NICOLA ABATANGELO
Curriculum Vitae

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Born on November 25, 1988 in Italy. Italian citizenship. Married, three children.

🏛 Since 09/2024, associate professor at **Alma Mater Studiorum Università di Bologna** (Italy)

📍 Address: Dipartimento di Matematica
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☑ Languages: Italian (mother tongue), English (fluent), French (fluent), and German (basic).

PAST POSITIONS

09/2021 – 08/2024   **assistant professor** at **Alma Mater Studiorum Università di Bologna** (Italy)
ricercatore a tempo determinato (senior) lett. b)

09/2019 – 08/2021   **post-doc** at **Goethe-Universität Frankfurt am Main** (Germany)
Alexander von Humboldt Fellowship for Postdoctoral Researchers

09/2018 – 06/2019   **post-doc** at **Universität Zürich** (Switzerland)
funded by *SNSF Research Project "Integro-differential elliptic equations"*

01/2017 – 08/2018   **post-doc** at **Université Libre de Bruxelles** (Belgium)
ULB individual fellowship

10/2015 – 12/2016   **post-doc** at **Université Libre de Bruxelles** (Belgium)
funded by *FNRS-MIS project F.4508.14 "Patterns, Phase Transitions, 4NLS & BIon"*

EDUCATION

PhD   in Mathematics, from 11/2012 to 09/2015, **Université de Picardie Jules Verne** (France)
- Co-advising agreement with **Università degli Studi di Milano** (Italy)
- Thesis: *Large Solutions for Fractional Laplacian Operators*, defended on September 28, 2015 (link)
- Advisers: Louis Dupaigne, Université Claude Bernard - Lyon 1 (France)
           Enrico Valdinoci, Università degli Studi di Milano (Italy)

MSc   in Mathematics, from 11/2010 to 07/2012, **Università degli Studi di Milano** (Italy)
- Final grade: *110/110 cum laude*

BSc   in Mathematics, from 09/2007 to 10/2010, **Università degli Studi di Milano** (Italy)
- Final grade: *110/110 cum laude*

PUBLICATIONS

[19] (with A. Saldaña and H. Tavares) *An asymptotic relationship between Lane-Emden systems and the 1-bilaplacian equation*, submitted, preprint available at arXiv:2312.16696.

[18] (with S. Jarohs) *On the shape of the first fractional eigenfunction*, Potential Anal. **60**, pp. 1461-1486, 2024. Link.

[17] (with S. Jarohs) *Oscillatory phenomena for higher-order fractional Laplacians*, Publ. Mat. **68**(1), pp. 267-286, 2024. Link.

[16] (with D. Gómez-Castro and J.L. Vázquez) *Singular boundary behaviour and large solutions for fractional elliptic equations*, J. Lond. Math. Soc. **107**(2), pp. 568-615, 2023. Link.

[15] (with M.M. Fall and R.Y. Temgoua) *A Hopf lemma for the regional fractional Laplacian*, Ann. Mat. Pura Appl. **202**, pp. 95-113, 2023. Link.

[14] *Higher-order fractional Laplacians: An overview*, Bruno Pini Math. Anal. Semin. **12**, pp. 53-80, 2021. Link.

[13] (with M. Cozzi) *An elliptic boundary value problem with fractional nonlinearity*, SIAM J. Math. Anal. **53**(3), pp. 3577-3601, 2021. Link.

[12] (with S. Jarohs and A. Saldaña) *Fractional Laplacians on ellipsoids*, Math. in Engineering **3**(5), pp. 1–34, 2021. Link.

[11] *A remark on nonlocal Neumann conditions for the fractional Laplacian*, Arch. Math. (Basel) **114**(6), pp. 699–708, 2020. Link.

[10] (with X. Ros-Oton) *Obstacle problems for integro-differential operators: Higher regularity of free boundaries*, Adv. Math. **360**, 106931, 61 pages, 2020. Link.

