**BIRINDELLI Isabella**

**POSITION**
Since Novembre 2018: Head of the Department
Since March 2007 : Professore ordinario (Full professor) Università di Roma ”La Sapienza”
1998-2007: Associate professor

**Publications bibliometrics**
according to Math Review Citation Database: 54 publications. Cited 576 times by 326 authors
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**INVITED SPEAKER IN CONFERENCES THE LAST YEARS**
•2019 January PDE in Front of the Alhambra, Granada
•2018 December, PDE at Valparaiso, Chile
•2018 ERC READY in Portquerolle, Francia
•2017 September, Workshop on Nonlinear Diff. Eq., Brasilia
•2017 September, 4th Conference on Recent Trends in Nonlinear Phenomena, Messina
•2017 July, Viscosity sol. approach to asymptotic problems in front propagation, dynamical sys. and related topics, RIMS, Kyoto
• 2017: March, Seminario Matematica e Fisico, Univ. di Milano
• 2017: January, James SERRIN: from His legacy to the new frontiers, Perugia
• 2016: September, A PDE day with Nirenberg, Haifa, Israel
• May 2016, 9th European Conference on Elliptic and Parabolic Problems, Gaeta
• April 2016, Recent Trends in Nonlinear Evolution Equations, CIRM, Marseille, France
• Febbraio 2016, Nonlinear PDE, Padova
• August 2015, Current trends in Analysis and PDE, IMPA, Rio de Janeiro, Brazil
• March 2015, Non linear PDE at the end of the world, Punta Arenas, Chile
• February 2015, Spectral theory and shape optimization problems for elliptic PDEs, Milano Bicocca

**OTHER RECENT RESEARCH-RELATED ACTIVITIES**

**1-ORGANIZATION OF CONFERENCES:**

From 2010, with A. Vitolo, F. Leoni and I. Capuzzo Dolcetta, I have created and organised a cycle of conferences , the idea being to gather a small but highly qualified group of researchers interested in the study of elliptic equations via the Maximum Principle. The conferences have proved to be a success and are becoming a reference in the field:

The first was ”Positivity: a key to fully-nonlinear equations” in Vietri, May 2010. Followed by ”Mostly maximum Principle” in Rome, September 2012 and ”Mostly maximum Principle” in Agropoli, September 2015. The success of these conferences has lead us to apply for a bigger

event, and it has taken place at the Banff International Research Station in April 2017 with over 40 participants.
From Optimal Control to Maximum Principle
workshop on the occasion of Italo Capuzzo Dolcetta's birthday
Castello di Agropoli, 12-14 settembre 2018
-January 2018, with A. Pistoia and M. Musso, organization of the 2nd Italian-Chilean Workshop in PDE's

2-Member of the scientific panel of Gruppo Nazionale Analisi Matematica, Probabilità e Applicazioni, INDAM that evaluates the funding of Mathematical analysis and probability in Italy
3-Member of the Panel for the funding of Mathematical research in Portugal for FCT, 2012 and 2013.
4- Invited professor in many important universities among others: Cergy-Pontoise, Paris X, University of Chile, Stanford University, Rutgers University, U. C. Berkeley
5- Member of the editorial Board of DCDS- series A.
6- Referee for many journals including ”Inventiones Matematicae”, ”Journal IHP", "Analyse non linéaire”, “Communication in Partial Differential Equations”, “Journal of European Mathematical Society”, “ Proceedings of the Royal Society of Edinburgh”, “Pacific Journal”,“Annali di Pisa”, “Non Linear Differential equations and applications”, “Nonlinearity”
7-PI of many research grants from Sapienza University, CNR and GNAMPA

**EDUCATION**

1993 Ph.D. in Mathematics, Courant Institute of Mathematical Sciences, N.Y.U.

Thesis: Second order elliptic equations in general domains: Hopf's lemma and Anti maximum principle . Advisor: Louis Nirenberg.

