

Curriculum Vitae
Javier Gómez Serrano
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Personal Data

Department of Mathematics
Brown University
151 Thayer Street
Providence, RI 02912, USA

and

Departament de Matemàtiques i Informàtica
Universitat de Barcelona
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Academic Background

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|---|---------------|
| 5-year degree | February 2009 |
| Universidad Politécnica de Cataluña, Barcelona.
Mathematics. Ranked 3 rd in class. | |
| 5-year degree | October 2009 |
| Universidad Politécnica de Cataluña, Barcelona.
Telecommunication. Ranked 1 st in class. Ranked 3 rd in Spain (36 universities).
Final Degree Project done in collaboration with EPFL (Lausanne, Switzerland):
<i>Mean field dynamics of the bounded confidence model</i>
Grade: 6.0/6.0 (ECTS: A), 10.0/10.0 (Honors)
Advisor: Prof. Jean-Yves Le Boudec. | |
| Engineering | October 2009 |
| Centro de Formación Interdisciplinaria Superior (CFIS), Barcelona.
Multidisciplinar Engineer. | |
| Master | October 2010 |
| Universidad Autónoma de Madrid, Madrid.
Mathematics. Ranked 1 st in class.
Master Thesis: <i>Boundary layer theory and Prandtl's equation</i>
Grade: 10.0/10.0. Advisor: Prof. Diego Córdoba. | |
| PhD | July 2013 |
| Universidad Autónoma de Madrid, Madrid.
Mathematics. Best dissertation of the year award.
<i>Analytical and Computer-assisted proofs in incompressible fluids</i>
Advisor: Prof. Diego Córdoba. | |

Professional Interests

Partial Differential Equations in Fluid Mechanics, Computer-assisted proofs,
Spectral geometry, Analysis

Appointments

- Visiting Professor, Brown University, 2020-currently.
- Investigador Distinguido, Universitat de Barcelona, 2020-currently.
- Assistant Professor, Princeton University, 2016-2020.
- Instructor, Princeton University, 2013-2016.
- ERC Predoc, CSIC, Madrid, 2009-2013.
- Software Engineering Intern, Google Dublin, 2008.
- Becario de Penúltimo Curso, CSIC, Madrid, 2007.
- High School Teacher (Programming in C++), Aula Escola Europea, Barcelona, 2007.

Publications

Research papers

1. “Self-similar blow-up profile for the Boussinesq equations via a physics-informed neural network” (with T. Buckmaster, C.Y. Lai and Y. Wang), *arXiv preprint:2201.06780*. Submitted.
2. “Existence of non-trivial non-concentrated compactly supported stationary solutions of the 2D Euler equation with finite energy” (with J. Park and J. Shi), *arXiv preprint:2112.03821*. Submitted.
3. “Self-similar solutions for the Muskat equation” (with E. García-Juárez, H. Q. Nguyen and B. Pausader), *arXiv preprint:2109.02565*. Submitted.
4. “A counterexample to Payne’s nodal line conjecture with few holes” (with J. Dahne and K. Hou), *Commun. Nonlinear Sci. Numer. Simul.*, 103, 105957 (2021). Special Issue “Computer Assisted Proofs in Dynamical Systems”.
5. “Remarks on stationary and uniformly-rotating vortex sheets: Flexibility results” (with J. Park, J. Shi and Y. Yao), *Philosophical Transactions of the Royal Society A*. To appear.
6. “Remarks on stationary and uniformly-rotating vortex sheets: Rigidity results” (with J. Park, J. Shi and Y. Yao), *Communications in Mathematical Physics*, 386, 1845–1879 (2021).
7. “Any three eigenvalues do not determine a triangle” (with G. Orriols), *Journal of Differential Equations*, 275, 920-938 (2021).
8. “Symmetry in stationary and uniformly-rotating solutions of active scalar equations” (with J. Park, J. Shi and Y. Yao), *Duke Mathematical Journal*, 170, no. 13, 2957-3038 (2021).
9. “Convexity of cusped Whitham waves” (with A. Enciso and B. Vergara), *arXiv preprint:1810.10935*. Submitted.
10. “Computer-Assisted Proofs in PDE: a survey”, *SeMA Journal*, 76, no. 3, 459-484 (2019).
11. “On the existence of stationary patches”, *Advances in Mathematics*, 343, 110-140 (2019).
12. “Spectral determination of semi-regular polygons” (with A. Enciso), *Journal of Differential Geometry*. To appear.
13. “Global solutions for the generalized SQG patch equation” (with D. Córdoba & A. Ionescu), *Arch. Ration. Mech. Anal.*, 233, no. 3, 1211-1251 (2019).
14. “Uniformly rotating smooth solutions for the incompressible 2D Euler equations” (with A. Castro & D. Córdoba), *Arch. Ration. Mech. Anal.*, 231, no. 2, 719-785 (2019).
15. “Global smooth solutions for the inviscid SQG equation” (with A. Castro & D. Córdoba), *Memoirs of the AMS*, 266, no. 1292, 89 pp (2020).
16. “A note on stability shifting for the Muskat problem II: stable to unstable and back” (with D. Córdoba & A. Zlatoš), *Analysis & PDE*, 10, no. 2, 367-378 (2017).

