

Pierpaola Santarsiero

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Employment

- Since 06/2025 Postdoctoral researcher**, Università Politecnica delle Marche, Ancona, Italy.
Mentor: Maria Chiara Brambilla.
Employed under the grant PRIN 2022 SC - CUP: I53C24002240006.
- 04/2024 - 05/2025 Postdoctoral researcher**, Bologna University, Bologna, Italy.
Mentor: Alessandro Gimigliano.
Employed under the NextGenerationEU Prin 2022 - Prot. n. 2022E2Z4AK.
- 04/2023 - 03/2024 Postdoctoral researcher**, Osnabrück University, Osnabrück, Germany.
Mentor: Paul Breiding.
Employed under the DFG grant – Projektnummer 445466444.
- 03/2022 - 03/2023 Postdoctoral researcher**, Max-Planck Institute for Mathematics in the Sciences, Leipzig, Germany.
Mentor: Bernd Sturmfels.
Employed under the SAXAG grant from the Sächsisches Staatsministerium für Wissenschaft, Kultur und Tourismus from July to December 2022. Employed under DFG grant – Projektnummer 445466444 from January 2023 to March 2023.

Education

- 11/2018 - 01/2022 PhD in Mathematics** University of Trento, Trento, Italy.
Thesis: *Identifiability of small rank tensors and related problems* defended on 01/04/2022.
Supervisor: Alessandra Bernardi.
- 10/2015 - 03/2018 MSc in Mathematics** University of Bologna, Bologna, Italy.
Mark: 110/110 cum laude.
- 10/2011 - 03/2015 BSc in Mathematics** University of Basilicata, Potenza, Italy.
Mark: 104/110.

Research Interests

Tensor decomposition: identifiability, various notions of rank, ABP width of forms, Waring and decomposition loci, Eigenschemes.

Zero-dimensional schemes: structure of points in embedded varieties, double-fat points, Terracini loci, contact loci.

Classical algebraic geometry: secant varieties, Veronese and Segre varieties, hessian map, discriminants.

Signature tensors: their tensor decomposition, applications to PDEs and topological data analysis.

Preprints and Publications

12. F. Galuppi, G. Moreno, P. Santarsiero: *Path signatures of ODE solutions*, arXiv preprint arXiv:2505.13234, 2025, submitted.
11. A. M. Bigatti, N. E., S. Kara, A. O’Keefe, S. Petrović, P. Santarsiero, J. Striuli: *Computation of dominant ideals*, arXiv preprint arXiv:2504.12146, 2025, proposed for the proceeding of the *Women in Commutative Algebra Conference*.
10. F. Galuppi, P. Santarsiero: *Rank and symmetries of signature tensors*, arXiv preprint arXiv:2407.20405, 2024, submitted.
9. A. Bernardi, A. Oneto, P. Santarsiero: *Decomposition loci of tensors*, Journal of Symbolic Computation (2025): 102451. <https://doi.org/10.1016/j.jsc.2025.102451>

8. P. Breiding, P. Santarsiero: *Degree of the subspace variety*, Collectanea Mathematica, 1-17 2024. <https://doi.org/10.1007/s13348-024-00465-5>
7. F. Galuppi, P. Santarsiero, D. A. Torrance, E. Teixeira Turatti: *Geometry of first nonempty Terracini loci*, accepted for publication in Communications in Contemporary Mathematics, 2025. <https://doi.org/10.1142/S0219199725500531>
6. C. Améndola, F. Galuppi, Á. D. Ríos Ortiz, P. Santarsiero, T. Seynnaeve: *Decomposing tensor spaces via path signatures*, Journal of Pure and Applied Algebra, 229.1: 107807, 2025. <https://doi.org/10.1016/j.jpaa.2024.107807>
5. J. Lindberg, P. Santarsiero: *The symmetric geometric rank of symmetric tensors*, Collectanea Mathematica 2025, 1:23. <https://doi.org/10.1007/s13348-025-00491-x>
4. P. Breiding, S. Fairchild, P. Santarsiero, E. Shehu: *Average degree of the essential variety*, La Matematica 3, 753–776.3, 2024. <https://doi.org/10.1007/s44007-024-00106-0>
3. P. Santarsiero: *An algorithm for the non-identifiability of rank-3 tensors*, Bollettino dell'Unione Matematica Italiana, 16, 595–624, 2023. <https://doi.org/10.1007/s40574-023-00352-0>
2. E. Ballico, A. Bernardi, P. Santarsiero: *Terracini locus for three points on a Segre variety*, Asian Journal of Mathematics, 27(3), 2023. <https://dx.doi.org/10.4310/AJM.2023.v27.n3.a3> Math., 27(3), 2023.
1. E. Ballico, A. Bernardi, P. Santarsiero: *Identifiability of rank-3 tensors*, Mediterranean Journal of Mathematics 18, 174, 2021. <https://doi.org/10.1007/s00009-021-01788-4>

Grants

- 06/2026 - 05/2029** Principal Investigator (PI) of the project *Metric Algebraic Geometry in Compressed Sensing*, funded by the Polish National Science Centre (NCN) under the *SONATINA 9* program. 676,607 PLN (approx. €150,000).
- 2021** Student Travel Award for the SIAM AG Conference in 2021. Received as registration waive for the online version of the conference.
- 11/2018 - 01/2022** 39 months PhD fellowship in Mathematics, University of Trento, Italy.

