JOSÉ ANTONIO CARRILLO DE LA PLATA

EDUCATION: Ph.D. in Mathematics, University of Granada, May 1996

CURRENT POSITION: Professor of the Analysis of Nonlinear Partial Differential Equations, Mathematical Institute, University of Oxford. Tutorial Fellow in Applied Mathematics, The Queen's College.

PREVIOUS POSITIONS

Lecturer	University of Texas at Austin	September 1998 - May 2000
Associate Prof.	University of Granada	January 2000 - March 2003
ICREA Research Prof.	Univ. Autònoma de Barcelona	March 2003 - September 2012
Professor	Imperial College London	October 2012 – March 2020

VISITING AND RESEARCH POSITIONS

Core participant	Program on Optimal Transport IPAM, UCLA	Jan. 2008 - June 2008
Visiting Professor	Norwegian Academy of Science and Letters, Oslo	Sept.-Oct. 2008
Visiting Professor	National University of Singapore	August 1-31, 2009
Visiting Professor	CEREMADE, Université Paris-Dauphine, Paris	February 2010
Visiting Professor	Newton Institute, Cambridge, United Kingdom	August-December 2010
Visiting Professor	Université Paris-Orsay	June 2012
Visiting Professor	MSRI, University of California at Berkeley	August-October 2013
Visiting Professor	Tsinghua University, Beijing	July-August 2015
Visiting Scholar	Mittag-Leffler Institute, Sweden	September-December 2016
Visiting Professor	Brown University, USA	August-September 2017
Changjiang Scholar	SWUFE, Chengdu, China	January 2018 – May 2021
Visiting Professor	Simons Institute, Berkeley, USA	August-September 2021
Visiting Professor	BCAM, Bilbao, Spain	1 month per year, 2021-
Visiting Professor	Chaire Morlet, CIRM, Marseille, France	First semester 2024

AWARDS, PRIZES and MAJOR GRANTS

- SeMA (Sociedad Española de Matemática Aplicada) Young Researcher Prize, 2003.
- Richard von Mises Prize of the International Assoc. of Applied Mathematics and Mechanics-GAMM 2006.
- Royal Society Wolfson Research Merit Award 2012.
- 2016 SACA Award to the best PhD supervision at Imperial College London.
- Elected member of the European Academy of Sciences 2018 and of the Academia Europeae 2023.
- SIAM Fellow Class 2019 and IMA Fellow 2021.
- Highly Cited Researcher 2015, 2016, 2017, 2018, 2019 and 2020.
- ERC Advanced Grant 2020.
- Foreign member of the Real Academia de Ciencias exactas y Naturales of Spain 2021.
- Echegaray Medal 2022 of the Real Academia de Ciencias exactas y Naturales of Spain.
- International Prize «Prof. Luigi Tartufari» for Mathematics, Mechanics and Applications 2024, Accademia Nazionale dei Lincei, Italy, 2024.

MENTORING: 20 Ph.D. Students and 30 Postdoctoral Fellows Supervised

PUBLICATIONS: Selected List of publications.