17. “Uniformly rotating analytic global patch solutions for active scalars” (with A. Castro and D. Córdoba), *Annals of PDE*, 2, no. 1, 1-34 (2016).
18. “Splash singularities for the free boundary Navier-Stokes equations” (with A. Castro, D. Córdoba, C. Fefferman and F. Gancedo), *Annals of PDE*, 5, no. 1, Art. 12, 1-117 (2019).
19. “A note on stability shifting for the Muskat problem” (with D. Córdoba & A. Zlatoš), *Philosophical Transactions of the Royal Society A*, 373, 20140278 (2015).
20. “Existence and regularity of rotating global solutions for the generalized surface quasi-geostrophic equations” (with A. Castro & D. Córdoba), *Duke Mathematical Journal*, 165, no. 5, 935-984 (2016).
21. “Structural stability for the splash singularities of the water waves problem” (with A. Castro, D. Córdoba, C. Fefferman & F. Gancedo), *Discrete and Continuous Dynamical Systems - A*, 34, no. 12, 4997-5043 (2014).
22. “Remarks on the geometric properties of the SQG sharp fronts and α -patches” (with A. Castro, D. Córdoba & A. Martín Zamora), *Discrete and Continuous Dynamical Systems - A*, 34, no. 12, 5045-5059 (2014).
23. “On turning waves for the inhomogeneous Muskat problem: a computer-assisted proof” (with R. Granero-Belinchón), *Nonlinearity*, vol. 27, n. 6, 1471-1498, (2014). Featured article.
24. “Finite time singularities for water waves with surface tension” (with A. Castro, D. Córdoba, C. Fefferman & F. Gancedo), *Journal of Mathematical Physics*, 53, 115622 (2012). Special issue “Incompressible Fluids, Turbulence and Mixing”.
25. “Finite time singularities for the free boundary incompressible Euler equations” (with A. Castro, D. Córdoba, C. Fefferman & F. Gancedo), *Annals of Mathematics*, 178, no. 3, 1061-1134 (2013).
26. “Splash Singularity for Water Waves” (with A. Castro, D. Córdoba, C. Fefferman & F. Gancedo), *Proceedings of the National Academy of Sciences (PNAS)* 109, num. 3, 733-738, (2012).
27. “The Bounded Confidence Model Of Opinion Dynamics” (with J.-Y. Le Boudec & C. Graham), *Mathematical Models and Methods in Applied Sciences (M3AS)* 22, num. 2, 1150007-1-1150007-46, (2012).
28. “Comment on Mixing Beliefs Among Interacting Agents” (with J.-Y. Le Boudec), *Advances in Complex Systems* Vol. 15, No. 7, 1250028-1-1250028-7, (2012).

