

Short Curriculum Vitae

Xavier Tolsa Domènech

October 28, 2024

PERSONAL INFORMATION

Researcher unique identifier: ORCID 0000-0001-7976-5433

Place and date of birth: Barcelona, 2-11-1966

email: xtolsa@mat.uab.cat

Web page: <http://www.mat.uab.cat/~xtolsa>

EDUCATION

- 1998 PhD in Mathematics.
Universitat Autònoma de Barcelona (UAB).
- 1995 PhD in Industrial Engineering.
Universitat Politècnica de Catalunya.
- 1994 Degree in Mathematics.
Facultat de Matemàtiques, Universitat de Barcelona.
- 1990 Industrial Engineer.
ETS Enginyers Industrials, Universitat Politècnica de Catalunya.

CURRENT POSITION

- 2003 - ICREA Research Professor at the Universitat Autònoma de Barcelona.
Institució Catalana de Recerca i Estudis avançats, Catalonia

PREVIOUS POSITIONS

- 2001 - 2003 Ramón y Cajal researcher.
Dept. of Mathematics, Universitat Autònoma de Barcelona.
- 2000 - 2001 Marie Curie Postdoctoral Fellow.
Dept. of Mathematics, Université de Paris-Sud, France.
- 1999 - 2000 Postdoctoral Fellow.
Dept. of Mathematics and Computer Science, Univ. of Göteborg, Sweden.
- 1994 - 1999 Assistant Professor.
Dept. of Applied Mathematics and Analysis, Universitat de Barcelona.

INDIVIDUAL FELLOWSHIPS AND AWARDS

- 2024 **Premio Nacional de Investigación Julio Rey Pastor**, from the Spanish government.
- 2024 **Frontiers of Science Award** from the International Congress of Basic Sciences (Beijing) for the work *On the uniform rectifiability of AD-regular measures with bounded Riesz transform operator: the case of codimension 1* (Acta Math., 2014) joint with F. Nazarov and A. Volberg.
- 2021 - 2026 **ERC Advanced Grant** for the project “Geometric analysis and Potential Theory”.
- 2019 **Prize Rei Jaume I of Basic Research**, yearly awarded by Generalitat Valenciana and Fundació Valenciana d’Estudis Avançats to a top scientist carrying out basic research in Spain.

- 2013 Ferran Sunyer i Balaguer Prize, for the book “Analytic capacity, the Cauchy transform, and non-homogeneous Calderón-Zygmund theory”, published by Birkhäuser-Verlag in 2014.
- 2013 - 2018 **ERC Advanced Grant** for the project “Geometric analysis in the Euclidean space”.
- 2004 **Prize of the European Mathematical Society** for young researchers, awarded for the solution of Painlevé’s problem.
- 2002 **Salem Prize**, awarded by Princeton University and the IAS of Princeton for the proof of the semadditivity of analytic capacity and the solution of Painlevé’s problem, open for more than 100 years.
- 2001 - 2003 Ramón y Cajal fellowship. Number 1 in Mathematics in the Ramón y Cajal program in 2001.
- 2000 - 2001 Marie Curie Postdoctoral Fellowship, at the Dept. of Mathematics of Université de Paris-Sud.
- 1999 - 2000 Postdoctoral Fellowship from the TMR network Harmonic Analysis (HARP), at the Dept. of Mathematics and Computer Science of Univ. of Göteborg.
- 1991 - 1994 Predoctoral grant from the Generalitat de Catalunya, at the Universitat Politècnica de Catalunya, for the PhD in Engineering.

P.I. OF FUNDED RESEARCH PROJECTS

- 2022 - 2024 Anàlisi real i complexa, i equacions en derivades parcials, 2021-SGR-00071. (AGAUR, Generalitat de Catalunya). 40.000 euros.
- 2021 - 2026 **ERC Advanced Grant** “Geometric analysis and Potential Theory” (agreement 101018680). 1.476.000 Euros.
- 2021 - 2024 “Singular integrals, geometric measure theory, and PDE’s”, PID2020-114167GB-I00 (MICINN, Spain). 60.000 Euros.
- 2017 - 2020 Anàlisi real i complexa, i equacions en derivades parcials, 2017-SGR-395 (AGAUR, Generalitat de Catalunya), 2017-2020. 65.896 Euros.
- 2017 - 2020 Análisis armonico, teoría geométrica de la medida y aplicaciones, MTM2016-77635-P (MINECO, Spain). 47.500 Euros.
- 2013 - 2018 **ERC Advanced Grant** “Geometric analysis in the Euclidean space” (agreement 320501). 1.105.000 Euros.
- 2014 - 2016 Integrales singulares, teoria geométrica de la medida, y espacios de Sobolev, MTM2013-44304-P (MINECO, Spain). 35.812 Euros.
- 2011 - 2013 Análisis geométrico en el espacio euclídeo, MTM2010-16232 (MEC, Spain). 57.800 Euros.
- 2008 - 2010 Las transformadas de Cauchy y de Riesz y la rectificabilidad, MTM2007-62817 (MEC, Spain). 65.400 Euros.

