

## Joaquim Serra

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CONTACT INFORMATION	ETH Zurich, Department of Mathematics Rämistrasse 101, 8092 Zurich, Switzerland	joaquim.serra@math.ethz.ch
DATE OF BIRTH	20th October 1986	
CITIZENSHIP	Spanish	
CURRENT POSITION	<b>Assistant Professor of Mathematics at ETH Zürich</b>	01.2021 -
EXPERIENCE	<b>SNF Ambizione Fellow at ETH Zürich</b> as PI of SNF Ambizione grant PZ00P2.180042	09.2018 - 12.2020
	<b>Postdoc at ETH Zürich</b> with Prof. A. Figalli (ERC 2017-2022 721675)	09.2016 - 08.2018
	<b>Postdoc at WIAS Berlin</b> with Prof. E. Valdinoci (ERC 2011-2015 277749)	01.2016 - 09.2016
	<b>Postdoc at UPC Barcelona (partime)</b> with Prof. X. Cabré (MINECO MTM2011-27739-C04-01)	09.2015 - 12.2015
	<b>Consultant at Arcvi “Big Data Agency”</b>	04.2014 - 08.2015
EDUCATION	<b>Ph.D. in Mathematics</b> Universitat Politècnica de Catalunya (UPC Barcelona) Advisor: Prof. <b>Xavier Cabré*</b> *ICREA researcher and Full professor at UPC Barcelona	2014
	<b>Master in Applied Mathematics</b> UPC	2010
	<b>Degree in Mathematics</b> UPC	2009
RESEARCH INTERESTS	Regularity theory for elliptic and parabolic Partial Differential Equations Reaction-diffusion equations, phase transitions, minimal surfaces Free boundary problems Integro-differential equations	
ARTICLES	<ul style="list-style-type: none"><li>• F. Franceschini, J. Serra <i>Free boundary partial regularity in the thin obstacle problem</i> preprint arXiv:2112.11104.</li><li>• X. Cabré, E. Cinti, J. Serra <i>Stable solutions to the fractional Allen-Cahn equation in the nonlocal perimeter regime</i>, preprint arXiv:2111.06285</li><li>• A. Audrito, J. Serra, <i>Interface regularity for semilinear one-phase problems</i>, Adv. Math., accepted; preprint arXiv:2110.09210.</li><li>• A. Figalli, X. Ros-Oton, J. Serra, <i>The singular set in the Stefan problem</i>, preprint arXiv:2103.13379. See also M. Rovrig’s story on the paper in Quanta Magazine: <i>Mathematicians Prove Melting Ice Stays Smooth</i>, [<a href="https://www.quantamagazine.org/mathematicians-prove-melting-ice-stays-smooth-20211006/">https://www.quantamagazine.org/mathematicians-prove-melting-ice-stays-smooth-20211006/</a>]</li><li>• S. Dipierro, X. Ros-Oton, J. Serra, E. Valdinoci, <i>Non-symmetric stable operators: regularity theory and integration by parts</i>, Adv. Math. 401 (2022), Paper No. 108321.</li><li>• E. Cinti, F. Glaudo, A. Pratelli, X. Ros-Oton, J. Serra, <i>Sharp quantitative stability for isoperimetric inequalities with homogeneous weights</i>, Trans. Amer. Math. Soc. 375 (2022), no. 3, 1509–1550.</li></ul>	