Other publications (educational)

1. “Combinatorial Games: Following John H. Conway (in Spanish)” (with L. Hernández-Corbato), in *Matemáticas para estimular el talento III*, pp. 223-245. Sociedad Andaluza de Educación Matemática THALES, Granada. Pérez, A.; Sánchez, M. (Eds.), ISBN: 978-84-15641-06-03, (2014).
2. “XXVII Olimpiada Iberoamericana de Matemáticas” (with M. Castrillón), *La Gaceta de la RSME.*, Vol. 15 (4), 772-775, (2012).
3. “XXVI Olimpiada Iberoamericana de Matemáticas” (with M. Castrillón), *La Gaceta de la RSME.*, Vol. 14 (4), 798-801, (2011).

Selected Prizes

- Antonio Valle Prize. Best Spanish Applied Mathematician under 33, 2018.
- FBBVA Vicent Caselles Prize. Best Spanish Mathematicians under 32, 2017.
- Junior Faculty Teaching Award, Princeton, 2015.
- Best PhD dissertation award in Mathematics in the year 2012-2013 at UAM, 2013.

- Third best Record Nationwide in Telecommunication Engineering (National Prize - 36 Universities), 2013.
- Certamen Universitario Arquímedes (Introduction to Research for Undergraduates), 2009. Science Category, 2nd Prize for the paper *The bounded confidence model in opinion dynamics*.
- International Mathematics Competition, 2nd Prize (2005), 3rd Prize (2006).
- Iberoamerican Mathematical Olympiad for University Students, Silver Medal (2004), Silver Medal (2007).
- Top 250 Worldwide at Google Code Jam 2005.
- ACM ICPC SouthWestern Europe Regional Contest, 7th Place (2004), 9th Place (2005), 4th Place (2006), 8th Place (2007), 3rd Place (2008).
- Participant at the International Mathematical Olympiad, (Tokio, Japan), 2003.
- Spanish National Olympiads:
 - Mathematics: Silver Medal (2002), Gold Medal (2003).
 - Physics: Bronze Medal (2003).
 - Chemistry: Bronze Medal (2002), Gold Medal (2003).
- Mediterranean Mathematics Competition, Honorable Mention (2002). Bronze Medal (2003).
- Olimpiada de Mayo (Iberoamerican level), Bronze Medal (2000).

Research Grants

- PI: ERC Starting Grant ERC-StG-CAPA-852741 (1,485,000 €), 2020-2025.
- PI: NSF CAREER Grant (*declined*).
- PI: NSF Grant DMS-1763356 (\$120,000), 2018-2021.
- PI: Simons Collaboration Grant (\$42,000), 2017-2022.
- PI: AMS-Simons Travel Grant, 2014-2016.

Students

Postdocs

- Jaemin Park, UB. 2021-
- Claudia García, UB. 2021-
- Eduardo García-Juárez, UB. 2020-2021
Next position: Marie Curie Individual Fellow at Universitat de Barcelona

Graduate students

- Joel Dahne, Uppsala (co-advised with Jordi-Lluís Figueras and Warwick Tucker). 2019-
- Jia Shi, Princeton (co-advised with Charles Fefferman). 2017-2022
- Bruno Vergara. Princeton / ICMAT. Visiting Graduate Student. Spring 2018, Spring 2019

Undergraduate students

- * Kimberly Hou, Princeton. Summer intern Summer 2020
- * Ryan Arbon - Mohammed Mannan - Michael Psenka - Seyoon Ragavan, Princeton. Junior paper (as a 4-person team) Spring 2020
- Jeff Kim, Princeton. Junior paper Spring 2020
- * Gonzalo Cao. Princeton / UPC. Double degree thesis. 2019-2020
- * Gerard Orriols. Princeton / UPC. Double degree thesis. 2018-2019
- Joseph Obiajulu, Princeton. Senior thesis. 2016-2017
- Yuan Wang, Princeton. Senior thesis. 2016-2017

*: publishable results.