1988 Laureata con lode, Sapienza, relatore: Prof. U. Mosco

**RESEARCH FIELD**

Fully non linear elliptic PDE, spectral properties, maximum principle, regularity. Elliptic, degenerate elliptic and systems of pPDE, with pattention to qualitative properties, regularity, existence and non-existence theorems in the semi-linear, quasi-linear and linear cases.

**SOME OF THE MAIN RESULTS OBTAINED**

I -Fully nonlinear equations

I.1 Truncated laplacian. Recently I have started an investigation concerning a class of fully nonlinear degenerate elliptic operators so called “truncated laplacian”, precisely, the operators

$P_k^+ (D^2u)$ indicate the some of the k largest eigenvalues of the Hessian matrix D^2u and

$P_k^- (D^2u)$indicate the some of the k smallest eigenvalues of the Hessian matrix D^2u. Many unusual and interesting phenomena occurs concerning the validity of the Maximum principle, the regularity of solutions, the existence of solutions.

For a class of fully nonlinear operators which are either degenerate or singular when the gradient is null:

I.2 Spectral properties when the equation is homogenous in the Hessian, the gradient and the function itself

-Existence of principal eigenvalues also called demi-eigenvalues

The existence is done through the maximum principle and the definition of principal eigenvalue à la Berestycki Nirenberg Varadhan in different contests Dirichlet problem [B.D.], unbounded domains [B.D.], Neuman problem [B.P.]

-Simplicity of the principal eigenvalues [B.D.]

-Evaluation of the eigenvalue and the eigenfunction: in special domains with explicit computations [B.L.] and through numerical schemes with a pointwise sup inf characterisation of the eigenvalue [B.C.CD.]

-Qualitative properties of eigenfunctions corresponding to higher eigenvalues.[B.L.P.]

-In the linear case, we prove that above the principal eigenvalue the anti-maximum principle holds [B]

I.3 Regularity of solutions.

-Harnack’s inequality [B.D.]

- Holder regularity of the gradient of the solutions local and global [B.D.]. The proof uses an improvement of flatness lemma and known regularity results.

-Global Holder regularity of the solution for singular unbounded domains through ABP estimates [B.CD.V]

I. 4 Qualitative properties.

-Characterization of domains with overdetermined non trivial solutions of equations involving the Pucci operators [B.D]

-Connection between symmetry and other qualitative properties of the solutions and the sign of some principal eigenvalue of the operator [B.L.P.]

-Liouville type results for semi/fully nonlinear equations [B.D.]
II Elliptic non linear PDE in other geometries:
II.1 The Heisenberg group and other Carnot groups
-Liouville type results [B.CD.C.]
-qualitative properties via the moving planes method [B.P.]
-Allen Cahn equations , stable solutions, monotone solutions. Classifications of symmetric solutions [B.P., B.L.]. Geometric features of the stable solutions and some non existence results [B.F.V.]
II.2 Hyperbolic space-Study the symmetry of solutions with respect to their behaviour at infinity in the hyperbolic state. [BM]

