

# Mauro Di Nasso

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## Research interests

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Mathematical Logic and its Applications, Nonstandard Analysis, Algebra in the space of Ultrafilters, Ramsey Theory, Combinatorics of Numbers, Foundational Theories.

## Work experience

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- Nov. 2023 – present: Full Professor (S.S.D. Mat/01, S.C. 01/A1), Department of Mathematics, University of Pisa (Italy)
- Dec. 2014 – Oct. 2023: Associate Professor, Department of Mathematics, University of Pisa (Italy).
- Oct. 2002 – Dec. 2014: Tenure-track researcher (“Ricercatore”), Department of Mathematics, University of Pisa (Italy).
- 2007 Fall Semester: Visiting professor, Department of Mathematics, University of Hawaii.
- 2001 – 2002: Research fellowship (“Assegno di ricerca”), Department of Applied Mathematics, University of Pisa (Italy).
- 2000 Fall Semester: Lecturer, Department of Mathematics, City College of CUNY (New York).
- 1998 – 1999: CNR Research fellowship, Department of Applied Mathematics, University of Pisa (Italy).
- 1997 – 1998: Lecturer, Department of Mathematics, City College of CUNY (New York).
- 1996 – 1997: Post-doc, Department of Mathematics, University of Siena (Italy).

Between academic appointments: High School tenured professor in “Mathematics” and “Mathematics and Physics”, 1999 – 2000 Liceo Scientifico, Viareggio (Italy); 1994 – 1995 Liceo Classico, Viareggio (Italy); 1992 – 1993 Liceo Scientifico, Viareggio (Italy).

## Education and qualifications

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- Jan. 2020: Italian National Scientific Qualification as Full Professor, sector A1/01 “Mathematical Logic, Mathematics Education, and History of Mathematics”.
- Mar. 2014: Italian National Scientific Qualification as Full Professor, sector A1/01 “Mathematical Logic, Mathematics Education, and History of Mathematics”.
- Oct. 1995: Ph.D. Degree in Mathematics, University of Siena (Italy), October 1995. Thesis title: “Stratified nonstandard universes”, advisors: M. Forti and F. Montagna.



- 1992-1993: Italian National Qualification as tenured High School teacher in “Mathematics” and in “Mathematics and Physics”.
- Jul. 1990: Degree (“Laurea”) in Mathematics with honors, University of Pisa (Italy).

## Appointments

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- 2009 – present: Member of the Editorial Board of “Journal of Logic and Analysis”.
- 2007 – 2008: Member of the Editorial Board of “Logic and Analysis”, Springer.
- 2005 – 2011: Secretary of AILA - Italian Association of Logic and its Applications.

## Grants

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- Local coordinator of the “Research Projects of Relevant National Interest” PRIN 2022: “Logic Methods in Combinatorics”.
- Member of the following “Research Projects of Relevant National Interest”, funded by the Italian Ministry of Research:
  - 2019 – 2021: PRIN 2017 “Mathematical logic: models, sets, computability”.
  - 2014 – 2017: PRIN 2012 “Logic, models, and sets”.
  - 2011 – 2013: PRIN 2009 “Models and sets”.
  - 2008 – 2010: PRIN 2007 “Model theory, set theory, and applications”.
  - 2004 – 2006: PRIN 2004 “Logic methods in algebra, analysis and geometry”.
  - 2002 – 2004: PRIN 2002 “Models theory and set theories, their interactions and applications”.
  - 1998 – 2000: PRIN 1998 “Mathematical logic and its connections with algebra, geometry and analysis”.
- 2017 – 2018 FFABR (Fondo Finanziamento Attività di Ricerca di Base), funded by the Italian Ministry of Research.

## Books

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1. *Nonstandard Methods in Ramsey Theory and Combinatorial Number Theory* (with I. Goldbring and M. Lupini), Lecture Notes in Mathematics vol. 2239, 206 pp., Springer, 2019.
2. *How to Measure the Infinite: Mathematics with Infinite and Infinitesimal Numbers* (with V. Benci), 348 pp., World Scientific Publishing Co., 2019.