Invited Talks at Conferences and Workshops

- Semester Program on "Hamiltonian Methods in Dispersive and Wave Evolution Equations" Numerics, Modeling, and Experiments in Wave Phenomena, ICERM September 2021
- Semester Program on "Hamiltonian Methods in Dispersive and Wave Evolution Equations" Minicourse 6 hours, ICERM September 2021
- New Mechanisms for Regularity, Singularity, and Long Time Dynamics in Fluid Equations, Banff International Research Station (Online) July 2021
- Thematic Program on Mathematical Hydrodynamics: Workshop on Free Surface Hydrodynamics, Fields Institute (virtual) October 2020
- AMS Fall Eastern Sectional Meeting. Special Session Conservation Laws and Nonlinear Wave Equations, Penn State (virtual) October 2020
- **(Plenary Talk)** V Congress of Young Researchers RSME, Castellón, Spain January 2020
- PDE's in fluid mechanics, CIEM, Castro Urdiales Minicourse 3 hours September 2019
- Summer school on fluid mechanics at the ICMAT, Madrid Minicourse 3 hours June 2019
- Scientific Computing Across Scales: Extreme events and criticality in fluid mechanics, Fields Institute April 2019
- Workshop: Rigorous Computational Dynamics in Infinite Dimensions, CRM Montréal April 2019
- AMS Spring Sectional Meeting. Special Session Stability and Singularity in Fluid Dynamics. University of Hawaii March 2019
- 12th AIMS Conference. Special Session Nonlinear and nonlocal evolution PDEs, Taipei July 2018
- **(Plenary Talk)** XVIII Spanish-French School Jacques-Louis Lions about Numerical Simulation in Physics and Engineering. Univ. Las Palmas de Gran Canaria June 2018
- Workshop "MathFluids", University of Seville June 2018
- AMS Spring Sectional Meeting. Special Session Nonlinear and Stochastic PDE and Applications. Northeastern University April 2018
- FRG-PDE Meeting, Princeton University October 2017
- 2017 Fall Program on Analysis of PDE, Fudan University October 2017
- 2017 Mathematical Congress of the Americas. Special Session Incompressible Fluid Dynamics, Montréal July 2017
- XXV Congreso de Ecuaciones Diferenciales y Aplicaciones (CEDYA). Special Session: Computational Dynamical Systems, Cartagena June 2017
- AMS Spring Eastern Sectional Meeting. Special Session Hydrodynamic and Wave Turbulence, Hunter College, CUNY May 2017
- AMS Spring Western Sectional Meeting. Special Session Analysis on the Navier-Stokes and related PDEs, Washington State University April 2017
- Semester Program on "Singularities and Waves In Incompressible Fluids" Dynamics of Small Scales in Fluids, ICERM February 2017
- V Congreso Latinoamericano de Matemáticos. Thematic Session Fluid dynamics, non linear and dispersive PDEs, Barranquilla, Colombia July 2016
- 11th AIMS Conference. Special Session Vortex Dynamics and Geometry, Orlando July 2016

- Analysis of PDEs of Fluid Mechanics, Rice University May 2016
- Thematic Program on Multiscale Scientific Computing
Extreme events and criticality in fluid mechanics, Fields Institute January 2016
- Second International ACCA-JP/UK Workshop, Kyoto January 2016
- Clay Research Conference and Workshops
Water Waves and Related Fluid Models, Oxford October 2015
- ICIAM 2015. Parallel Session
Extreme Behaviour in Flow Models, Beijing August 2015
- AMS Spring Western Sectional Meeting
Special Session on Waves and Fluids, Las Vegas April 2015
- AMS Fall Western Sectional Meeting. Special Session
Nonlinear PDE I, San Francisco October 2014
- 10th AIMS Conference. Special Session
Rigorous and Numerical Methods, Madrid July 2014
- AMS Fall Central Sectional Meeting
Special Session on Fluid Mechanics, St. Louis October 2013
- Rigorous computation for infinite dimensional nonlinear dynamics
AIM Workshop, Palo Alto August 2013
- Congress of Young Researchers RSME, Soria, Spain September 2011
- Workshop for Young Researchers in Mathematics 2010, Madrid September 2010
- II Seminario sobre actividades para estimular
el talento precoz en Matemáticas, Madrid March 2009