[9] (with S. Dipierro, M.M. Fall, S. Jarohs, and A. Saldaña) *Positive powers of the Laplacian in the half space under Dirichlet boundary conditions*, Discr. Cont. Dyn. Syst. **39**(3), pp. 1205–1235, 2019. Link.

[8] (with S. Jarohs and A. Saldaña) *Integral representation of solutions to higher-order fractional Dirichlet problems on balls*, Comm. Cont. Math. **20**(8), 1850002, 36 pages, 2018. Link.

[7] (with S. Jarohs and A. Saldaña) *On the loss of maximum principles for higher-order fractional Laplacians*, Proc. Amer. Math. Soc. **146**(11), pp. 4823–4835, 2018. Link.

[6] (with S. Jarohs and A. Saldaña) *Green function and Martin kernel for higher-order fractional Laplacians in balls*, Nonlinear Anal. **175**, pp. 173–190, 2018. Link.

[5] (with S. Jarohs and A. Saldaña) *Positive powers of the Laplacian: from hypersingular integrals to boundary value problems*, Comm. Pure Appl. Anal. **17**(3), pp. 899-922, 2018. Link.

[4] *Very large solutions for the fractional Laplacian: Towards a fractional Keller-Osserman condition*, Adv. Nonlin. Anal. **6**(4), pp. 383–405, 2017. Link.

[3] (with L. Dupaigne) *Nonhomogeneous boundary conditions for the spectral fractional Laplacian*, Ann. IHP Nonlin. Anal. **34**(2), pp. 439–467, 2017. Link.

[2] *Large s-harmonic functions and boundary blow-up solutions for the fractional Laplacian*, Discr. Cont. Dyn. Syst. **35**(12), pp. 5555–5607, 2015. Link.

[1] (with E. Valdinoci) *A notion of nonlocal curvature*, Numer. Funct. Anal. Optim. **35**(7), pp. 793–815, 2014. Link.

Conference proceedings, book chapters, etc...

c) *Higher order fractional Laplacians, maximum principles, and related issues*, MFO-RIMS Tandem Workshop (hybrid meeting): Nonlocality in Analysis, Probability and Statistics; Oberwolfach Rep. (2022). Link.

b) (with E. Valdinoci) *Getting acquainted with the fractional Laplacian*, Contemporary Research in elliptic PDEs and Related Topics, Springer INdAM Ser. **33**, Springer, Cham, pp. 1–105, 2019. Link.

a) *On Dirichlet data for the spectral Laplacian*, Rend. Sem. Mat. Univ. Politec. Torino **74**(2), *Bruxelles-Torino Talks in PDE's - Turin, May 2-5, 2016*, pp. 31–41, 2016. Link.

Other

ii. (with S. Jarohs and A. Saldaña) *On the maximum principle for higher-order fractional Laplacians*, available at arXiv:1607.00929.

i. *Large Solutions for Fractional Laplacian Operators*, PhD thesis, available at arXiv:1511.00571.

TALKS

2024   *Large solutions in fractional PDEs*, invited talk at the workshop *A glimpse into PDEs*, Caserta (Italy).

      An elliptic boundary value problem with fractional nonlinearity, invited talk at the workshop *Regularity and geometric aspects of nonlinear PDEs*, Pisa (Italy).

2023   *An elliptic equation with fractional nonlinearity*, Bruno Pini Mathematical Analysis Seminar at Alma Mater Studiorum Università di Bologna, Bologna (Italy).

2022   *Oscillatory phenomena of higher-order fractional Laplacians*, invited talk at the workshop *Fall workshop on nonlinear and nonlocal PDEs*, Madrid (Spain).

      Higher-order fractional Laplacians, maximum principles, and related issues, invited talk at the workshop *MFO-RIMS Tandem Workshop: Nonlocality in Analysis, Probability, and Statistics*, Oberwolfach (Germany).

2021   *Laplaciens fractionnaires d'ordre supérieur : un aperçu*, web seminar at Université de Rouen Normandie, Rouen (France).