## Papers

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- Papers in Journals:
  1. *Foundations of iterated star maps and their use in combinatorics* (with R. Jin), Ann. Pure Appl. Logic, vol. 176 (2025), 103511.
  2. *Monochromatic exponential triples: an ultrafilter proof* (with. M. Ragosta), Proc. Amer. Math. Soc., vol. 152 (2024), 81-87.
  3. *Self-divisible ultrafilters and congruences in  $\beta\mathbb{Z}$*  (with L. Luperi Baglini, R. Mennuni, M. Pierobon, M. Ragosta), J. Symb. Logic, vol. 90 (2025), 1180--1197.
  4. *Infinite monochromatic patterns in the integers*, J. Combin. Theory Ser. A, vol. 189 (2022), 28pp.
  5. *Abstract densities and ideals of sets* (with R. Jin), Acta Arith., vol. 184 (2018), 301-313.
  6. *Idempotent ultrafilters without Zorn's Lemma* (with E. Tachtsis), Proc. Amer. Math. Soc., vol. 146 (2018), 397-411.
  7. *Ramsey properties of nonlinear Diophantine equations* (with L. Luperi Baglini), Adv. Math., vol. 324 (2018), 84-117.
  8. *Fermat-like equations that are not partition regular* (with M. Riggio), Combinatorica, vol. 38 (2018), 1067-1078.
  9. *Intersections of sets of distances*, Integers, vol. 16 (2016), A85, pp. 18.
  10. *A monad measure space for logarithmic density* (with I. Goldbring, R. Jin, S. Leth, M.Lupini, K. Mahlburg), Monatsh. Math., vol. 181 (3) (2016), 577-599.
  11. *High density piecewise syndeticity of product sets in amenable groups* (with I. Goldbring, R. Jin, S. Leth, M.Lupini, K. Mahlburg), J. Symb. Logic, vol. 81 (2016), 1555-1562.
  12. *Approximate polynomial structure in additively large sets* (with I. Goldbring, R. Jin, S. Leth, M.Lupini, K. Mahlburg), Integers, vol. 16 (2016), A49, pp. 11.
  13. *Intersections of shifted sets*, Electron. J. Comb., vol. 22 issue 2 (2015), pp. 7.
  14. *Finite embeddability of sets and ultrafilters* (with A. Blass), Bull. Pol. Acad. Sci. Math., vol. 63 (2015), 195-206.
  15. *High density piecewise syndeticity of sumsets* (with I. Goldbring, R. Jin, S. Leth, M.Lupini, K. Mahlburg), Adv. Math., Vol. 278 (2015), 1-33.
  16. *Some applications of numerosities in measure theory* (with V.Benci and E. Bottazzi), Atti Accad. Naz. Lincei, Rend. Lincei, Mat. Appl., vol. 26 (2015), 1-11.
  17. *On a sumset conjecture by Erdős* (with I. Goldbring, R. Jin, S. Leth, M.Lupini, K. Mahlburg), Canad. J. Math., vol. 67 (2015), 795-809.



18. *Iterated hyper-extensions and an idempotent ultrafilter proof of Rado's theorem*, Proc. Amer. Math. Soc., vol. 143 (2015), 1749-1761.
19. *Nonstandard analysis and the sumset phenomenon in arbitrary amenable groups* (with M. Lupini), Illinois J. Math., vol. 58 (2014), 11-25.
20. *Elementary numerosity and measures* (with V. Benci and E. Bottazzi), J. Log. Anal., vol. 6 (2014), pp. 14.
21. *An elementary proof of Jin's Theorem with a bound*, Electron. J. Comb., vol. 21 issue 2 (2014), pp. 7.
22. *Embeddability properties of difference sets*, Integers, vol. 14 (2014), A27, pp. 24.
23. *Quasi-selective ultrafilters and asymptotic numerosities* (with A. Blass and M. Forti), Adv. Math., vol. 231 (2012), 1462-86.
24. *Fine asymptotic densities for sets of natural numbers*, Proc. Amer. Math. Soc., vol. 138 (2010), 2657-65.
25. *Numerosities of point sets over the real line* (with M. Forti), Trans. Amer. Math. Soc., vol. 362 (2010), 5355-71.
26. *A Euclidean measure of size for mathematical universes* (with V. Benci and M. Forti), Log. Anal., vol. 197 (2007), 43-52.
27. *An Aristotelian notion of size* (with V. Benci and M. Forti), Ann. Pure Appl. Logic, vol. 143 (2006), 43-53.
28. *Hausdorff ultrafilters* (with M. Forti), Proc. Amer. Math. Soc., vol. 134 (2006), 1809-1818.
29. *Topological and nonstandard extensions* (with M. Forti), Monatsh. Math., vol. 144 (2005), 89-112.
30. *Hausdorff nonstandard extensions* (with V. Benci and M. Forti), Bol. Soc. Parana. Mat. (new series), vol. 20 (2002), 9-20.
31. *A purely algebraic characterization of the hyperreal numbers* (with V. Benci), Proc. Amer. Math. Soc., vol. 133 (2005), 2501-2505.
32. *Alpha-Theory: an elementary axiomatics for nonstandard analysis* (with V. Benci), Expo. Math., vol. 21 (2003), 355-386.
33. *Numerosities of labelled sets: a new way of counting* (with V. Benci), Adv. Math., vol. 173 (2003), 50-67.
34. *Combinatorial principles in nonstandard analysis* (with K. Hrbacek), Ann. Pure Appl. Logic, vol. 119 (2003), 265-293.
35. *A ring homomorphism is enough to get nonstandard analysis* (with V. Benci), Bull. Belg. Math. Soc. Simon Stevin, vol. 10 (2003), 1-10.
36. *On the foundations of nonstandard mathematics*, Mathematica Japonica, vol. 50 n.1 (1999), 131-160.
37. *The generic filter property in nonstandard analysis*, Ann. Pure Appl. Logic, vol. 111 (2001), 23-37.