1. J. A. Carrillo, H. Murakawa, M. Sato, M. Wang, A new paradigm considering multicellular adhesion, repulsion and attraction represent diverse cellular tile patterns, PLOS Computational Biology 21, e1011909, 2025.
2. C. Falcó, R. E. Baker, J. A. Carrillo, A Nonlocal-to-Local Approach to Aggregation-Diffusion Equations, SIAM Review 67, 353–372, 2025.
3. J. A. Carrillo, S. Guo, From Fisher information decay for the Kac model to the Landau-Coulomb hierarchy, Preprint.
4. J. A. Carrillo, S. R. Charles, G.-Q. G. Chen, D. Yuan, Global Existence and Nonlinear Stability of Finite-Energy Solutions of the Compressible Euler-Riesz Equations with Large Initial Data of Spherical Symmetry, Preprint.
5. J. Kim, H. Jeong, C. Falco, A. M. Hruska, W. D. Martinson, A. Marzoratti, M. Araiza, H. Yang, C. Franck, J. A. Carrillo, M. Guo, I. Y. Wong, Collective Transitions from Orbiting to Matrix Invasion in 3D Multicellular Spheroids, Preprint.
6. V. Castin, P. Ablin, J. A. Carrillo, G. Peyré, A Unified Perspective on the Dynamics of Deep Transformers, Preprint.
7. J. A. Carrillo, A. Holzinger, S. Guo, Propagation of chaos for multi-species moderately interacting particle systems up to Newtonian singularity, Preprint.
8. J. A. Carrillo, J. Skrzeczkowski, J. Warnett, The Stein-log-Sobolev inequality and the exponential rate of convergence for the continuous Stein variational gradient descent method, Preprint.
9. J. A. Carrillo, X. Chen, B. Du, A. Jüngel, Fluid relaxation approximation of the Busenberg–Travis cross-diffusion system, to appear in Comm. Math. Phys.
10. J. A. Carrillo, A. Fernández-Jiménez, D. Gómez-Castro, Aggregation-diffusion equations with saturation, to appear in SIAM J. Math. Anal.
11. J. A. Carrillo, J. Li, Z.-A. Wang, W. Yang, Boundary spike-layer solutions of the singular Keller-Segel system: existence, profiles and stability, Preprint.
12. J. A. Carrillo, R. C. Fetecau, H. Park, Existence of ground states for free energies on the hyperbolic space, to appear in Canadian J. Math.
13. J. A. Carrillo, X. Feng, S. Guo, P.-E. Jabin, Z. Wang, Relative Entropy Method for Particle Approximation of the Landau Equation for Maxwellian Molecules, Preprint.
14. J. A. Carrillo, A. Esposito, J. Skrzeczkowski, J. Wu, Nonlocal particle approximation for linear and fast diffusion equations, Preprint.
15. J. A. Carrillo, Y. Chen, D. Z. Huang, J. Huang, D. Wei, Fisher-Rao Gradient Flow: Geodesic Convexity and Functional Inequalities, Preprint.
16. J. A. Carrillo, X. Dou, P. Roux, Z. Zhou, Classical solutions of a mean field system for pulse-coupled oscillators: long time asymptotics versus blowup, Preprint.
17. R. Bailo, J. A. Carrillo, J. Hu, The Collisional Particle-In-Cell Method for the Vlasov-Maxwell-Landau Equations, J. Plasma Physics 90, 905900415, 2024.
18. J. A. Carrillo, A. Esposito, C. Falcó, A. Fernández-Jiménez, Competing effects in fourth-order aggregation-diffusion equations, Proc. London Math. Soc.129, e12623, 2024.
19. J. A. Carrillo, A. Fernández-Jiménez, D. Gómez-Castro, Partial mass concentration for fast-diffusions with non-local aggregation terms, J. Diff. Eqns. 409, 700-773, 2024.
20. J. A. Carrillo, L. Wang, C. Wei, Structure preserving primal dual methods for gradient flows with nonlinear mobility transport distances, SIAM J. Num. Anal. 62, 376-399, 2024.
21. J. A. Carrillo, A. Esposito, J. S.-H. Wu, Nonlocal approximation of nonlinear diffusion equations, Calc. Var. PDE, 63, 100, 2024.
22. C. Falcó, D. J. Cohen, J. A. Carrillo, R. E. Baker, Quantifying tissue growth, shape and collision via continuum models and Bayesian inference, J. R. Soc. Interface 20, 20230184, 2023.