**Pubblications**


1. Birindelli, Isabeau; Demengel, Françoise; Leoni, Fabiana; □1,γ regularity for singular or degenerate fully nonlinear equations and applications. NoDEA Nonlinear Differential Equations Appl. 26 (2019),
2. Birindelli, Isabeau; Galise, Giulio; Leoni, Fabiana; Pacella, Filomena Concentration and energy invariance for a class of fully nonlinear elliptic equations. Calc. Var. Partial Differential Equations 57 (2018), no. 6, Art. 158, 22 pp.
3. Birindelli, Isabeau; Galise, Giulio; Ishii, Hitoshi A family of degenerate elliptic operators: maximum principle and its consequences. Ann. Inst. H. Poincaré Anal. Non Linéaire 35 (2018), no. 2, 417–441.
4. Birindelli, Isabeau; Galise, Giulio; Leoni, Fabiana Liouville theorems for a family of very degenerate elliptic nonlinear operators. Nonlinear Anal. 161 (2017), 198–211. 35J60 (35B53 35J70)
5. Birindelli, Isabeau; Leoni, Fabiana; Pacella, Filomena Symmetry and spectral properties for viscosity solutions of fully nonlinear equations. J. Math. Pures Appl. (9) 107 (2017), no. 4, 409–428.
6. Birindelli, Isabeau; Camilli, Fabio; Capuzzo Dolcetta, Italo On the approximation of the principal eigenvalue for a class of nonlinear elliptic operators. Commun. Math. Sci. 15 (2017), no. 1, 55–75.
7. Birindelli, Isabeau; Demengel, Françoise Existence and regularity results for fully nonlinear operators on the model of the pseudo Pucci's operators. J. Elliptic Parabol. Equ. 2 (2016), no. 1-2, 171–187.
8. Birindelli, Isabeau; Demengel, Françoise Fully nonlinear operators with Hamiltonian: Hölder regularity of the gradient. NoDEA Nonlinear Differential Equations Appl. 23 (2016), no. 4, Art. 41, 17 pp.
9. Birindelli, I.; Capuzzo Dolcetta, I.; Vitolo, A. ABP and global Hölder estimates for fully nonlinear elliptic equations in unbounded domains. Commun. Contemp. Math. 18 (2016), no. 4, 1550075, 16 pp
10. Birindelli, Isabeau; Demengel, Francoise Hölder regularity of the gradient for solutions of fully nonlinear equations with sub linear first order term. Geometric methods in PDE's, 257–268, Springer INdAM

11. Birindelli, Isabeau; Leoni, Fabiana Symmetry minimizes the principal eigenvalue: an example for the Pucci's sup operator. Math. Res. Lett. 21 (2014), no. 5, 953–967. 35J60 (35P30)
12. Birindelli, I.; Demengel, F. $\mathcal{C}1,\beta$ regularity for Dirichlet problems associated to fully nonlinear degenerate elliptic equations. ESAIM Control Optim. Calc. Var. 20 (2014), no. 4, 1009–
13. Birindelli, I.; Demengel, F. Overdetermined problems for some fully non linear operators. Comm. Partial Differential Equations 38 (2013), no. 4, 608–628.
14. Birindelli, Isabeau; Cedrone, Renata Modern geometry versus modern architecture. Imagine math, 105–115, Springer, Milan, 2012. 00A67 (51N20)
15. Birindelli, I.; Demengel, F. Regularity for radial solutions of degenerate fully nonlinear equations. Nonlinear Anal. 75 (2012), no. 17, 6237–6249. 35J60 (35B07 35B65)
16. Birindelli, Isabeau; Valdinoci, Enrico On the Allen-Cahn equation in the Grushin plane: a monotone entire solution that is not one-dimensional. Discrete Contin. Dyn. Syst. 29 (2011), no. 3, 823–838.
17. Demengel, F.; Birindelli, I. One-dimensional symmetry for solutions of Allen Cahn fully nonlinear equations. Symmetry for elliptic PDEs, 1–15, Contemp. Math., 528, Amer. Math. Soc., Providence, RI, 2010.
18. Birindelli, I.; Demengel, F. Eigenfunctions for singular fully nonlinear equations in unbounded domains. NoDEA Nonlinear Differential Equations Appl. 17 (2010), no. 6, 697–714.
19. Birindelli, I.; Demengel, F. Regularity and uniqueness of the first eigenfunction for singular fully nonlinear operators. J. Differential Equations 249 (2010), no. 5, 1089–1110.
20. Birindelli, Isabeau; Patrizi, Stefania A Neumann eigenvalue problem for fully nonlinear operators. Discrete Contin. Dyn. Syst. 28 (2010), no. 2
21. Birindelli, Isabeau; Ferrari, Fausto; Valdinoci, Enrico Semilinear PDEs in the Heisenberg group: the role of the right invariant vector fields. Nonlinear Anal. 72 (2010), no. 2, 987–997. 35R03 (35A01 35H20)
22. Birindelli, I.; Demengel, F. Uniqueness of the first eigenfunction for fully nonlinear equations: the radial case. Z. Anal. Anwend. 29 (2010), no. 1, 77–90. 35P30 (35J60)
23. Birindelli, Isabeau; Mazzeo, Rafe Symmetry for solutions of two-phase semilinear elliptic equations on hyperbolic space. Indiana Univ. Math. J. 58 (2009), no. 5, 2347–2368.
24. Birindelli, I.; Demengel, F. Eigenvalue and Dirichlet problem for fully-nonlinear operators in non-smooth domains. J. Math. Anal. Appl. 352 (2009), no. 2, 822–835. 35J60
25. Birindelli, Isabeau; Demengel, Françoise Bifurcation for singular fully nonlinear equations. On the notions of solution to nonlinear elliptic problems: results and developments, 117–144, Quad. Mat., 23, Dept. Math., Seconda Univ. Napoli, Caserta, 2008. 35J60
26. Birindelli, Isabeau; Valdinoci, Enrico The Ginzburg-Landau equation in the Heisenberg group. Commun. Contemp. Math. 10 (2008), no. 5, 671–719. 35H10
27. Birindelli, Isabeau; Demengel, Françoise The Dirichlet problem for singular fully nonlinear operators. Discrete Contin. Dyn. Syst. 2007, Dynamical systems and