Research stays

- 12/2024** 2 weeks research visit to Francesco Galuppi, University of Warsaw, Poland.
- 10/2022** 6 weeks research visit at IMPAN, Poland, to participate at *Algebraic Geometry with Applications to Tensors and Secants (AGATES)* semester.
- 01/2022** 6 weeks research visit to Nick Vannieuwenhoven, KU Leuven, Belgium.
- 09/2020** 2 weeks research visit to Luca Chiantini, University of Siena, Italy.
- 02/2020** 2 weeks research visit to Luca Chiantini, University of Siena, Italy.

Teaching

- 2024/2025** Instructor of the PhD course *The geometry of tensor decomposition*, Bologna University, Italy (20 hours).
- 2022/2023** Instructor of the seminar *The geometry of tensor decomposition*, Osnabrück University, Germany.
- 2020/2021** Teaching assistant of the course *Geometria 1*, Bachelor Degree in Physics, University of Trento, Italy.
- 2019/2020** Teaching assistant of the course *Geometria 1*, Bachelor Degree in Physics, University of Trento, Italy.
- 2017/2018** Tutor for the course *Algebra 1*, Bachelor Degree in Mathematics, University of Bologna, Italy.

Talks and Conferences

Conference presentations

- 02/2026** *TBA*, Signatures and Rough Analysis workshop, Weierstrass Institute Berlin, Berlin, Germany (Plenary speaker).

- 11/2025** *Terracini-inspired insights for tensor decomposition*, workshop Geometry of tensors in Nancy 2025, Institut Élie Cartan de Lorraine (IECL), Nancy, France (invited speaker).
- 06/2025** *Firme di cammini di soluzioni di equazioni differenziali ordinarie*, Giornate di Geometria Algebrica e Argomenti Correlati XVII, Isola delle Femmine, Palermo, Italy (invited speaker).
- 01/2025** *Decomposition loci of tensors*, Royal Spanish Mathematical Society's 7th Congress of Young Researchers, Bilbao, Spain (invited speaker).
- 12/2024** *An algebraic perspective on signature tensors*, Lie-Størmer Colloquium 2024, Tromsø, Norway (Plenary speaker).
- 07/2024** *Degree of subspace varieties*, Effective Methods in Algebraic Geometry MEGA2024, Leipzig, Germany.
- 07/2024** *An algebraic perspective on signature tensors*, Kick-off meeting of the INABAG research group, Torino, Italy (invited speaker).
- 06/2024** *A geometric perspective on condition numbers for tensor decomposition*, II Meeting UMI for doctoral students, Napoli, Italy.
- 05/2024** *The symmetric geometric rank of symmetric tensors*, SIAM Conference on Applied Linear Algebra LA 24, Paris, France.
- 07/2023** *The symmetric geometric rank of symmetric tensors*, SIAM Conference on Applied Algebraic Geometry AG 23, TU Eindhoven, The Netherlands (invited speaker).
- 11/2022** *Representation theory of signature tensors*, Pfaffians, tensors and applications, Max-Planck in Leipzig, Germany.
- 09/2022** *On the Terracini locus of a (Segre) variety*, Moduli day, Max-Planck in Leipzig, Germany (Plenary speaker).
- 09/2022** *On the Terracini locus of a Segre variety*, Kickoff workshop AGATES semester, Warsaw University, Poland (Plenary speaker).
- 05/2022** *A geometrical perspective on tensors and the identifiability problem*, Saxonian Seminar Day on Algebra and Geometry, TU Dresden, Germany (Plenary speaker).
- 08/2021** *On the Terracini locus of a Segre variety*, SIAM Conference on Applied Algebraic Geometry AG21, online (invited speaker).
- 06/2021** *Identifiability of rank-3 tensors*, Effective Methods in Algebraic Geometry MEGA2021, online.