      Higher-order fractional Laplacians: An overview, Bruno Pini Mathematical Analysis Seminar at Alma Mater Studiorum Università di Bologna, Bologna (Italy).

2020   *Fractional Laplacians on ellipses*, web seminar at University of Western Australia, Perth (Australia).

      Fractional Laplacians on ellipses, web seminar at Goethe-Universität, Frankfurt am Main (Germany).

2019   *Higher regularity of free boundaries in the nonlocal obstacle problem*, invited seminar at Université de Pau et des Pays de l'Adour, Pau (France).

      Between the Laplacian and the bilaplacian: the case of higher-order fractional Laplacians, invited talk at the workshop *IMI one-day workshop on PDEs*, Madrid (Spain).

2018   *Le principe du maximum entre le Laplacien et le bilaplacien* (in French), invited talk at the conference *Journées Jeunes EDPistes 2018*, Nancy (France).

      A glimpse into the theory of positive powers of the Laplacian, invited talk at the conference *Young PDE's @ Roma*, Rome (Italy).

      Some results on powers of the Laplacian between 1 and 2, seminar at Max-Planck-Institut, Leipzig (Germany).

2017   *Funzioni s-armoniche*, portion of a mini-course in the context of the INdAM Intensive Period "Contemporary Research in elliptic PDEs and related topics", Università degli Studi di Bari, Bari (Italy).

      Keller-Osserman type solutions for the fractional Laplacian, invited seminar at Instituto Superior Técnico, Lisbon (Portugal).

2016   *The maximum principle for higher-order fractional Laplacians*, seminar at Université Libre de Bruxelles, Brussels (Belgium).

      Loss of maximum principles for higher-order fractional Laplacians, invited seminar at Universidad de Chile, Santiago de Chile (Chile).

      A very weak theory for fractional Dirichlet problems, invited seminar at Goethe-Universität, Frankfurt am Main (Germany).

      Solutions grandes pour des opérateurs du type Laplacien fractionnaire (in French), invited educational presentation at Logis du Roy, Amiens (France).

2015   *Large solutions for the fractional Laplacian*, seminar at Université Libre de Bruxelles, Brussels (Belgium).

      Large solutions for fractional Laplacian operators, seminar at Università degli Studi di Milano, Milan (Italy).

2014   *Une introduction à l'analyse non-standard*, presentation at Université de Picardie Jules Verne in the context of the doctoral seminar, Amiens (France).

2013   *Explosive solutions for the fractional Laplacian*, seminar at Université de Picardie Jules Verne, Amiens (France).

      A notion of nonlocal curvature, poster at the Summer School *Recent advances in Partial Differential Equations and applications*, Milan (Italy).

      A notion of nonlocal curvature, seminar at Université de Picardie Jules Verne, Amiens (France).

ORGANIZED CONFERENCES

2024   workshop *NonPUB24 - Nonlocal and nonlinear PDEs at the University of Bologna*, 6-7 June 2023, Alma Mater Studiorum Università di Bologna (Italy).

2023   workshop *NonPUB23 - Nonlocal and nonlinear PDEs at the University of Bologna*, 8-9 June 2023, Alma Mater Studiorum Università di Bologna (Italy).

2022   workshop *NonPUB - Nonlocal and nonlinear PDEs at the University of Bologna*, 8-9 September 2022, Alma Mater Studiorum Università di Bologna (Italy).

2018 workshop *Fractional day on nonlocal operators*, 20 April 2018, Université Libre de Bruxelles, Brussels (Belgium).

2017 residential seminar *Intensive Week of PDEs at Spa*, 11-15 December 2017, Radisson Blu Palace Hotel, Spa (Belgium).

2017 *First Belgium-Chile-Italy Conference in PDEs*, 13-17 November 2017, Université Libre de Bruxelles, Brussels (Belgium).

SCIENTIFIC PROJECTS

2024 member of the GNAMPA project *Nonlinear problems in local and nonlocal settings with applications*.