TOP 10 PUBLICATIONS (out of more than 90)

1. X. Tolsa. *Unique continuation at the boundary for harmonic functions in C^1 domains and Lipschitz domains with small constant*. **Comm. Pure Appl. Math.** 76 (2), 2023, pp. 305-336. Solution of a problem posed by Fang-Hua Lin in 1991 in the particular case of Lipschitz domains with small constant (the original question, still open, is for general Lipschitz domains).
2. B. Jaye, X. Tolsa, and M. Villa. *A proof of Carleson’s ε^2 -conjecture*. **Ann. of Math.** (2) 194 (2021), no. 1, 97–161. This work solves the ε^2 -conjecture regarding the characterization of tangent points of Jordan cuves, posed by Chris Bishop and Lennart Carleson around 1990.

3. J. Azzam, S. Hofmann, J.M. Martell, M. Mourgoglou, and X. Tolsa. *Harmonic measure and quantitative connectivity: geometric characterization of the L^p -solvability of the Dirichlet problem.* **Invent. Math.** 222 (2020), 881–993.
4. J. Azzam, M. Mourgoglou and X. Tolsa. *Mutual absolute continuity of interior and exterior harmonic measure implies rectifiability.* **Comm. Pure Appl. Math.** Vol. LXX (2017), 2121–2163. This work solves the so-called two-phase problem for harmonic measure posed by C. Bishop in 1992, assuming the CDC condition.
5. J. Azzam, M. Mourgoglou, X. Tolsa., and A. Volberg. *On a two-phase problem for harmonic measure in general domains.* **Amer. J. Math.** 141(5) (2019), 1259–1279. Full solution of Bishop’s two-phase problem for harmonic measure from 1992.
6. F. Nazarov, X. Tolsa and A. Volberg. *On the uniform rectifiability of AD-regular measures with bounded Riesz transform operator: the case of codimension 1.* **Acta Math.** 213:2 (2014), 237–321. Solution of the David-Semmes problem about Riesz transforms and rectifiability in codimension 1, proposed by David and Semmes around 1990.
7. X. Tolsa. *Bilipschitz maps, analytic capacity, and the Cauchy integral.* **Ann. of Math.** 162:3 (2005), 1241–1302. This work shows that analytic capacity is bilipschitz invariant modulo multiplicative estimates, solving a problem posed by J. Verdera in 1994.
8. X. Tolsa. *The semiadditivity of continuous analytic capacity and the inner boundary conjecture.* **Amer. J. Math.** 126 (2004), no. 3, 523–567.
9. J. Mateu, X. Tolsa and J. Verdera. *The planar Cantor sets of zero analytic capacity and the local $T(b)$ theorem.* **J. Amer. Math. Soc.** 16 (2003), 19–28.
10. X. Tolsa. *Painlevé’s problem and the semiadditivity of analytic capacity.* **Acta Math.** 190:1 (2003), 105–149. This work proves the semiadditivity of analytic capacity (posed by Vituskkin in the 1960’s) and gives a solution of the Painlevé problem (from the 1900’s) about removable singularities for bounded analytic functions in terms of Melnikov’s curvature of measures.

BOOK

- X. Tolsa, “Analytic capacity, the Cauchy transform, and non-homogeneous Calderón-Zygmund theory”, Progress in Mathematics, Vol. 307, Birkhäuser-Verlag, 2014, 396 p.

OTHER 10 SELECTED PUBLICATIONS FROM THE LAST 5 YEARS

1. M. Mourgoglou and X. Tolsa. *The regularity problem for the Laplace equation in rough domains.* **Duke Math. J.** 173 (9) (2024), 1731–1837.
2. M. Mourgoglou, B. Poggi, and X. Tolsa. *Solvability of the Poisson-Dirichlet problem with interior data in L^p -Carleson spaces and its applications to the L^p -regularity problem.* Preprint (2022). To appear in **J. Eur. Math. Soc. (JEMS)**.
3. O. Tapiola and X. Tolsa. *Connectivity conditions and boundary Poincaré inequalities.* **Analysis & PDE** 17-5 (2024), 1831–1870.
4. X. Tolsa. *The dimension of harmonic measure on some AD-regular flat sets of fractional dimension.* **Int. Math. Res. Not. IMRN**, vol. 2024, no. 8 (2024), pp. 6579–6605.
5. A. Molero, M. Mourgoglou, C. Puliatti, and X. Tolsa. *L^2 -boundedness of gradients of single layer potentials for elliptic operators with coefficients of Dini mean oscillation-type.* **Arch. Ration. Mech. Anal.** 247 (2023), no. 3, Paper No. 38, 59 pp.