23. J. A. Carrillo, F. Hoffmann, A. M. Stuart, U. Vaes, The Ensemble Kalman Filter in the Near-Gaussian Setting, to appear in SIAM J. Numerical Analysis.
24. J. A. Carrillo, R. Shu, Existence of radial global smooth solutions to the pressureless Euler-Poisson equations with quadratic confinement, Arch. Rat. Mech. Anal. 247, 73, 2023.
25. J. A. Carrillo, R. Shu, Global Minimizers of a Large Class of Anisotropic Attractive-Repulsive Interaction Energies in 2D, Comm. Pure Appl. Math. 77, 1353-1404, 2024.
26. C. Falcó, R. E. Baker, J. A. Carrillo, A local continuum model of cell-cell adhesion, SIAM J. Appl. Math. 84, S17-S42, 2024.
27. J. A. Carrillo, R. Shu, Minimizers of 3D anisotropic interaction energies, to appear in Advances in Calculus of Variations.
28. J. A. Carrillo, D. Gómez-Castro, Interpreting systems of continuity equations in spaces of probability measures through PDE duality, to appear in Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas.
29. J. A. Carrillo, P. Roux, S. Solem, Noise-driven bifurcations in a nonlinear Fokker-Planck system describing stochastic neural fields, Physica D: Nonlinear Phenomena 449, 133736, 2023.
30. J. A. Carrillo, H. Holden, S. Solem, Noise-driven bifurcations in a neural field system modelling networks of grid cells, J. Math. Biology 85, 42, 2022.
31. J. A. Carrillo, R. Shu, From radial symmetry to fractal behavior of aggregation equilibria for repulsive-attractive potentials, Calc. Var. Partial Differential Equation 62, 28, 2023.
32. J. A. Carrillo, F. Hoffmann, A. M. Stuart, U. Vaes, Consensus Based Sampling, *Stud. Appl. Math.* 148, 1069–1140, 2022.
33. J. A. Carrillo, D. Gómez-Castro, Y. Yao, C. Zeng, Asymptotic simplification of Aggregation-Diffusion equations towards the heat kernel, Arch. Rat. Mech. Anal. 247, 11, 2023.
34. J. A. Carrillo, D. Gómez-Castro, J. L. Vázquez, Infinite-time concentration in Aggregation–Diffusion equations with a given potential, J. Math. Pures et Appl. 157, 346-398, 2022.
35. J. A. Carrillo, Y.-P. Choi, Y. Peng, Large friction-high force fields limit for the nonlinear Vlasov-Poisson-Fokker-Planck system, Kinetic and Related Models 15, 355-384, 2022.
36. J. A. Carrillo, D. Kalise, F. Rossi, E. Trélat, Controlling swarms towards flocks and mills, SIAM J. Control and Optimization 60, 1863-1891, 2022.
37. J. A. Carrillo, L. Chen, Q. Wang, An Optimal Mass Transport Method for Random Genetic Drift, SIAM J. Numer. Anal. 60, 940–969, 2022.
38. J. A. Carrillo, K. Lin, Sharp conditions on global existence and blow-up in a degenerate two-species and cross-attraction system, Adv. Nonlinear Analysis 11, 1-39, 2022.
39. J. A. Carrillo, M. G. Delgadino, R. L. Frank, M. Lewin, Fast Diffusion leads to partial mass concentration in Keller-Segel type stationary solutions, *Math. Models Methods Appl. Sci.* 32, 831–850, 2022.
40. T. S. Gutleb, J. A. Carrillo, S. Olver, Computing Equilibrium Measures with Power Law Kernels, Mathematics of Computation 91, 2247–2281, 2022.
41. J. A. Carrillo, R. S. Gvalani, J. Wu, An invariance principle for gradient flows in the space of probability measures, J. Diff. Eqns. 345, 233-284, 2023.
42. J. A. Carrillo, M. G. Delgadino, L. Desvillettes, J. Wu, The Landau equation as a Gradient Flow, Analysis & PDE 17-4, 1331-1375, 2024.
43. J. A. Carrillo, K. Craig, L. Wang, C. Wei, Primal dual methods for Wasserstein gradient flows, Found. Comput. Math. 22, 389–443, 2022.
44. J. A Carrillo, J. Li, Z. Wang, Boundary spike-layer solutions of the singular Keller-Segel system: existence and stability, Proceedings of the LMS 122, 42-68, 2021.
45. J. A. Carrillo, J. Hu, L. Wang, J. Wu, A particle method for the homogeneous Landau equation, J. Comp. Phys. X 7, 100066, 2020.
46. J. A. Carrillo, R. S. Gvalani, G. A. Pavliotis, A. Schlichting, Long-time behaviour and phase transitions for the McKean--Vlasov equation on the torus, Arch. Rat. Mech. Anal. 235, 635-690, 2020.
47. J. A. Carrillo, H. Murakawa, M. Sato, H. Togashi, O. Trush, A population dynamics model of cell-cell adhesion incorporating population pressure and density saturation, J. Theor. Biology 474, 14-24, 2019.