38. *An axiomatic presentation of the nonstandard methods in mathematics*, J. Symb. Logic, vol. 67 (2002), 315-325.
39. *Pseudo-superstructures as nonstandard universes*, J. Symb. Logic, vol. 63 (1998), 222-236.
40. *Linearly stratified models for the foundations of nonstandard set theory*, MLQ Math. Log. Q., vol. 44 (1998), 138-142.
41. *\*ZFC: an axiomatic \*approach to nonstandard methods*, C. R. Math. Acad. Sci. Paris, t. 324, Serie I, (1997), 963-967. [Erratum: t. 325, Serie I, (1997), p.5]

- Papers in books:

42. *Translation invariant filters and van der Waerden's Theorem*, chapter in "Combinatorial and Additive Number Theory III" (M.B. Nathanson, ed.), Proceedings in Mathematics & Statistics 297, Springer, 2020.
43. *Hypernatural numbers as ultrafilters*, chapter in "Nonstandard Analysis for the Working mathematician" (P.A. Loeb and M. Wolff, eds.), 2nd edition, Springer, 2015.
44. *A taste of nonstandard methods in combinatorics of numbers*, chapter in "Geometry, Structure and Randomness in Combinatorics" (J. Matousek, J. Nešetřil and M. Pellegrini, eds.), CRM Series, vol. 18, Scuola Normale Superiore, Pisa, 2015.
45. *The eightfold path to nonstandard analysis* (with V. Benci and M. Forti), in "Nonstandard Methods and Applications in Mathematics" (N.J. Cutland, M. Di Nasso and D.A. Ross, eds.), Lecture Notes in Logic vol. 25, ASL, AK Peters, 2006, 3-44.
46. *Ultrafilter semirings and nonstandard submodels of the Stone-Cech compactification of the natural numbers* (with M. Forti), in "Logic and its Applications" (A. Blass and Y. Zhang, eds.), AMS Contemporary Mathematics, vol. 380 (2005), 45-51.
47. *On the ordering of the nonstandard real line* (with M. Forti), in "Logic and Algebra", AMS Contemporary Mathematics, vol. 302 (2002), 259-273.
48. *Nonstandard analysis and an application to the symmetric group on the natural numbers* (with Y. Zhang), in "Logic and Algebra", AMS Contemporary Mathematics, vol. 302 (2002), 249-258.
49. *Nonstandard analysis by means of ideal values of sequences*, in "Reuniting the Antipodes - Constructive and Nonstandard Views of the Continuum" (P. Schuster, U. Berger and H. Osswald, eds.), Synthese Library, Kluwer Academic Publishers, vol. 306 (2001), 63-73.
50. *Hyperordinals and nonstandard alpha-models*, in "Logic and Algebra" (A. Ursini and P. Aglianò, eds.), Lecture Notes in Pure and Applied Mathematics, vol. 180 (1996), Marcel Dekker, New York, 457-475.



## Editor of books

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- (with V. Bergelson, A. Blass, R. Jin) *Ultrafilters across Mathematics*, Contemporary Mathematics, vol. 530, AMS, 2010, pp. 200.
- (with N.J. Cutland and D.A. Ross) *Nonstandard Methods and Applications in Mathematics*, AK Peters, 2006, pp. 262.

## Referee for

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*Advances in Mathematics, American Mathematical Monthly, Annals of Pure and Applied Logic, Archive in Mathematical Logic, Australasian Journal of Combinatorics, Bulletin de la Societe Mathematique de Belgique, Calcolo, Central European Journal of Mathematics, Contemporary Mathematics of the AMS, Student Math Library Series of the AMS, Electronic Journal of Combinatorics, European Journal of Combinatorics, Integers, Journal of Logic and Analysis, Journal of Symbolic Logic, Lecture Notes in Mathematics, Monatshefte fur Mathematik, Semigroup Forum, Studia Logica.*  
*Reviewer for the Executive Board of the Austrian Science Fund.*

## International Conferences organizer

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1. (with L. Carlucci, R. Carroy, L. Luperi Baglini) International Conference RATLOCC 2024 “Ramsey Theory in Logic, Combinatorics, and Complexity”, Pisa, June 11-14, 2024.
2. (with L. Luperi Baglini) International Conference ULTRAMATH 2022 “Ultrafilters across Mathematics”, Pisa, June 6-11, 2022.
3. (with L. Carlucci, N. Galesi, and W. Gasarch) International Conference RaTLoCC18 “Ramsey Theory in Logic, Combinatorics, and Complexity”, Bertinoro, Centro Residenziale Universitario, July 15-20, 2018.
4. (with L. Luperi) International Workshop “Ramsey Theory of Equations and Related Topics”, Math. Dept. of the University of Pisa, February 16-17, 2018.
5. (with I. Goldbring and M. Lupini) International Workshop “Nonstandard Methods in Combinatorial Number Theory”, American Institute of Mathematics, San Jose (USA), August 14-18, 2017.
6. International workshop SWIP 2017 “Set Theory Workshop in Pisa”, Math. Dept. Of the University of Pisa, June 13, 2017.
7. (with I. van den Berg) Special Session “Logic and Analysis”, Logic Colloquium 2013, Evora (Portugal), July 22-27, 2013.
8. International Workshop ULTRACOMBINATORICS “Applications of Ultrafilters in Combinatorial Number Theory and Related Topics”, Centro di Ricerca Matematica "E. De Giorgi", Pisa, January 24-25, 2013.
9. International Workskop “Infinite Combinatorics”, Centro di Ricerca Matematica "E. De Giorgi", Pisa, June 28, 2010.



