4, 2021.

7. *Preiss's rectifiability theorem in the first Heisenberg group.* Jyväskylä Geometric Analysis Seminar, online, March 22, 2021.

8. *The Marstrand-Mattila rectifiability criterion in Carnot groups* Geometric Measure Theory and applications, Cortona, August 30-September 3, 2021.

9. *Endpoint Fourier restriction and unrectifiability.* Seminar in Bilbao Analysis and PDEs, online, October 14, 2021.

10. *The density problem in the parabolic space.* Interactions between Geometric measure theory, Singular integrals, and PDE, Bonn, 13-19 March 2022.

11. *On the density problem in Heisenberg groups.* First UMI meeting of Ph.D. students, Padova, 26-27 May 2022.

12. *On the converse of Pansu's Theorem.* Geometric measure theory and analysis on metric spaces, Warwick, 8-10 August 2022.

13. *On the converse of Pansu's Theorem.* Seminar at the Universidad Autónoma de Barcelona, May 2023.

14. *Carnot rectifiability and Alberti representations.* Geometric Measure Theory in Bressanone, 29 May- 2 June 2023.

15. *Carnot rectifiability and Alberti representations.* Nordic congress of mathematicians, Aalborg, 2-7 July 2023.

16. *On the converse of Pansu's Theorem.* Frontiers in Sub-Riemannian Geometry, 25-29 November 2024, CIRM, Marseille.

17. *On the converse of Pansu's Theorem*, OxPDE Lunchtime Seminar in Oxford, 15 may 2025.

ORGANIZATION OF SCIENTIFIC MEETINGS

1. **Co-organizer.** International Conference on Harmonic Analysis, PDEs, and Geometric Measure Theory, Bilbao, 12-16 June 2023.

GRANTS AND AWARDS

1. **2022-2024, Grant.** Marie Skłodowska Curie Action, European Union's research and innovation programme Horizon 2022. Grant agreement number 101065346.

2. **2022, Prize.** Premio Guido Stampacchia relative to the theme "Calculus of Variations", of the "Accademia di Scienze Fisiche e Matematiche della Società Nazionale di Scienze, Lettere e Arti" in Naples.

3. **2023, Prize.** Premio Gioacchino Iapichino, for a young mathematician author of a work, published or unpublished, in the field of mathematical Analysis, of the "Accademia Nazionale dei Lincei".

3. **2023, Prize.** Premio Indam-Umi-Simai, for the best PhD thesis in mathematics discussed in an italian university in the previous 3 years.

4. **2024.** Reserve List ERC STG grant.