Seminars and Colloquia

- Rutgers University February 2022
- Spectral geometry in the clouds (Laval) June 2021
- Uppsala University May 2021
- Universitat de Barcelona April 2021
- University of Bath March 2021
- Penn State University March 2021
- Wave Turbulence Seminar (Simons Collaboration) December 2020
- Virtual Maxwell Analysis Seminar (Edinburgh) November 2020
- CRM - CAMP (Montréal) July 2020
- Shanghai Tech July 2020
- Université de Rennes January 2020
- Tulane University October 2019
- Princeton University September 2019
- University of Minnesota (2 talks) February 2019
- Brown University February 2019
- Georgia Tech February 2019
- University of Toronto January 2019
- Duke University January 2019
- Brown University November 2018
- Georgia Tech February 2018

• UPenn	November 2017
• UIC	October 2017
• Uppsala University	June 2017
• Heriot-Watt University	April 2017
• University of Pittsburgh	January 2017
• Ohio State University	April 2016
• Columbia University	March 2016
• Brown University	November 2015
• UW Madison	November 2015
• Universidad de Sevilla	September 2015
• Princeton University	April 2014
• UPenn	February 2014
• Rutgers University	November 2013
• Universidad Autónoma de Madrid (Minicourse 3 hours)	April 2013
• Instituto de Ciencias Matemáticas	March 2013
• Instituto de Ciencias Matemáticas (Minicourse 6 hours)	February 2013
• Uppsala University	October 2012
• Universidad Autónoma de Madrid	April 2011
• CSIC (National Research Council, Madrid)	October 2009

Stays in research centers

• Princeton University, 2 Weeks	August 2021
• Uppsala University, 2 Weeks	May 2021
• Université de Rennes, 1 Week	January 2020
• Instituto de Ciencias Matemáticas, 8 Weeks	June-July 2019
• Instituto de Ciencias Matemáticas, 12 Weeks	May-August 2018
• Instituto de Ciencias Matemáticas, 8 Weeks	June-August 2017
• Uppsala University, 1 Week	June 2017
• Instituto de Ciencias Matemáticas, 13 Weeks	June-August 2016
• Instituto de Ciencias Matemáticas, 15 Weeks	June-September 2015
• Instituto de Ciencias Matemáticas, 13 Weeks	June-August 2014
• Uppsala University, 1 Week	October 2012
• International Centre for Theoretical Physics, 3 Weeks	June 2011
• Princeton University, 1 Week	May 2011
• EPFL, 28 Weeks	February-August 2009

Teaching experience (University)

• <i>At Universitat de Barcelona</i> – Introduction to Fluid Mechanics (Graduate)	Spring 2022
• <i>At Brown University</i>	

- Math 1110 (Ordinary Differential Equations) Fall 2021
- Math 2370 (Graduate PDE) Fall 2020
- *At Princeton University*
 - Math 972 (Junior Seminar: Spectral geometry) Spring 2020
 - Math 215 (Honors Analysis) Fall 2019
 - Math 330 (Complex Analysis with Applications) Spring 2019
 - Math 215 (Honors Analysis) Fall 2018
 - Math 104 (Calculus II) - two sections, course head Fall 2017
 - Math 104 (Calculus II) - two sections, course head Fall 2016
 - Math 104 (Calculus II) - precepts Spring 2016
 - Math 981 (Junior Seminar: Computer-assisted proofs in analysis) Spring 2016
 - Math 202 (Linear Algebra) - precepts Fall 2015
 - Math 321 (Numerical Methods) Fall 2015
 - Math 204 (Advanced Linear Algebra) Spring 2015
 - Math 104 (Calculus II) - two sections Fall 2014
 - Math 202 (Linear Algebra) - two sections Spring 2014
 - Math 103 (Calculus I) Fall 2013
- *At Universidad Autónoma de Madrid*
 - Mathematics I Fall 2011
- *At Universitat Politècnica de Catalunya (Barcelona)*
 - Problem Workshop II Spring 2006, Spring 2007, Spring 2008
 - Problem Workshop I Fall 2005, Fall 2006, Fall 2007