10. International Conference ULTRAMATH 2008 “Applications of ultrafilters and ultraproducts in mathematics”, Math. Dept. of the University of Pisa, June 1-7, 2008.
11. International Conference NSM 2006 “Nonstandard Methods and Applications in Mathematics”, Math. Dept. of the University of Pisa, May 25-31, 2006.
12. International Conference MARIAN 2004 “Nonstandard Models of Arithmetic and Analysis”, Math. Dept. of the University of Pisa, June 25-26, 2004.
13. (with A. Berarducci, N.J. Cutland and D.A. Ross) International Conference NS 2002 “Nonstandard Methods and Applications in Mathematics”, Math. Dept. of the University of Pisa, June 10-16, 2002.
14. (with K. Hrbacek) Conference “Nonstandard Set Theory and Related Topics”, The City College of CUNY, New York, December 1-2, 2000. (Sponsored by MAMLS - Mid-Atlantic Mathematical Logic Seminar).

## Invited talks (selection)

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- *A theory of numerosity for infinite sets where the whole is larger than the part*, Horizons – A conference in honor of Petr Vopenka, Charles University and the Czech Academy of Sciences, Prague, October 24, 2025.
- *Infinite monochromatic configurations via ultrafilters and nonstandard analysis*, Set Theory and Topology in Messina STTM 2025, Messina, September 5, 2025.
- *Elementary self-extensions of the universe and applications in Ramsey Theory*, Set Theory and General Topology SETTOP 2024, Novi Sad, Serbia, August 19, 2024.
- *Arithmetic Ramsey theory with ultrafilters and nonstandard methods*, XXII Congresso U.M.I., Pisa, September 7, 2023.
- *Ultrafilters and tensor pairs of nonstandard analysis*, Descriptive Set Theory and Combinatorics, Torino, December 20, 2022.
- *Arithmetic Ramsey Theory by ultrafilter method*, European Set Theory Conference, Torino, August 30, 2022.
- *The use of nonstandard natural numbers as ultrafilters in arithmetic Ramsey Theory*, Combinatorics Meets Model Theory, Cambridge, June 22, 2022.
- *Nonstandard natural numbers in arithmetic Ramsey Theory and topological dynamics*, AMS Joint Mathematics Meeting (Virtual), Special Session on Abraham Robinson’s Nonstandard Methods in Mathematics and Its Applications, April 6, 2022.
- *Infinite monochromatic patterns in the integers*, XVI International Luminy Workshop in Set Theory, CIRM, Marseille, September 17, 2021.
- *Alpha-Theory: an elementary axiomatics for the use of infinitesimal and infinite numbers*, Advances and Challenges in Nonlinear Analysis and Beyond! (On the occasion of Vieri Benci's 70th birthday), Università di Bari, September 25, 2019.



- *Ultrafilters as nonstandard points: some new applications in Ramsey Theory*, AMS Sectional Meeting – Special session “Applications of Ultrafilters and Nonstandard Methods”, University of Hawaii, Honolulu, March 23, 2019.
- *L'analisi nonstandard* (Italian), Abraham Robinson: commemoration in the centenary of his birth, Accademia delle Scienze di Torino, October 16, 2018.
- *Nonstandard Methods and Ultrafilters in Ramsey Theory*, Workshop “Ramsey Theory and Computability”, Notre Dame University Global Gateway, Rome, July 11, 2018.
- *Generalized notions of asymptotic density*, CANT 2018 - Combinatorial and Additive Number Theory, CUNY Graduate Center, New York, May 23, 2018.
- *Nonstandard Natural Numbers in Ramsey Theory*, Model Theory and Combinatorics Workshop, Institut Henri Poincare, Paris, February 1, 2018.
- *Nonstandard Integers and Ramsey Theory of Diophantine Equations*, International Congress “Ultrafilters, Ramsey Theory and Dynamics”, Université de Lyon, November 24, 2017.
- *Hypernatural Numbers in Ramsey Theory*, International Workshop “Nonstandard Methods in Combinatorial Number Theory”, American Institute of Mathematics, San Jose, August 15, 2017.
- *An elementary proof of Jin's theorem*, Atelier de travail (workshop) "Les densités et leurs applications", Université Jean Monnet, St-Etienne, July 8, 2013.
- *Applications in combinatorial number theory of iterated nonstandard extensions and idempotent ultrafilters*, CANT 2013 - Combinatorial and Additive Number Theory, CUNY Graduate Center, New York, May 24, 2013.
- *Nonstandard methods in combinatorics of numbers: a few examples*, RaTLoCC 2011 - Ramsey Theory in Logic, Combinatorics and Complexity, Bertinoro - Italy, May 27, 2011.
- *Numerosities: a possible way to refine Cantor's cardinalities*, International Congress “Logic and Mathematics”, York, UK, August 4, 2009.
- *Beyond cardinality: is there a measure for the size of infinite sets where “the whole is larger than the part”?*, 3rd Sino-French Mathematics Conference, Sun Yat-sen University, Guang-Zhou (Canton), December 1, 2008.
- *Numerosities and special ultrafilters*, 10th International workshop in Set Theory, C.I.R.M. - Luminy, September 23, 2008.
- *Euclidean measures of sets*, International Congress "Leonhard Euler and Modern Combinatorics", St. Petersburg, June 4, 2007.
- *Set theory and nonstandard analysis*, International Congress "Set Theory and Analysis", Turin, July 11, 2006.
- *Different paths to nonstandard analysis*, International Congress "Non Standard Mathematics", Aveiro, Portugal, July 5-10, 2004.
- *Purely algebraic characterization of the hyperreals of nonstandard analysis*, International Congress: "Logic, algebra and geometry", St. Petersburg Dept. of Steklov Math. Institute - Euler International Math. Institute – Russian Academy of Science, St. Petersburg, Russia, June 3, 2004.