48. J. A. Carrillo, Y.-P. Choi, M. Hauray, S. Salem, Mean-field limit for collective behavior models with sharp sensitivity regions, J. European Math. Soc. 21, 121-161, 2019.
49. J. A. Carrillo, S. Hittmeir, B. Volzone, Y. Yao, Nonlinear Aggregation-Diffusion Equations: Radial Symmetry and Long Time Asymptotics, Inventiones Mathematicae 218, 889-977, 2019.
50. J. A. Carrillo, M. G. Delgadino, J. Dolbeault, R. L. Frank, F. Hoffmann, Reverse Hardy-Littlewood-Sobolev inequalities, J. Math. Pure Appl. 132, 133–165, 2019.
51. J. A. Carrillo, K. Craig, F. S. Patacchini, A Blob Method For Diffusion, Calc. Var. Partial Differential Equations 58, Art. 53, 2019.
52. J. A. Carrillo, Y.-P. Choi, C. Totzeck, O. Tse, An analytical framework for a consensus-based global optimization method, Math. Mod. and Meth. in the Applied Sciences 28, 1037-1066, 2018.
53. J. A. Cañizo, J. A. Carrillo, F. S. Patacchini, Existence of Compactly Supported Global Minimisers for the Interaction Energy, Arch. Rat. Mech. Anal. 217, 1197-1217, 2015.
54. D. Balagué, J. A. Carrillo, T. Laurent, G. Raoul, Dimensionality of Local Minimizers of the Interaction Energy, Archive for Rational Mechanics and Analysis 209, 1055-1088, 2013.
55. M. J. Cáceres, J. A. Carrillo, B. Perthame, Analysis of Nonlinear Noisy Integrate & Fire Neuron Models: blow-up and steady states, Journal of Mathematical Neuroscience 1, 7, 2011.
56. E. A. Carlen, J. A. Carrillo, M. Loss, Hardy-Littlewood-Sobolev inequalities via fast diffusion flows, Proc. Nat. Acad. USA 107 (46), 19696-19701, 2010.
57. J. A. Carrillo, M. Fornasier, J. Rosado, G. Toscani, Asymptotic Flocking Dynamics for the kinetic Cucker-Smale model, SIAM J. Math. Anal. 42, 218-236, 2010.
58. J. A. Carrillo, M. DiFrancesco, A. Figalli, T. Laurent, D. Slepcev, Global-in-time weak measure solutions and finite-time aggregation for nonlocal interactions, Duke Math. J. 156, 229-271, 2011.
59. A. Blanchet, J. A. Carrillo, P. Laurençot, Critical mass for a Patlak-Keller-Segel model with degenerate diffusion in higher dimensions, Calculus of Variations and PDEs 35, 133-168, 2009.
60. A. Blanchet, V. Calvez, J. A. Carrillo, Convergence of the mass-transport steepest descent scheme for the sub-critical Patlak-Keller-Segel model, SIAM J. Numer. Anal. 46, 691-721, 2008.
61. A. Blanchet, J. A. Carrillo, N. Masmoudi, Infinite Time Aggregation for the Critical PKS model in R2, Comm. Pure and Applied Mathematics 61, 1449-1481, 2008.
62. V. Calvez, J.A. Carrillo, Volume effects in the Keller-Segel model: energy estimates preventing blow-up, Journal Mathématiques Pures et Appliquées 86, 155-175, 2006.
63. J.A. Carrillo, R.J. McCann, C. Villani, Contractions in 2-Wasserstein length space and thermalization of granular media, Arch. for Rat. Mech. and Anal. 179, 217-263, 2006.
64. J.A. Carrillo, R.J. McCann, C. Villani, Kinetic equilibration rates for granular media and related equations, Revista Matemática Iberoamericana 19, 1-48, 2003.
65. J. A. Carrillo, G. Toscani, Asymptotic L^1-decay of solutions of the porous medium equation to self-similarity, Indiana University Mathematics Journal, 49, 113-141, 2000.