- A. Figalli, X. Ros-Oton, J. Serra, *Generic regularity of free boundaries for the obstacle problem*, Publ. Math. IHÉS 159 (2020), 181-292.
- X. Cabré, A. Figalli, X. Ros-Oton, J. Serra, *Stable solutions to semilinear elliptic equations are smooth up to dimension 9*, Acta Math. 224 (2020), 187-252.
- X. Fernández-Real, J. Serra, *Regularity of minimal surfaces with lower dimensional obstacles*, J. Reine Angew. Math. 767 (2020), DOI: <https://doi.org/10.1515/crelle-2019-0035>.
- X. Cabré, E. Cinti, J. Serra, *Stable  $s$ -minimal cones in  $R^3$  are flat for  $s \sim 1$* , J. Reine Angew. Math 764 (2020), DOI: <https://doi.org/10.1515/crelle-2019-0005>
- A. Figalli, J. Serra, *On the fine structure of the free boundary for the classical obstacle problem*, Invent. Math. 215 (2019), 311-366.
- S. Serfaty, J. Serra, *Quantitative stability of the free boundary in the obstacle problem*, Anal. PDE 11 (2018), 1803-1839.
- A. Figalli, J. Serra, *On stable solutions for boundary reactions: a De Giorgi type result in dimension  $4+1$* , Invent. Math. 219 (2020), 153-177.
- S. di Pierro, J. Serra, E. Valdinoci, *Improvement of flatness for nonlocal phase transitions*, Amer. J. Math. 142 (2020), no. 4, 108-1160.
- S. di Pierro, J. Serra, E. Valdinoci, *Nonlocal phase transitions: rigidity results and anisotropic geometry*, Rend. Semin. Mat. Univ. Politec. Torino 74 (2016), 135-149.
- X. Ros-Oton, J. Serra, *The boundary Harnack principle for nonlocal elliptic equations in non-divergence form*, J. Potential Anal. 51 (2019), 51-315.
- X. Ros-Oton, J. Serra, *The structure of the free boundary in the fully nonlinear thin obstacle problem*, Adv. Math. 316 (2017), 710-747.
- E. Cinti, J. Serra, E. Valdinoci, *Quantitative flatness results and BV-estimates for nonlocal minimal surfaces*, J. Differential Geom. 112 (2019), 447-504.
- L. Caffarelli, X. Ros-Oton, J. Serra, *Obstacle problems for integro-differential operators: regularity of solutions and free boundaries*, Invent. Math. 208 (2017), 1155-1211.
- X. Ros-Oton, J. Serra, *Boundary regularity estimates for nonlocal elliptic equations in  $C^1$  and  $C^{1,\alpha}$  domains*, Ann. Mat. Pura Appl. 196 (2017), 1637-1668.
- X. Cabré, J. Serra, *An extension problem for sums of fractional Laplacians and 1-D symmetry of phase transitions*, Nonlinear Anal. Theor. 137 (2016), 246-265.
- X. Ros-Oton, J. Serra, E. Valdinoci, *Pohozaev identities for anisotropic integro-differential operators*, Comm. Partial Differential Equations 42 (2017), 1290-1321.
- X. Ros-Oton, J. Serra, *Boundary regularity for fully nonlinear integro-differential equations*, Duke Math. J. 165 (2016), 2079-2154.
- X. Ros-Oton, J. Serra, *Regularity theory for general stable operators*, J. Differential Equations 260 (2016), 8675-8715.
- X. Ros-Oton, J. Serra, *Local integration by parts and Pohozaev identities for higher order fractional Laplacians*, Discrete Contin. Dyn. Syst. A 35 (2015), 2131-2150.
- J. Serra,  *$C^{\sigma+\alpha}$  regularity for concave nonlocal fully nonlinear elliptic equations with rough kernels*, Calc. Var. Partial Differential Equations 54 (2015), 3571-3601.
- J. Serra, *Regularity for fully nonlinear nonlocal parabolic equations with rough kernels*, Calc. Var. Partial Differential Equations 54 (2015), 615-629.
- X. Ros-Oton, J. Serra, *Nonexistence results for nonlocal equations with critical and supercritical nonlinearities*, Comm. Partial Differential Equations 40 (2015), 115-133.
- X. Cabré, X. Ros-Oton, J. Serra, *Sharp isoperimetric inequalities via the ABP method*, J. Eur. Math. Soc. 18 (2016), 2971-2998.
- X. Ros-Oton, J. Serra, *The extremal solution for the fractional Laplacian*, Calc. Var. Partial Differential Equations 50 (2014), 723-750.
- X. Ros-Oton, J. Serra, *The Pohozaev identity for the fractional Laplacian*, Arch. Rational Mech. Anal. 213 (2014), 587-628.
- X. Ros-Oton, J. Serra, *The Dirichlet problem for the fractional Laplacian: regularity up to the boundary*, J. Math. Pures Appl. 101 (2014), 275-302.