2023 member of the PRIN project 2022R537CS *NO^3 - Nodal Optimization, NOnlinear elliptic equations, NOnlocal geo-
-25 metric problems, with a focus on regularity*.

2023 member of the GNAMPA project *Equazioni nonlocali di tipo misto e geometrico*.

2022 P.I. of the GNAMPA project *PDE ellittiche a diffusione mista*.

2016 member of the international project *REC 05* in the context of program Bilatéral Nord (ULB - CMP Chili), funded by
-17 Wallonie-Bruxelles International, for exchanges and research stays between PDE teams in Brussels and Santiago de Chile.

2014 member of the international project *Blow-up Solutions for Semilinear Elliptic Equations: A Probabilistic Approach* in the context of program PHC Ulysses, funded by the Irish Research Council and the Ministère Français des Affaires étrangères et du Développement international and the Ministère Français de l'Education nationale, de l'Enseignement supérieur et de la Recherche, for exchanges and research stays between PDE teams in Amiens, Lyon, Pau and Dublin.

REVIEWING ACTIVITIES

- Reviewer for *Mathematical Reviews - MathSciNet* (8).

- Reviewer for *zbMATH Open* (9).

- Referee for (in alphabetical order):
  Acta Mathematica Scientia,
  Advances in Nonlinear Analysis,
  Annali di Matematica Pura e Applicata,
  Annals of the Brazilian Academy of Science,
  Applied Mathematics - A Journal of Chinese Universities,
  Boundary Value Problems,
  Bruno Pini Mathematical Analysis Seminar (4),
  Bulletin of the Belgian Mathematical Society,
  Bulletin of the London Mathematical Society,
  Calculus of Variations and PDEs (3),
  Communications in Contemporary Mathematics,
  Communications on Pure and Applied Analysis (2),
  Discrete and Continuous Dynamical Systems,
  Indiana University Mathematics Journal,
  Journal de Mathématiques Pures et Appliquées (2),
  Journal of Mathematical Analysis and Applications,
  Journal of Functional Analysis,
  Mathematical Models and Methods in Applied Sciences,
  Mathematische Nachrichten (2),
  Nonlinear Analysis (2),
  Nonlinear Differential Equations and Applications,
  Nonlinearity,
  Potential Analysis,
  Springer-INdAM Series,
  Topological Methods in Nonlinear Analysis.

TEACHING

24/25 course "Analisi Matematica 1" (108hrs), Alma Mater Studiorum Università di Bologna, 1st year Physics.
portion of the course "Analisi Matematica T-2" (45hrs), Alma Mater Studiorum Università di Bologna, 1st year Electric Engineering.

23/24 PhD course "Large solutions for semilinear PDEs" (16hrs), Alma Mater Studiorum Università di Bologna.
course "Analisi Matematica T-A" (90hrs), Alma Mater Studiorum Università di Bologna, 1st year Energy Engineering.
mini-course "Un'introduzione all'analisi nonstandard" (6hrs), Alma Mater Studiorum Università di Bologna, MSc in Mathematics.

22/23 course "Analisi Matematica T-A" (90hrs), Alma Mater Studiorum Università di Bologna, 1st year Energy Engineering.

21/22 course "Analisi Matematica" (60hrs), Alma Mater Studiorum Università di Bologna, 1st year Information Science for Management.

18/19 exercise sessions for "Analysis III", Universität Zürich, 2nd year Mathematics.

14/15 exercise sessions (*travaux dirigés*) for "Signaux et systèmes, Mathématiques des transformées", INSA - Lyon, Licence (3rd year) Génie électrique.

HABILITATIONS

2020 Abilitazione Scientifica Nazionale professore di II fascia, SC 01/A3 — Qualification to associate professorship in Mathematical Analysis granted by the Italian minister of education, university, and research.

2017 Habilitation MCF, Section CNU 26 — Qualification to associate professorship in Applied Mathematics granted by the French minister of education.

2016 Habilitation MCF, Section CNU 25 — Qualification to associate professorship in Mathematics granted by the French minister of education.

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