**Sergio Polidoro's Curriculum Vitae**

Born the 10th of February, 1964, in Rome (Italy).

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https://orcid.org/0000-0002-5227-7787

**Education**

→ June 1994: Ph.D. in Mathematics, Bologna University.
→ February 1988: Degree in Mathematics, Bologna University.

**Current position**

November 2007: Full professor in Mathematical Analysis, Department of Physics, Informatics and Mathematics, Modena and Reggio Emilia University.

**Membership in Scientific Societies**:

→ January 2025: Corresponding member of the Accademia Nazionale di Scienze, Lettere e Arti of Modena
https://www.accademiasla-mo.it/en

**Previous positions**

→ November 1998: Associate Professor in Mathematical Analysis, Department of Mathematics, Bologna University.
→ June 1990: Assistant Professor, Department of Mathematics, Bologna University.

**Visiting positions**

→ Mittag-Leffler Institute – Stockholm from 01-09-2013 to 30-09-2013.
→ Université Paris Diderot - Paris 7 from 01-04-2011 to 30-04-2011.

**Supervision of PhD Students**

Advisor of the Ph.D. students:
→ Gennaro Cibelli, thesis defended in 2017
→ Francesca Anceschi, thesis defended in 2021
→ Annalaura Rebucci, thesis defended in 2023
Co-advisor of Mirco Piccinini (Advisor: G. Palatucci, thesis defended in 2024)
Advisor of the Ph.D. student Giulio Pecorella.

**Teaching activity**

→ Chair of several standard and advanced University courses on Mathematical Analysis at Bologna University and at Modena and Reggio Emilia University.
→ Chair of PhD courses at Bologna University, Lecce University, Marne la Vallée University, and for the Ferrara, Modena and Reggio Emilia, Parma PhD Programme.

## Assignments

→ September 2025: Member of the Scientific Committee of the INdAM National Group for Mathematical Analysis and Probability for the four-year period 2025-2029.
→ 1st November 2024: Director of the Department of Physical, Computer and Mathematical Sciences and member of the Academic Senate of the University of Modena and Reggio Emilia.
→ September 2021: Member of the Scientific Committee of the INdAM National Group for Mathematical Analysis and Probability for the four-year period 2021-2025.
→ From 29-10-2018 to 15-09-2021: Member of the National Scientific Habilitation committee in Mathematical Analysis and Probability.
→ From September 2017 to August 2021: Head of the scientific team of the interdisciplinary project of the Modena and Reggio Emilia University titled: “The role of Asymmetry and Kolmogorov Equations in Financial Risk Modeling" (PI: S. Muzzioli).
→ From September 2013 to August 2016: Local coordinator for the Modena and Reggio Emilia University of the Ph.D. programme in Mathematics, in Convention between the universities of Ferrara, Modena and Reggio Emilia, Parma.
→ From September 2008 to March 2022: Head of the Bachelor's and Master's Degree Course in Mathematics.
→ From September 2004: organizer and head of the “Corso di Alta Formazione in Finanza Matematica”, University of Bologna, (with A. Pascucci).

## Editorial activity

→ Edtorial board of the Bruno Pini Mathematical Analysis Seminar
https://mathematicalanalysis.unibo.it/
→ Edtorial board of the journal AIMS Mathematics
https://www.aimspress.com/math/news/solo-detail/editorialboard
→ Editor of the Springer INdAM volume “Geometric Methods in PDEs” Springer, 2015 (with G. Citti, M. Manfredini, D. Morbidelli and F. Uguzzoni)
→ Editor of the volume 56 of the Springer INdAM Series “Kolmogorov Operators and Their Applications”, 2024 (with S. Menozzi and A. Pascucci).

## Scientific activity - Organization

→ Meeting “Giornate in occasione del 150° anno dalla nascita di Giuseppe Vitali“ - Modena, September 8-9, 2025
→ “XIII Brazilian-Italian Workshop in Nonlinear Differential Equations“ Modena, September 1-5, 2025
→ “Joint Meeting AMS-UMI Palermo 2024 — Special Session A22” Palermo, July 23-24, 2024 (with G. Staffilani)
→ Meeting “Three days on Regularity Results for Variational Problems and PDEs” - Modena, 22-24 February 2024
→ I.N.d.A.M. Meeting “Kolmogorv Operators and their Applications” Cortona, June 13-17 2022
→ Workshop “Journées Kolmogorov à Evry 2018”, Evry, 24-26 September 2018,
→ I.N.d.A.M. Meeting on Harnack's inequalities and nonlinear operators, Cortona, June 18-24 2017

→ Workshop “Kolmogorov-Fokker-Planck Equations: theoretical issues and appliations”, Modena, April 10-11 2017
→ Geometric Methods in PDE´s: I.N.d.A.M. Meeting on the occasion of the 70 th birthday of Ermanno Lanconelli, Cortona, May 27-31 2013
→ Meeting “Kolmogorov equations in Physics and Finance” - Modena, September 8-10 2010
→ Meeting “Geometric Methods in PDE's: a conference on the occasion of the 65th birthday of Ermanno Lanconelli” - Bologna, May 27-30 2008
→ I.N.d.A.M. Meeting on Subelliptic PDE's and Applications to Geometry and Finance, held in Cortona, June 12-17 2006

**Research interest**

My research activity is mainly concerned with the regularity theory for second order linear Partial Differential Equations with non-negative characteristic form. In particular, I developed the main lines of the classical theory of degenerate Kolmogorov equations described below.