- X. Cabré, X. Ros-Oton, J. Serra, *Euclidean balls solve some isoperimetric problems with nonradial weights*, C. R. Math. Acad. Sci. Paris 350 (2012), 945-947.
- X. Ros-Oton, J. Serra, *Fractional Laplacian: Pohozaev identity and nonexistence results*, C. R. Math. Acad. Sci. Paris 350 (2012), 505-508.
- J. Serra, *Radial symmetry for diffusion equations with discontinuous nonlinearities*, J. Differential Equations 254 (2013), 1893-1902.

SURVEYS AND  
EXPOSITORY  
PAPERS

- J. Serra *From branching singularities in minimal surfaces to, non-smoothness points in ice-water interfaces*, Proceedings of the 8th European Congress of Mathematicians 2020 (in press).
- J. Serra, *The geometric structure of interfaces and free boundaries*, EMS Magazine 120, 8-15.
- X. Ros-Oton, J. Serra, *Regularity and singularities in free boundary problems*, Catalan Butl. Soc. Catalana Mat. 35 (2020), 155–176.
- X. Ros-Oton, J. Serra, *Understanding singularities in free boundary problems*, Mat. Cult. Soc. Riv. Unione Mat. Ital. 4 (2019), 107-118.

EDITORIAL BOARDS

- Editor of *Ars Inveniendi Analytica* (<https://ars-inveniendi-analytica.com>) A peer-reviewed journal in Mathematical Analysis, holding to the highest scientific standards, completely free for authors and readers.

TALKS AT  
CONFERENCES

- **Conference of the Australian Mathematical Society (plenary talk)**, online due to pandemic, 09.12.2021.
- **8th European Congress of Mathematicians (EMS prize lecture)**, online due to pandemic, 23.06.2021
- **Barcelona Mathematical Days 2020 (plenary talk)** online due to pandemic, 23.10.2020.
- Realizing the Potential – Theory in Bielefeld, Bielefeld (Germany), 09.2019
- Swedish Summer PDE at KTH, Stockholm (Sweden), 08.2019
- Oberwolfach Workshop “Partial Differential Equations”, Oberwolfach (Germany), 07.2019.
- Non Standard Diffusions in Fluids, Kinetic Equations and Probability, Marseille (France), 12.2018
- Recent advances in Geometric Analysis, Pisa (Italy), 06.2018
- IV Congreso de Jóvenes Investigadores de la RSME (plenary talk), Valencia (Spain), 09.2017
- Recent Advances in PDEs and the Calculus of Variations, Venice (Italy), 07.2017
- 23rd Rolf Nevanlinna Colloquium, Zurich (Switzerland), 06.2017
- Barcelona Mathematical Days, Barcelona (Spain), 04.2017
- Nonlinear, nonlocal problems and stochastic methods, Helsinki (Finland), 12.2016
- Partial Differential Equations in Valencia, Valencia (Spain), 10.2015
- A week on fractional diffusion, Milan (Italy), 06.2013
- Variational and geometric methods in PDEs, Ancona (Italy), 06.2013
- Recent advances in Partial Differential Equations and applications, Milan (Italy), 06.2013

AWARDS

- ERC Starting Grant “StableIF” (01.01.2018-31.12.2025, 1.398.125 EUR)
- EMS Prize 2020 from the European Mathematical Society.
- José Luis Rubio de Francia Prize 2018 from the Royal Spanish Mathematical Society
- Starting grant from Fundación BBVA associated to Rubio de Francia Prize (35.000 EUR)
- Antonio Valle Prize 2019 from the Spanish Society of Applied Mathematics
- SNF Ambizione grant PZ00P2\_180042 (789.000 CHF)