Seminars and colloquia

- 11/2025** *Geometry of tensors and their tangential contact loci*, Seminar DIISM, Università Politecnica delle Marche, Italy.
- 01/2025** *On the Terracini locus of a variety*, Algebra and Geometry seminar, University of Bologna, Italy.
- 11/2024** *Degree of subspace varieties*, IMPANGA seminar, IMPAN, Poland.
- 11/2024** *Rank and symmetries of signature tensors*, NUMA seminar, KU Leuven, Belgium.
- 12/2023** *On the rank and symmetries of signature tensors*, Algebraic Geometry seminar, MIMUW, Poland.
- 06/2023** *The symmetric geometric rank of symmetric tensors*, Oberseminar, Bielefeld University, Germany.
- 05/2023** *The symmetric geometric rank of symmetric tensors*, Nonlinear Algebra seminar, Max-Planck in Leipzig, Germany.
- 05/2023** *The symmetric geometric rank of symmetric tensors*, Oberseminar, Osnabrück University, Germany.
- 02/2023** *On the symmetric geometric rank*, Oberseminar, OVGU Magdeburg, Germany.
- 04/2022** *Identifiability of small rank tensors and related problems*, Trento University, Italy.
- 04/2022** *Identifiability of small rank tensors and related problems*, Nonlinear Algebra seminar, Max-Planck in Leipzig, Germany.
- 10/2021** *Identifiability of rank-3 tensors*, IMPAN, Poland.
- 05/2021** *On the Terracini locus of a Segre variety*, Algebraic Geometry seminar, Trento University, Italy, online.

Posters

- *Decomposition loci of tensors*, presented at the workshop *8th Workshop on Algebraic Complexity Theory (WACT 2025)*, March 31 - April 4, 2025, Ruhr University Bochum, Germany.
- *Decomposition loci of tensors*, presented at the conference *MEGA: Effective Methods in Algebraic Geometry*, July 29 - August 02, 2024, MPI MiS Leipzig, Germany.
- *Decomposition loci of tensors*, presented at the conference *Go 60: Pure & Applied Algebraic Geometry celebrating Giorgio Ottaviani's 60th birthday*, June 21-25, 2021, online.

Organization

Conferences and Workshops

- Co-organizer of the minisymposium *Applied and Computational Algebraic Geometry* at the Royal Spanish Mathematical Society 2026 Congress, Alicante, Spain, January 2026.
- Co-organizer of the *INABAG Conference 2025, with a day in honor of Sandro Gimigliano*, Trento, Italy, June 2025. Partial support from CIRM (5000€) and from INdAM-GNSAGA (1000€).
- Co-organizer of the school *TIME 2025 – Invariant Theory: from classics to modern developments* at the Lie-Størmer Center in Tromsø, Norway, May 2025. Fully funded by the Lie-Størmer Center (total budget: 200000 NOK, approx. 17000€).
- Co-organizer of the *Conference on Applied Algebra* at the Osnabrück University, Germany, September 2023.
- Co-organizer of the minisymposium *Tensors in Applications* at SIAM Conference on Applied Algebraic Geometry AG 23, July 2023.

Seminars

- Co-organizer of the seminar *Applied Algebraic Geometry 2024-2025*, Bologna - Firenze, Italy.
- Co-organizer of *preparatory lectures for ICM 2022*, at the Max-Planck in Leipzig, Germany, June 2022.
- Co-organizer of *online Tensor Ph.D. seminars* in the academic year 2021/2022.

Service

Guest Co-Editor for the Springer volume coming from the school *Treasures in Mathematical Encounters TIME – Invariant Theory: from classics to modern developments*, 2026.

Led the Bologna bid for the SIAM Conference on Applied Algebraic Geometry 2027 at the SIAM AG25 business meeting (July 25, 2025), which received the highest community vote; the final host was selected by SIAM as Dresden.

Referee for *Transactions of the American Mathematical Society*, *SIAM Journal on Matrix Analysis and Applications*, *Bollettino dell'Unione Matematica Italiana*.

Advanced Training and Selected Workshops

- Participant: workshop *Women In Numbers Europe 5 WINE5*, 18 - 23 August 2025, Split, Croatia.
- Invited participant: conference *Giornate di Geometria Algebrica e Argomenti Correlati XVII*, 2 - 6 June 2025, Isola delle Femmine, Palermo, Italy.
- Participant: seminar *Metric Algebraic Geometry*, 28 May - 2 June 2023, Mathematisches Forschungsinstitut Oberwolfach (MFO) Oberwolfach, Germany.
- Participant: workshop *Women in Commutative Algebra II*, 16 - 20 October 2023, Trento, Italy. Collaboration initiated during the event led to the article *Computations of dominant ideals*, cf. Preprints and Publications section.

Outreach

- Speaker at *ShaKER 2025*, Verona, Italy, December 4, 2025. Organized by PhD School in Mathematics Trento-Verona. Target audience: early-career researchers.
- Talk *Decoding tensors through a geometric lens* at *Tensor Day 2024*, University of Trento, Italy, December 9, 2024. Organized by the TensorDec Laboratory. Target audience: Master and PhD students.
- Stand/Hands-on *I tensori e le loro scomposizioni* at *European Researchers' Night 2024*, Piazza Scaravilli, Bologna, Italy. Target audience: children, adults, and university students.
- Stand/Hands-on *La moltiplicazione* at *European Researchers' Night 2019*, MUSE, Trento, Italy. Target audience: children, adults, and university students.

Skills

- Languages: Italian (native), English (fluent), French (intermediate), German (beginner).
- Programming: Macaulay2 (advanced), Sagemath (beginner), Julia (beginner).

20.10.2025

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