- *Topological and nonstandard extensions*, AMS Joint Mathematics Meeting – Special session on “Nonstandard Methods”, Phoenix, Arizona, January 8, 2004.
- *Topological and nonstandard extensions and their connections with special ultrafilters*, International Conference "Logic and its Applications in Algebra and Geometry", University of Michigan, Ann Arbor, April 11-13, 2003.

## Research visits

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- University of Michigan at Ann Arbor, Department of Mathematics, invited by A. Blass, May 8-12, 2025.
- University of California at Irvine, Mathematics Department, invited by I. Goldbring, May 5-8, 2025.
- Charleston College, Department of Mathematics, invited by R. Jin, May 21-30, 2023.
- University of Oslo, Department of Mathematics, invited by T. Lindstrom, April 3-6, 2019.
- University of Hawaii, Department of Mathematics, invited by D.A. Ross, Department of Mathematics, March 17 - April 2, 2019.
- Albert-Ludwigs University of Freiburg, Mathematisches Institut, invited by M. Pizarro, January 29 - February 2, 2019.
- University of Cambridge, Department of Pure Mathematics and Mathematical Statistics, invited by I. Leader, October 24-27, 2018.
- University of California at Irvine, Department of Mathematics, invited by I. Goldbring, May 30-June 1, 2018.
- Caltech, Pasadena, Department of Mathematics, invited by M. Lupini, May 26-29, 2018.
- Universität Wien, Department of Mathematics, invited by L. Luperi Baglini, April 20-24, 2016.
- AIM - American Institute of Mathematics, SQuaRE program on “Nonstandard Methods in Number Theory”:
  - Research Conference Center, San Jose - June 2015.
  - Research Conference Center, Palo Alto - August 2014.
  - Research Conference Center, Palo Alto - June 2013.
- Sun Yat-sen University, Guang-Zhou, China, Graduate Center, invited by Y. Zhang, October 2011.
- Sun Yat-sen University, Guang-Zhou, China, Graduate Center, invited by Y. Zhang, November-December 2008.
- University of Hawaii, Department of Mathematics, invited by D. Ross, Fall Semester 2007.
- Sun Yat-sen University, Guang-Zhou, China, Graduate Center, invited by Y. Zhang, November-December 2004.



- City College of CUNY (City University of New York), USA, invited by K. Hrbacek, Fall Semester 2000.
- Caltech (California Institute of Technology), Pasadena, USA, invited by W.A.J. Luxemburg, June 1998.
- City College of CUNY (City University of New York), USA, invited by K. Hrbacek, academic year 1997-1998.

## Invited seminars/colloquia (selection)

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- *Nonstandard analysis in arithmetic Ramsey theory*, Logic Seminar, University of Michigan, Ann Arbor, May 9, 2025.
- *Infinite monochromatic configurations and Ramsey's witnesses*, Logic and Set Theory Seminars, University of California at Irvine, May 5, 2025.
- *A notion of numerosity for infinite sets where the whole is larger than the part*, Logic Seminars, University of Oslo, March 20, 2025.
- *Numerosities of infinite sets and its relationships with measures*, Séminaire "Infini Mathématique", Univ. Paris 1, May 5, 2022.
- *Nonstandard natural numbers in arithmetic Ramsey Theory and topological dynamics - Part 1 and Part 2*, NYLogic - MOPA Seminar, CUNY Graduate Center (Virtual), November 22, 2021 and January 17, 2022.
- *Nonstandard methods in Ramsey Theory*, Seminars of the University of Oslo, Norway, April 4, 2019.
- *Nonstandard methods in Ramsey Theory*, Mathematical Logic Seminars, Albert Ludwigs University of Freiburg, January 30, 2019.
- *Nonstandard methods in Ramsey Theory*, Combinatorics Seminar, University of Cambridge, October 24, 2018.
- *Nonstandard natural numbers in Ramsey Theory*, Logic and Set Theory Seminar, California University at Irvine, May 30, 2018.
- *Nonstandard natural numbers in Ramsey Theory*, Caltech Seminar, Pasadena, May 29, 2018.
- *Combinatorics of numbers and nonstandard analysis*, Universität Wien Seminar, April 21, 2016.
- *Ultrafilters and nonstandard methods in combinatorics of numbers*, Set Theory Seminars & Models of PA, CUNY Graduate Center, New York, June 18, 2015.
- *Applications in combinatorial number theory of iterated nonstandard extensions and idempotent ultrafilters*, CUNY Graduate Center, New York, May 24, 2013.
- *Numerosities: A possible way to refine Cantor's cardinalities where the whole is larger than the part*, Colloquium of the Mathematics Department, College of Science, Swansea University, March 22, 2013.
- *Nonstandard analysis in combinatorics of numbers: some examples*, Mathematics seminar - University of Northern Colorado, Greeley, October 4, 2011 & Model Theory Seminar, Graduate Center of CUNY, New York, October 14, 2011.