- Josep Teixidó Prize 2016 from the Catalan Mathematical Society

UNIVERSITY  
SEMINARS AND  
COLLOQUIA

- Fields Geometric Analysis Colloquium, online due to pandemic, 02.12.2021
- IAS Analysis Seminar in Princeton, 14.12.2020
- Oberseminar (Max-Planck Institute + University) in Leipzig, 23.06.2020
- III Coloquio Premio Rubio de Francia at Universidad Autónoma de Madrid, 10.2019
- Analysis Seminar at Universität Basel, 03.2017
- Oberseminar Analysis - Probability at MPI Leipzig, 07.2016
- Séminaire EDP-Analysen at University Lyon 1, 05.2016
- Analysis Seminar at UT Austin, 04.2016
- PDE seminar at Università di Roma Tor Vergata, 11.2013
- PDE and Applications seminar at Universitat Politècnica de Catalunya, 04.2013
- PDE seminar. Basque Center for Applied Mathematics, 02.2013

MINI-COURSES

- 8h course on the obstacle problem in the “Advanced PDE Seminar” at the Institute of Advanced Mathematics in Hangzhou (China), May 2019.
- 6h course on integro-differential elliptic equations in the INDAM intensive period “Contemporary research in elliptic PDEs and related topic” , Bari, 05.2017 (6h)

ORGANIZATION OF  
CONFERENCES

- Co-organizer (with A. Figalli and X. Ros-Oton) of the conference “PDEs and Geometric Measure Theory” held at ETH Zürich from 29.10.2018 to 02.11.2018.

MENTORING

- Federico Franceschini, PhD student at ETH (09.2019- )
- Alessandro Audrito, Maire-Curie postdoc at ETH (09.2020- )
- Simon Eberle, postdoc at BCAM [cosupervised with Prof. Luis Vega] (09.2021-)
- Philippe Anjolras ( École Normale Supérieure of Paris) — research stay (02.2021-07.2021)
- Michele Caselli (ETH) — Master thesis (02.2021-07.2021)
- David Urech (ETH) — Bachelor thesis (02.2021-07.2021)
- Anthony Salib (ETH) — Master thesis (09.2021-02.2022)
- Jingeon Ann (EPF Lausanne) — Master thesis (09.2021-02.2022)
- Cyrill Graf (ETH) — Bachelor thesis (02.2022-)
- Giacomo Colombo (Scuola Normale Superiore of Pisa) — Master thesis (02.2022-)
- Julien Moy ( École Normale Supérieure of Paris) — research stay (02.2022-)

TEACHING

- *Differential Geometry II* (professor), ETH-Zurich, Spring 2020-21 (10 ECTS)
- *Differential Geometry I* (professor), ETH-Zurich, Spring 2020-21 (10 ECTS)
- *Seminar on Classical Elliptic Regularity Theory* (professor), ETH-Zurich, Spring 2020-21 (14 hours)
- *Seminar on Fully Nonlinear Elliptic Equations* (professor), ETH-Zurich, Fall 2017-18 (14 hours)
- *Measure and integration – exercise* (assistant), undergraduate course, ETH-Zurich, Spring 2016-17 (22 hours)
- *Differential Geometry – exercise* (assistant), undergraduate course, ETH-Zurich, Fall 2016-17 (13 hours)
- *Ampliació d’anàlisi* (Advanced functional analysis), undergraduate course, UPC, Spring 2011-12 (30 hours)
- *Equacions en derivades parcials* (Partial differential equations), undergraduate course, UPC, Spring 2012-13 (60 hours) and Spring 2013-14 (30 hours)
- *Mathematical modelling with PDEs*, course of the MSc in Advanced Mathematics and Mathematical Engineering, UPC, Fall 2013-14 (7.5 hours), Fall 2014-15 (7.5 hours)

hours) and Fall 2015-16 (7.5 hours)

LANGUAGES Catalan and Spanish (native), English (fluent), Italian (fluent), German (basic)

OTHER Father of 2 boys (2013 and 2021) and 1 girl (2018)