Book Chapters (Selected)

66. J. A. Carrillo, P. Roux, Nonlinear partial differential equations in neuroscience: from modelling to mathematical theory, Math. Mod. Meth. Appl. Sci. 2025-Special Issue: Review Papers 35, 403–584, 2025.
67. V. Calvez, J. A. Carrillo, F. Hoffmann, the geometry of diffusing and self-attracting particles in a one-dimensional fair-competition regime, Lecture Notes in Mathematics 2186, Springer, 2018.
68. J. A. Carrillo, M. Fornasier, G. Toscani, F. Vecil, Particle, Kinetic, and Hydrodynamic Models of Swarming, Series: Modelling and Simulation in Science and Technology, Birkhauser, (2010), 297-336

INVITED LECTURES

Conference Talks (selected)

1. Invited Speaker at the 5th European Congress of Mathematicians, (Amsterdam 2008).
2. Invited Speaker at the 13th International Conference on Hyperbolic Problems, (Beijing 2010).
3. Plenary Speaker at the Canadian Mathematical Society Summer Meeting, (Halifax 2013).
4. Invited Speaker at Modern Perspectives in Applied Mathematics, (Washington 2014).
5. Plenary Speaker at XV International Conference on Hyperbolic Problems, IMPA, (Rio de Janeiro 2014).
6. Invited Speaker at the 2nd joint SIAM-CAIMS Annual Meeting (Toronto 2020).
7. QJMAM Lecture at the joint BMC-BAMC (Glasgow 2021).
8. Plenary Speaker at SIAM PDE (Berlin 2022).
9. Plenary Speaker at the ICIAM 2023 (Tokyo).
10. Invited Speaker at the ENUMATH (Lisbon 2023).

PROFESSIONAL ACTIVITIES AND SERVICE

Serving Committees

- ICIAM Officer 2024-2028.
- SIAM APDE Young Research Prize 2025.
- EMS Prizes Selection Panel 2024.
- Comité Científico-Técnico de la Agencia Estatal de Investigación, Spain, 2021-2025.
- Head of the Division of the European Academy of Sciences, Section Mathematics, 2020-2024.
- Vice-president-Board member of the European Society of Mathematical and Theoretical Biology 2021-2026.
- Program Director of the SIAM activity group in Analysis of PDE 2019-2020.
- Applied Mathematics Committee, European Mathematical Society, 2010-2013. Chair 2014-2017.
- Member of the ECMI Council, 2005 - October 2012.

Editorial Boards – Selected

- Journal and Bulletin of the London Mathematical Society 2013-. Section Editor 2023-.
- Kinetic and Related Models, 2008-
- SIAM Journal on Mathematical Analysis (SIMA), 2010-
- Discrete and Continuous Dynamical Systems - Series A (DCDS-A), 2013-
- Multiscale Modeling and Simulation: A SIAM Interdisciplinary Journal, 2017-

Conferences/Thematic Programs Organized - Selected

- "Optimal Transport," IPAM, UCLA, March-June 2008.
- "Mathematical Biology: Modelling and Differential Equations," CRM, Barcelona, January-June 2009.
- "PDEs in Kinetic Theories", Isaac Newton Institute for Mathematical Sciences, Cambridge (UK), 2010.
- "Interactions between PDEs & Functional Inequalities", Institut Mittag-Leffler, Fall 2016.
- "Year of Mathematical Biology", 2018. It is joint venture of ESMTB and EMS.
- "Differential Equations arising from Organising Principles in Biology", Oberwolfach, 23-29 September, 2018.
- "Frontiers in Kinetic Theory", Isaac Newton Institute for Mathematical Sciences, Cambridge (UK), 2022.
- Chaire Morlet, CIRM, first semester 2024.

Panel Funding Agencies - Selected

- European Research Council, Committee Starting and Consolidator Grants in Mathematics, 2010-2017.
- ICREA Research Professors 2017, 2019 and 2021.
- Swedish Research Council 2018-2020.
- NSERC of Canada, Selection Committee for the Discovery Institutes Support Grants 2022.