- *Numerosities: a possible way to refine Cantor's cardinalities*, Colloquium of the Mathematics Department, College of Charleston, October 7, 2011.
- *Model theory and nonstandard analysis* (series of seminars, with V.Benci), Summer School in Logic - AILA (Italian Association of Logic and its Applications), Gargnano, August 29-September 4, 2010.
- *Beyond cardinality: are there measures of sets where the whole is larger than the part?*, University of Ghent, Belgium, June 28, 2007.
- *Beyond cardinality: are there measures of sets where the whole is larger than the part?*, Mathematics Colloquium, University of Hawaii, Honolulu, September 28, 2007.
- *I numeri infinitesimi e l'analisi nonstandard* (Italian), Olympics of Mathematics, XXI Italian Final Competition, Cesenatico, May 6, 2005.
- *A new way of counting infinite sets*, Mathematics Colloquium, Sun Yat-sen University, Guang-Zhou (Canton), China, December 10, 2004.
- *Numerosities: a new way of counting*, The University of Michigan Mathematics Colloquium, Ann Arbor, April 8, 2003.
- *Nonstandard analysis by axiomatic method*, Bilgi University, Istanbul, May 2000.

## Teaching experience

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- 2002 - Present – University of Pisa (Italy):
  - Master Program in Mathematics: Elements of Set Theory, Mathematical Logic, Model Theory, Ultrafilters and Nonstandard Methods.
  - Bachelor (Computer Science): Discrete Mathematics.
  - Bachelor (Engineering): Linear Algebra, Calculus (assistant), Multivariable calculus (assistant).
- 2007 – Hawaii University, USA. “Math 244” (Multivariable calculus), MATH 302 (Introduction to differential equations).
- 2005 – Sun Yat-sen University, Guang-Zhou (Canton), China, PhD course: Infinite and infinitesimal numbers: from numerosities to nonstandard analysis.
- 2000 – City College of CUNY, USA. “Math 392” (Vector calculus and linear algebra), “Math 100” (pre-Calculus).
- 1997-1998 – City College of CUNY, USA. “Math 90” and “Math 100” (pre-Calculus). Report on the observation of my classes by the Mathematics Department Executive Committee of CCNY: ranked “excellent”.



## Secondary school didactics (Italian)

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- Mini-corso: *Un invito alla logica matematica e ai numeri infinitesimi e infiniti*, Summer School IANUA – Scuola Superiore dell’Università di Genova, 25 Luglio 2025.
- Conferenza: *I numeri infinitesimi esistono?*, World Logic Day, Liceo “Filippo Buonarroti”, Pisa, 15 Gennaio 2024.
- Conferenza: *Numeri infinitesimi e numeri infiniti*, Settimana Matematica 2022, Dipartimento di Matematica Univ. Pisa, 21 Aprile 2022.
- Conferenza per insegnanti: *La retta iperreale dell’analisi nonstandard: uno sguardo ravvicinato*, “X Giornata Nazionale di Analisi Nonstandard” (convegno per insegnanti di scuola superiore), Università di Verona, 13 Marzo, 2021.
- Conferenza per insegnanti: *Metodi nonstandard nel calcolo sublime: infinitesimi ed infiniti tra filosofia e matematica*, Liceo “Piccolomini”, Siena, 12 Febbraio, 2020.
- Conferenziere invitato: *I fondamenti dell’analisi nonstandard*, “IX Giornata Nazionale di Analisi Nonstandard” (convegno per insegnanti di scuola superiore), Università di Verona, 5 Ottobre, 2019.
- Membro del Comitato Scientifico: “VIII Giornata Nazionale di Analisi Nonstandard” (convegno per insegnanti di scuola superiore), Dipartimento di Matematica e Informatica “U. Dini”, Università di Firenze, 6 Ottobre, 2018.
- Lezione: *Un invito alla logica*, Master “Didattica della Matematica e nuove tecnologie: dalla teoria alla pratica”, Università di Pisa, 13 Giugno, 2018.
- Lezione: *L’analisi nonstandard*, Master “Didattica della Matematica e nuove tecnologie: dalla teoria alla pratica”, Università di Pisa, 1 Febbraio, 2017.
- Responsabile Scientifico: “VI Giornata Nazionale di Analisi Nonstandard” (convegno per insegnanti di scuola superiore), Complesso San Michele, Lucca, 1 Ottobre, 2016.
- Conferenziere invitato: *Un’introduzione all’analisi con infinitesimi*, “V Giornata di Analisi Nonstandard” (convegno per insegnanti di scuola superiore), Università di Verona, 10 Ottobre, 2015.
- Conferenza: *Numeri infiniti e numeri infinitesimi*, Liceo Scientifico “Dini”, Pisa, 14 Maggio, 2015.
- Corso di aggiornamento per insegnanti di scuola superiore: *Sulla didattica della logica matematica* – 6 ore, Liceo “Dini”, Pisa, Gennaio-Maggio 2015.