6. L. Prat, C. Puliatti, and X. Tolsa. *L^2 -boundedness of gradients of single layer potentials and uniform rectifiability*. *Analysis & PDE* 14 (2021), no. 3, 717–791.
7. A. Chang and X. Tolsa. *Analytic capacity and projections*. **J. Eur. Math. Soc. (JEMS)** 22 (2020), no. 12, 4121–4159.
8. B. Jaye, F. Nazarov, and M.C. Reguera, and X. Tolsa. *The Riesz transform of codimension smaller than one and the Wolff energy*. **Mem. Amer. Math. Soc.** 266 (2020), no. 1293.
9. M. Prats and X. Tolsa. *The two-phase problem for harmonic measure in VMO*. *Calc. Var. Partial Differential Equations* 59 (2020), no. 4, 102, 58 pp.
10. M. Mourougolou and X. Tolsa. *Harmonic measure and Riesz transform in uniform and general domains*. *J. Reine Angew. Math.* 758 (2020), 183–221.

10 SELECTED PLENARY ADDRESSES (about 5 per year in the last five years)

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| 2020 | Analysis, Dynamics, Geometry and Probability (in honor of Chris Bishop). Simons Center for Geometry and Physics, Stony Brook, New York. |
| 2019 | Modern Aspects of Complex Analysis and Its Applications (in honor of Don Marshall and John Garnett). University of Washington, Seattle. |
| 2018 | Geometric Aspects of Harmonic Analysis (in honor of F. Ricci), Cortona, Italy. |
| 2017 | Geometry, Analysis and Probability. Conference in honor of Peter Jones. Seoul, South Korea. |
| 2017 | Recent Developments in Harmonic Analysis. MSRI, Berkeley. |
| 2016 | Harmonic analysis, complex analysis, spectral theory and all that (in honor of A. Volberg). Bedlewo (Poland). |
| 2013 | 26 th Nordic and 1 st European-Nordic Congress of Mathematicians (Lund, Sweden). |
| 2007 | Lars Ahlfors Centennial Celebration, Helsinki. |
| 2006 | International Congress of Mathematicians , Madrid. (Invited speaker). |
| 2004 | Fourth European Congress of Mathematics , Stockholm. |

EDITORIAL WORK

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| 2024 - | Member of the Editorial Board of “Ars Inveniendi Analytica”. |
| 2019 - | Member of the Editorial Board of “Publicacions Matemàtiques”. |
| 2014 - 2016 | Member of the Editorial Board of the Journal of the European Mathematical Society . |
| 2012 - | Member of the Editorial Board of “Annales de la Faculté des Sciences de Toulouse. Mathématiques”. |
| 2003 -2005 | Member of the scientific committee of the journal “Collectanea Mathematica”. |

SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS

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| 2009 - 2018 | Completion of the direction of 7 PhD theses in UAB: Aleix Ruiz de Villa (2009), Albert Mas (2011), Martí Prats (2015), Daniel Girela Sarrión (2016), Petr Chunaev (2018), Carmelo Puliatti (2019), Damian Dabrowski (2021). |
| 2009 - 2022 | Supervision of many Postdoctoral fellows in the Dept. of Mathematics of Univ. Autònoma de Barcelona: D. Karp (2006), V. Feuvrier (2009-2010), V. Choussionis (2010-2012), M.C. Reguera (2012-2013), A. Mas (2013-2014), J. Azzam (2014-2016), M. Mourougolou (2014-2016), J. Conde-Alonso (2015-2017), A. Kauaranen (2017-2019), G. Sakellaris (2017-2020), M. Prats (2017-2019), B. Poggi (2021-2024), O. Tapiola (2021-2023), M. Villa (2022-2024). |

SELECTED MANAGERIAL ACTIVITIES

- 2022 Co-organizer of the research trimester “Interactions between Geometric measure theory, Singular integrals, and PDE”, in the Hausdorff Institute of Mathematics, Bonn.
- 2019 Member of the Program Committee of the Barcelona Analysis Conference 2019 (BAC19).
- 2017 Member of the Scientific Committee of the Joint Meeting of the Catalan, the Royal Spanish and the Swedish Mathematical Societies, Umeå (Sweden).
- 2016 President of the Scientific Committee of the Barcelona Analysis Conference 2016.
- 2014 - 2017 Member of the Scientific Committee of the **MFO (Oberwolfach)**.
- 2013 - 2015 Member of the Scientific Committee of the Barcelona Graduate School of Mathematics.
- 2010 Member of the scientific committee of the analysis section of the **ICM 2010** (International Conference of Mathematicians).
- 2009 Coordinator of the research program “Harmonic Analysis, Geometric Measure Theory and Quasiconformal Mappings”, in the CRM (Centre de Recerca Matemàtica).