Activities Organization and Service

- Director of Graduate Studies, Princeton 2016 - 2020
- Graduate Admissions Committee, Princeton 2016/2017, 2017/2018, 2018/2019, 2019/2020
- Co-organizer of the PDE Seminar, Brown 2021 -
- Co-organizer of the ONEPAS (Virtual) Seminar 2020 - 2021
- Co-organizer of the Analysis of Fluids Seminar, Princeton 2015 - 2020
- Co-organizer of the Colloquium, Princeton 2019
- Organizer of the "What's Happening in Fine Hall" Seminar, Princeton 2016 - 2019
- Co-organizer of the ICERM Semester Program
Harmonic Analysis and Convexity Fall 2022
- Co-organizer of a Parallel Session at the
Mathematical Congress of the Americas 2021 July 2021
- Organizer of a Parallel Session at the
XII Americas Conference on Differential Equations and Nonlinear Analysis December 2019
- Co-Organizer of the First Multidisciplinary Week (UAM, Madrid) July 2010
- PhD Defense Committee of Matt Hernandez (Princeton, 2017), Jaemin Park (Georgia Tech, 2021).
- Reader of the PhD Thesis of In-Jee Jeong (Princeton, 2017), Bruno Vergara (UAM, 2019), Joonhyun La (Princeton, 2019), Claudia García (Granada-Rennes, 2020).

- Referee for: Advances in Mathematics, Annals of Mathematics, Annals of PDE, Archive for Rational Mechanics and Analysis, Asymptotic Analysis, Bulletin of the LMS, Communications in Mathematical Physics, Communications in Mathematical Sciences, Communications on Pure and Applied Mathematics, Discrete and Continuous Dynamical Systems, Forum of Mathematics: Pi, International Mathematics Research Notices, Journal of Differential Equations, Journal of Mathematical Analysis and Applications, Journal of Nonlinear Science, Journal of the American Mathematical Society, Journal of the European Mathematical Society, Monatshefte für Mathematik, Nonlinear Analysis: TMA, Nonlinearity, Proceedings of the AMS, RACSAM, Rendiconti del Circolo Matematico di Palermo, Revista Matemática Iberoamericana, SIAM Journal on Applied Dynamical Systems, SIAM Journal on Mathematical Analysis, SIAM Journal on Scientific Computing, Transactions of the AMS.
- External Referee for the “Programme for Postdoctoral Talent Attraction” (UAM).
- NSF Panelist. NWO (Dutch Agency) External Reviewer.

Outreach

- Co-Organizer of the Barcelona Introduction to Mathematical Research 2022 July 2022
- Lecturer at the Smartick Mathematics and Technology Summer Camp for girls July 2017
- Lecturer at the BarcelonaTech Math Summer Camp (UPC) July 2015, 2016, 2017, 2018, 2019, 2021
- Lecturer at the JAE School of Mathematics (ICMAT, Madrid) July 2013, 2019
- Deputy Leader of the Spanish delegation at the Iberoamerican Mathematical Olympiad September 2011, 2012
- Evaluator at the Spanish Mathematical Olympiad March 2010, 2011, 2012, 2013
- Problemsetter and Evaluator at the ACM ICPC - Southwestern Europe Regional Contest October 2009, 2010, 2011
- Deputy Leader of the Spanish delegation at the International Olympiad in Informatics August 2007, 2009
- Problemsetter and Evaluator at the Spanish Olympiad in Informatics June 2007
- Problem Selection Committee for the Assamblée générale de 'Le Kangourou sans frontières' June 2006
- Trainer for the Spanish (and International) Math. Olympiad 2004-2007
- Selection Committee, interviewer and teacher of the ESTALMAT (Stimulus of the Mathematical Talent) Project 2003 - 2013, 2018

Languages

- Spanish: Mother tongue.
- English: Certificate in Advanced English obtained in 2009.
- German: Zentrale Mittelstufenprüfung obtained in 2003. German University Entrance Exams (Abitur) passed with a 1.8 grade in a scale between 1.0 (best) and 6.0 (worst).
- French: Intermediate.
- Catalan: Intermediate.