differential equations. Proceedings of the 6th AIMS International Conference, suppl., 110–121. ISBN: 978-1-60133-010-9; 1-60133-010-3 35J60 (35D05)
28. Birindelli, Isabeau; Stroffolini, Bianca Existence theorems for fully nonlinear equations in the Heisenberg group. Subelliptic PDE's and applications to geometry and finance, 49–55, Lect. Notes Semin. Interdiscip. Mat., 6, Semin. Interdiscip. Mat. (S.I.M.), Potenza, 2007. 35H20
29. Birindelli, I.; Demengel, F. Eigenvalue, maximum principle and regularity for fully non linear homogeneous operators. Commun. Pure Appl. Anal. 6 (2007), no. 2, 335–366.
30. Birindelli, Isabeau; Demengel, Françoise First eigenvalue and maximum principle for fully nonlinear singular operators. Adv. Differential Equations 11 (2006), no. 1, 91–119.
31. Birindelli, Isabeau; Demengel, Françoise Comparison principle and Liouville type results for singular fully nonlinear operators. Ann. Fac. Sci. Toulouse Math. (6) 13 (2004), no. 2, 261–287. (Reviewer: Kai Seng Chou) 35J60
32. Birindelli, Isabeau; Demengel, Françoise Existence of solutions for semi-linear equations involving the p-Laplacian: the non coercive case. Calc. Var. Partial Differential Equations 20 (2004), no. 4, 343–366
33. Birindelli, I.; Lanconelli, E. A negative answer to a one-dimensional symmetry problem in the Heisenberg group. Calc. Var. Partial Differential Equations 18 (2003), no. 4, 357–372
34. Birindelli, I.; Wigniolle, J. Homogenization of Hamilton-Jacobi equations in the Heisenberg group. Commun. Pure Appl. Anal. 2 (2003), no. 4, 461–479
35. Birindelli, Isabeau; Demengel, Françoise Sur les équations de Lane-Emden avec opérateurs non linéaires. (French) [Lane-Emden equations with fully nonlinear operators] C. R. Math. Acad. Sci. Paris 336 (2003), no. 9, 725–730. 35J60 (35A30 35B05)
36. Birindelli, Isabeau Superharmonic functions in the Heisenberg group: estimates and Liouville theorems. NoDEA Nonlinear Differential Equations Appl. 10 (2003), no. 2, 171–185.
37. Birindelli, Isabeau; Demengel, Françoise Some Liouville theorems for the p-Laplacian. Proceedings of the 2001 Luminy Conference on Quasilinear Elliptic and Parabolic Equations and System, 35–46, Electron. J. Differ. Equ. Conf., 8, Southwest Texas State Univ., San Marcos, TX, 2002. 35J60 (35D05)
38. Birindelli, Isabeau; Lanconelli, Ermanno A note on one dimensional symmetry in Carnot groups. Atti Accad. Naz. Lincei Cl. Sci. Fis. Mat. Natur. Rend. Lincei (9) Mat. Appl. 13 (2002), no. 1, 17–22
39. Birindelli, I.; Prajapat, J. Monotonicity and symmetry results for degenerate elliptic equations on nilpotent Lie groups. Pacific J. Math. 204 (2002), no. 1, 1–17.