→ Degenerate Kolmogorov-Fokker-Planck equations - Kolmogorov equations are second order linear PDEs that naturally arise in several classical models in physics and in mathematical finance. The characteristic form of Kolmogorov equations is non-negative, in many relevant case it is strongly degenerate. Nevertheless, the solutions of several degenerate Kolmogorov equations have good regularity properties. This fact was first observed by Kolmogorov then by Hörmander, who developed a general regularity theory for a wide class of second order linear PDEs with non-negative characteristic form. The regularity of this class of operators is related to a geometric Lie group structure, which is explicitly known in the case of Kolmogorov operators. In my research activity I developed an "ad hoc" regularity theory for classical solutions to Kolmogorov equations. Among the main contributions of my research, I recall the existence of the fundamental solution, its accurate upper and lower bounds, invariant Harnack inequalities, uniqueness results for the Cauchy problem. I proved "a priori" estimates in the Sobolev-Stein spaces naturally related to the Kolmogorov equations and I obtained several regularity results for distributional solutions to Kolmogorov equations in divergence form, as well as in non-divergence form. I proved pointwise bounds for the solutions to Kolmogorov equations with measurable coefficients, by adapting Moser´s method to the above functional setting.

→ Hypoelliptic ultraparabolic equations on Lie groups - The main results of our regularity theory for Kolmogorov equation are based on the Analysis on Lie groups. The methods used to prove Harnack inequalities and asymptotic bounds for positive solutions to Kolmogorov equations have been used to prove analogous results for a wider class of second order linear PDEs which are invariant with respect to the action of a homogeneous Lie group. In this more general framework the analysis on Lie groups has been combined with the Optimal Control Theory.

→ Partial Differential Equations arising in Mathematical Finance - The modeling of path-dependent Options in the Black and Scholes theory inolves degenerate Kolmogorov equations. Our theory of Kolmogorov equations gives useful tools in the Option pricing problem. In particular, we proved numerical convergence

of finite difference schemes for Asian Options and for a Stochastic Volatility model for European Options. Aiming at studying path-dependent American Options, we proved optimal regularity results for the obstacle problem related to degenerate Kolmogorov equations. This kind of results has interest in itself and has applications to other research areas.

→ Partial Differential Equations with memory terms - I studied in collaboration with M. Fabrizio the long time behavior of solutions of integro-differential equations arising in the models for materials with memory.

**Recent seminars**

→ Bari, EDP e Dintorni X: Tenth Meeting around PDE, January 29-31, 2025 “Taylor formulas for Nonlocal Kinetic Equations”
→ Abu Dhabi, 14th AIMS International Conference on Dynamical Systems, Differential Equations, and Applications – from 16 to 20 December 2024 - “Strong maximum principle and Harnack inequality for classical solutions to subelliptic partial differential equations” in Special session “Regularity results of solutions of problems having nonstandard growth and nonuniform ellipticity”, and “A study of the Kuramoto model for synchronization phenomena based on a degenerate partial differential equation” in Special session “Nonlinear Differential Problems on Flat and Curved Structures: Variational and Topological Methods”
→ Caserta, August 30, 2024 “Degenerate Kolmogorov equations: theory and applications”
→ Ancona, Kolmogorov operators: local and nonlocal models – February 21, 2024 “Taylor formulas for Nonlocal Kinetic Equations”
→ Wilmington, 13th AIMS International Conference on Dynamical Systems, Differential Equations, and Applications – from May 31 to June 4, 2023 - “On a Kinetic Equation in Special Relativity” in Special session “At the Edge of Ellipticity”, and “Mean value formulas for classical solutions to subelliptic equations with non-smooth coefficients” in Special session “Variational, Topological and Set-Valued Methods for Nonlinear Differential Problems”
→ Hagen, Geometric Aspects of Evolution and Control - 17 April 2023 “Degenerate Kolmogorov Equations in Relativistic Kinetic Theory”
→ Non-local Operators, Probability and Singularities – 20 December 2022 (on line) “Asymptotic bounds for the relativistic Fokker-Planck operator”
→ Urbino, 20 December 2022 “On the relativistic di Fokker-Planck operator”
→ Cagliari, 13-14 September 2022 “Mean value formulas for classical solutions to possibly degenerate parabolic equations with non-smooth coefficients”
→ Roma, 23-24 June 2022 “A boundary value problem for a totally degenerate partial differential equation”
→ Cortona, 30 May-3 June 2022 “Mean value formulas, maximum principle and Harnack inequality for classical solutions to degenerate Kolmogorov equations”
→ Salerno - 26 January 2022 “A boundary value problem for a totally degenerate partial differential equation”
→ MDPI - Mathematics Webinar - 20 October 2021 (online) "Asymptotic Estimates for Hörmander’s Operators with Drift"
→ Urbino, 8-10 September 2021, 3 days on Evolution Equations, "Mean value formulas for classical solutions to uniformly parabolic equations"
→ Napoli, 6-7 September 2021, Variational Methods & Evolution Equations (online) "Regularity results for classical solutions to degenerate Kolmogorov

equations"
→ Bari, 12-15 July 2021, International Conference on “PDEs and Semigroups in Applied Analysis”, "The Kolmogorov equation related to a stochastic process introduced by Geman and Yor"

## Articles

The list of my publications is available at my web page
https://unimore.unifind.cineca.it/get/person/014745
and at the following links
https://orcid.org/0000-0002-5227-7787
https://www.scopus.com/authid/detail.uri?authorId=6603562307

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