## Students

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- PhD Theses:
  - Mariacarla Ragosta, Arithmetic Ramsey theory and combinatorics, some new results via ultrafilters and nonstandard methods, University of Pisa, 2025.



- Moreno Pierobon, *Nonstandard and Boolean valued models, and interactions with combinatorics, dynamics, and sheaf theory*, University of Pisa, 2023.
- Lorenzo Luperi Baglini, *Hyperintegers and nonstandard techniques in combinatorics of numbers*, University of Siena, 2012. (Luperi Baglini is now an associate professor at the University of Milan, Dept. of Mathematics.)

• Master Theses: supervisor of 18 students.

1. Giacomo Giomi, *Measure vs. topological recurrence: intersectivity, ultrafilters, and non-standard methods*, Univ. Pisa, 2025.
2. Alessandro Petetta, *Stationary tower forcing and  $\Sigma_{1,2}$ -absoluteness* (co-supervisor with B. Velickovic), Univ. Pisa, 2025.
3. Chiara Molinari, *Monochromatic sums and products*, Univ. Pisa, 2024.
4. Alberto De Castelli, *Una dimostrazione del teorema di Szemerédi con metodi nonstandard*, Univ. Pisa, 2024.
5. Alessandro Vegnuti, *Last results about Hindman's conjecture and a nonstandard approach*, Univ. Pisa, 2024.
6. Roberto Riccardi: *Partition regularity of geoarithmetic progressions and generalizations*, Univ. Pisa, 2021
7. Mariacarla Ragosta: *Central sets in Ramsey Theory*, Univ. Pisa, 2021.
8. Domenico Fabrizio, *Metodi nonstandard e teoria di Ramsey* (co-supervisor with with G. Lenzi), Univ. Salerno, 2021.
9. Giacomo Bertolucci: *Finite colorings, partition regularity, and families of large sets*, Univ. Pisa, 2019
10. Giacomo Tendas: *Strongly Preserved Formulas in Topoi* (co-supervisor with A. Blass), Univ. Pisa, 2017.
11. Florian Yusuf Ali: *Nonstandard analysis and partition regularity of Diophantine equations*, Université Paris VII, 2017.
12. Luigi Marangio: *Arithmetic progressions in a set of positive density*, Univ. Pisa, 2017.
13. Pietro Porqueddu: *Gowers' Ramsey Theorem*, Univ. Pisa, 2017.
14. Francesco Di Baldassarre: *Non-elementary methods in combinatorial number theory: Roth's and Sarkozy's Theorems*, Univ. Pisa, 2016.
15. Maria Riggio: *Partition regularity of nonlinear Diophantine equations*, Univ. Pisa, 2016.
16. Martino Lupini: *Recurrence and Szemerédi's theorem*, Univ. Pisa, 2010.
17. Lorenzo Luperi Baglini: *Un nuovo modo di contare l'infinito*, Univ. Pisa, 2008.
18. Michiel De Smet: *Nonstandard models and sequential extensions of the real numbers* (University of Ghent, Belgium), 2007.



• Bachelor Theses: supervisor of 38 students.

1. Daniele Spadoni, *Il teorema di Fox e una caratterizzazione algebrica dell'ipotesi del continuo*, Univ. Pisa, 2025.
2. Alberto Giannarelli, *Il sistema dinamico universale sullo spazio e una dimostrazione dinamica del Teorema di van der Waerden*, Univ. Pisa, 2025.
3. Alessandro Petetta: *Un teorema di Jech e Shelah sulle partizioni di coppie di insiemi finite*, 2023.
4. Giacomo Giomi: *Il Teorema dei contenitori per ipergrafi*, 2023.
5. Niccolò Guarguaglini: *Un'estensione del Teorema di Rado per equazioni nonlineari*, 2023.
6. Vittorio Meini: *Cardinali misurabili, due caratterizzazioni in termini di compattezza*, 2021.
7. Tommaso Capolla: *Teoria di Ramsey delle configurazioni esponenziali*, 2021.
8. Leonardo Mazzoni: *Misure sui reali e grandi cardinali*, 2020.
9. Andrea Pachetti: *Il teorema di Hales-Jewett: un utilizzo degli ultrafiltri in combinatoria*, 2020.
10. Matteo Casarosa: *Ultrafilters, the triangle removal lemma, and Roth's Theorem*, 2020.
11. Roberto Riccardi: *Il teorema di van der Waerden polinomiale*, 2019.
12. Gabriele Farnesi: *Limiti lungo ultrafiltri in spazi di Hilbert e applicazioni alla teoria combinatoria dei numeri*, 2019.
13. Maria Clara Ragosta: *Il Lemma di regolarità di Szemerédi e il Teorema di Roth*, 2018.
14. Alessandra Boscolo: *Gli ultrafiltri idempotenti, dagli insiemi ai modelli*, 2016.
15. Fabio Brau: *Insiemi di Bohr, teoremi di Folner e Kriz, e alcune applicazioni*, 2015.
16. Giacomo Tendas: *Il Teorema Delta-Ramsey e un lemma di van der Corput*, 2015.
17. Alessio Melosi: *Una dimostrazione elementare del teorema di Furstenberg-Sarkozy*, 2015.
18. Isabella Panaccione: *Gruppi amenabili*, 2015.
19. Marta Lemmi: *Alcune proprietà degli insiemi di distanze*, 2015.
20. Francesco Di Baldassarre: *Il teorema di immersione di Jin*, 2012.
21. Pietro Porqueddu: *Alcune proprietà degli insiemi centrali*, 2012.
22. Pietro Salmaso, *Una dimostrazione combinatoria del teorema denso di Hindman*, 2011.
23. Nicolò Neroni, *Il Teorema di Deuber*, 2011.
24. Alessandra Caraceni, *The crossing number inequality* (Colloquio Scuola Normale Superiore), 2010.
25. Alessandro Maserati, *Il Teorema di Jin, dalla densità di Banach agli insiemi di Bohr a tratti*, 2010.
26. Alex Cardelli: *Il Teorema di Sarkozy-Furstenberg, una dimostrazione ergodica*, 2009.