40. Birindelli, Isabeau; Demengel, Françoise On some partial differential equation for non coercive functional and critical Sobolev exponent. Differential Integral Equations 15 (2002), no. 7, 823–837.

41. Birindelli, Isabeau; Prajapat, Jyotshana One-dimensional symmetry in the Heisenberg group. Ann. Scuola Norm. Sup. Pisa Cl. Sci. (4) 30 (2001), no. 2, 269–284.
42. Birindelli, Isabeau; Capuzzo Dolcetta, Italo Morse index and Liouville property for superlinear elliptic equations on the Heisenberg group. Contributions in honor of the memory of Ennio De Giorgi (Italian). Ricerche Mat. 49 (2000), suppl., 1–15
43. Birindelli, Isabeau; Giacomoni, Jacques Bifurcation problems for superlinear elliptic indefinite equations. Topol. Methods Nonlinear Anal. 16 (2000), no. 1, 17–36.
44. Birindelli, I.; Mitidieri, È.; Svirs, G. Existence of the principal eigenvalue for cooperative elliptic systems in a general domain. (Russian) Differ. Uravn. 35 (1999), no. 3, 325–333, 429; translation in Differential Equations 35 (1999), no. 3, 326–334
45. Birindelli, I.; Prajapat, J. Nonlinear Liouville theorems in the Heisenberg group via the moving plane method. Comm. Partial Differential Equations 24 (1999), no. 9-10, 1875–1890
46. Birindelli, Isabeau; Mitidieri, Enzo Liouville theorems for elliptic inequalities and applications. Proc. Roy. Soc. Edinburgh Sect. A 128 (1998), no. 6, 1217–1247
47. Birindelli, Isabeau; Finzi Vita, Stefano A class of quasi-linear elliptic systems arising in image segmentation. NoDEA Nonlinear Differential Equations Appl. 5 (1998), no. 4, 445–459
48. Birindelli, I.; Capuzzo Dolcetta, I.; Cutrì, A. Indefinite semi-linear equations on the Heisenberg group: a priori bounds and existence. Comm. Partial Differential Equations 23 (1998), no. 7-8, 1123–1157.
49. Birindelli, Isabeau Nonlinear Liouville theorems. Reaction diffusion systems (Trieste, 1995), 37–50, Lecture Notes in Pure and Appl. Math., 194, Dekker, New York, 1998.
50. Birindelli, I.; Capuzzo Dolcetta, I.; Cutrì, A. Liouville theorems for semilinear equations on the Heisenberg group. Ann. Inst. H. Poincaré Anal. Non Linéaire 14 (1997), no. 3, 295–308
51. Birindelli, Isabeau Periodic solutions for a class of second order systems with a small forcing term. Nonlinear Anal. 27 (1996), no. 3, 261–270.
52. Birindelli, Isabeau; Cutrì, Alessandra A semi-linear problem for the Heisenberg Laplacian. Rend. Sem. Mat. Univ. Padova 94 (1995), 137–153.
53. Birindelli, Isabeau Hopf's lemma and anti-maximum principle in general domains. J. Differential Equations 119 (1995), no. 2, 450–472.
54. Birindelli, I.; Vivaldi, M. A. Nonlinear two-obstacle problems: pointwise regularity. Rend. Mat. Appl. (7) 14 (1994), no. 3, 415–455. (Reviewer: Gary M. Lieberman) 35J85 (35B65)
55. Birindelli, Isabeau Second-order elliptic equations in general domains: Hopf's lemma and anti-maximum principle. Thesis (Ph.D.)–
56. Birindelli, Isabeau Energy decay for Dirichlet problems in irregular domains with quadratic Hamiltonian. Differential Integral Equations 5 (1992), no. 5, 1089–1109. 35J85 (35J60)