27. Daniela Quaranta: *L'ipotesi dei cardinali singolari, un risultato recente*, 2009.
28. Nicolò Staiti: *Sull'assolutezza*, 2008.
29. Nina Petersen: *Applications of ultrafilters to combinatorial number theory* (NTN University, Trondheim, Norway), 2007
30. Davide Maffioli: *Il Teorema di Jin*, 2007.
31. Nicola Picoco: *Alcune applicazioni di metodi logici in teoria combinatoria dei numeri*, 2007.
32. Mattia Talpo: *Due dimostrazioni alternative nella teoria di Ramsey* (Colloquio Scuola Normale Superiore Pisa), 2007.
33. Umberto Grandi: *Completezza logica della geometria elementare e teoria dei campi reali chiusi*, 2006.
34. Lorenzo Luperi Baglini: *Una classe di modelli della teoria dei campi reali chiusi con esponenziazione*, 2006.
35. Abramo Bertucco: *Estensione della densità asintotica e studio delle loro proprietà mediante ultrafiltri*, 2006.
36. Nicola Lanaro: *Il teorema di Hahn-Banach e il paradosso di Banach-Tarski*, 2006.
37. Eleonora Guerrini: *Il teorema di Bernstein-Robinson*, 2004.
38. Tiziano Casavecchia: *Applicazione degli ultrafiltri alla teoria di Ramsey*, 2003.

## Organizer of Italian Meetings

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- (with G. Lenzi and V. Tortorelli) “C.O.M.FORT 2015” - Conference in honor of Marco Forti on the occasion of his retirement, May 22-23, 2015.
- (with M. Forti) Meeting “Il tutto è maggiore della parte?”, Centro di Ricerca Matematica “E. De Giorgi”, Pisa, May 6, 2009.
- (with M. Forti) Meeting “Matematica straordinaria: alcuni teoremi inaspettati”, Domus Galilaeana, Pisa, December 12, 2008.
- (with V. Benci e M. Forti) Meeting “L'infinito in matematica: aspetti storici, scientifici e filosofici”, Domus Galilaeana, Pisa, April 22, 2005.
- (with A. Berarducci, M. Forti and E. Moriconi) Conference “XXII Incontro AILA” (Meeting of the Italian Association of Logic and Applications), Math. Dept. of the University of Pisa, February 10-13, 2005.
- (with V. Benci e M. Forti) Meeting “L'infinito in matematica, fisica e filosofia”, Domus Galilaeana, Pisa, March 26, 2004.
- Meeting “Il metodo assiomatico da Euclide a Gödel”, Domus Galilaeana, Pisa, June 13, 2003.
- (with V. Benci and M. Forti) Meeting “I numeri infinitesimi: aspetti storici, filosofici, scientifici e didattici di una grande controversia”, Domus Galilaeana, Pisa, November 15, 2002.



## Expository papers (italian)

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- *La retta iperreale dell'analisi nonstandard, uno sguardo ravvicinato* (Italian), chapter in “Analisi nonstandard per le scuole superiori, X Giornata di Studio”, Atti del Convegno 2021, [Matematicamente.it](http://Matematicamente.it).
- *I fondamenti dell'analisi nonstandard* (Italian), chapter in “Analisi nonstandard per le scuole superiori, IX Giornata di Studio”, Atti del Convegno 2019, [Matematicamente.it](http://Matematicamente.it).
- *Il Teorema di Hindman sull'esistenza di insiemi infiniti con somme monocromatiche* (Italian), chapter in “Il Teorema più bello” (L. Modica and C. Petronio eds.), Pisa University Press, 2018.
- *Metodi e modelli nonstandard* (Italian) (with M. Forti), chapter in “Le Direzioni della Logica in Italia vol. 2” (H. Hosni, G. Lolli, C. Toffalori eds.), Collana analitica, Edizioni ETS, 2018.
- *Un'introduzione all'analisi con infinitesimi* (Italian), chapter in “Analisi nonstandard per le scuole superiori, V Giornata di Studio”, Atti del Convegno 2015, [Matematicamente.it](http://Matematicamente.it).
- *I numeri infinitesimi e l'analisi nonstandard* (Italian), *Archimede*, vol. 1 (2003), 13-22.