Diogo A. Gomes

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King Abdullah University of Science and Technology

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Academic Positions

- **Professor** 2016–Present
  CEMSE Division, King Abdullah University of Science and Technology
- **Associate Professor** 2013–2016
  CEMSE Division, King Abdullah University of Science and Technology
- **(Assistant, Associate, Full) Professor** (2001,2004, 2009)–2012
  Mathematics Department, Instituto Superior Técnico
- **Bing Instructor** 2001-2002
  U. T. Austin
- **Post-Doctoral Member** 2000-2001
  Institute for Advanced Study, Princeton

Education

- **Habilitation in Mathematics** 2006
  Instituto Superior Técnico, Universidade Técnica de Lisboa
- **Ph.D. in Mathematics** 2000
  University of California at Berkeley, USA

Awards and Honors

IAS Fellow, Stephenson College, Durham University (UK, 2025), Selected paper "A Stochastic Analog of Aubry-Mather theory" for IOP Select (2002), Morrey Prize, University of California Berkeley (1998), First Prize in Portuguese Mathematical Olympiads (1987, 1989, 1990), Honorable Mention, International Mathematical Olympiad, Braunschweig (Germany, 1989).

Selected Publications

Books (Selected)

- Regularity Theory for Mean-Field Game Systems (with E. Pimentel and V. Voskanyan), SpringerBriefs in Mathematics, 2016
- Economic Models and Mean-Field Games Theory (with E. Pimentel and L. Nurbekyan), IMPA, 2015

Journal Articles (Selected)

- Weak-strong uniqueness for solutions to mean-field games (with R. Ferreira and V. Voskanyan), *Proc. AMS*, 2025 (to appear)
- $C^{1,\alpha}$ regularity for stationary mean-field games with logarithmic coupling (with T. Bakaryan, G. Di Fazio), *NoDEA*, 31, Article 90, 2024
- A random-supply Mean Field Game price model (with J. Gutierrez, R. Ribeiro), *SIAM J. Fin. Math.*, 14(1), 188–222, 2023
- Machine Learning architectures for price formation models (with J. Gutierrez, M. Laurière), *Appl. Math. Optim.*, 88, Article 23, 2023
- Particle approximation of one-dimensional Mean-Field-Games with local interactions (with M. Di Francesco, S. Duisembay, R. Ribeiro), *Discrete Contin. Dyn. Syst.*, 42(7), 3569–3591, 2022
- The large-time profile for Hamilton-Jacobi-Bellman equations (with H. Mitake, H. Tran), *Math. Ann.*, 384(3/4), 1409–1459, 2022
- Existence of weak solutions to time-dependent mean-field games (with R. Ferreira, T. Tada), *Nonlinear Anal.*, 212, 2021
- Singular Mean-Field Games (with M. Cirant, E. Pimentel, H. Sanchez-Morgado), *J. Dyn. Games*, 8(4), 445–465, 2021

- Uniform estimates for the planning problem with potential (with R. Ferreira, T. Bakaryan), *NoDEA*, 28(2), 2021
- A mean-field game approach to price formation in electricity markets (with J. Saude), *Dyn. Games Appl.*, 11(1), 29–53, 2021
- The Hessian Riemannian flow and Newton's method for Effective Hamiltonians and Mather measures (with X. Yang), *ESAIM: Math. Model. Numer. Anal.*, 54(6), 2020
- Two-scale Homogenization of a stationary mean-field game (with R. Ferreira, X. Yang), *ESAIM Control Optim. Calc. Var.*, 26, 2020
- Existence of weak solutions to first-order stationary mean-field games with Dirichlet conditions (with R. Ferreira, T. Tada), *Proc. AMS*, 147(11), 4713–4731, 2019
- Displacement convexity for first-order mean-field games (with T. Seneci), *Minimax Theory Appl.*, 3(2), 261–284, 2018
- Existence of solutions to stationary mean-field games through variational inequalities (with R. Ferreira), *SIAM J. Math. Anal.*, 50(6), 5969–6006, 2018
- Two numerical approaches to stationary mean-field games (with R. Ferreira, N. Al-Mulla), *Dyn. Games Appl.*, 7(4), 657–682, 2017
- Weak KAM theory for a weakly coupled system of Hamilton-Jacobi equations (with D. Farias, A. Figalli), *Calc. Var. Partial Differ. Equ.*, 55(4), Article 79, 2016
- Weak KAM theory in the d-infinite dimensional torus (with L. Nurbekyan), *Discrete Contin. Dyn. Syst.*, 36(11), 6167–6185, 2016
- Weakly coupled mean-field game systems (with S. Patrizi), *Nonlinear Anal.*, 144, 110–138, 2016
- Extended mean-field games (with V. Voskanyan), *SIAM J. Control Optim.*, 54(2), 1030–1055, 2016
- Time dependent mean-field games with logarithmic nonlinearities: the subquadratic case (with E. Pimentel), *SIAM J. Math. Anal.*, 47(5), 3798–3812, 2015
- Short-time existence of solutions for mean-field games with congestion (with V. Voskanyan), *J. Lond. Math. Soc. (2)*, 92(3), 778–799, 2015
- Time dependent mean-field games in the superquadratic case (with H. Sanchez-Morgado, E. Pimentel), *ESAIM Control Optim. Calc. Var.*, 22(2), 562–580, 2016
- Obstacle and weakly coupled systems in mean-field games (with S. Patrizi), *Interfaces Free Bound.*, 17(1), 55–68, 2015
- A new method for large time behavior of degenerate viscous Hamilton–Jacobi equations with convex Hamiltonians (with F. Cagnetti, H. Mitake, H. Tran), *Ann. Inst. H. Poincaré Anal. Non Linéaire*, 32(1), 183–200, 2015
- Time dependent mean-field games in the subquadratic case (with H. Sanchez-Morgado, E. Pimentel), *Commun. Partial Differ. Equ.*, 40(1), 40–76, 2015
- On the minimizers of Calculus of Variations problems in Hilbert Spaces (with L. Nurbekyan), *Calc. Var. Partial Differ. Equ.*, 52(1–2), 65–93, 2015
- On the stochastic Evans-Aronsson problem (with H. Sanchez-Morgado), *Trans. AMS*, 366(2), 903–929, 2014
- On the existence of stationary solutions of extended mean-field games (with S. Patrizi, V. Voskanyan), *Nonlinear Anal.*, 99, 49–79, 2014
- Mean-field games: a brief survey (with J. Saúde), *Dyn. Games Appl.*, 4(2), 110–154, 2014
- Continuous time finite state space mean-field games (with J. Mohr, R. Sousa), *Appl. Math. Optim.*, 68(1), 99–143, 2013
- Adjoint methods for obstacle problems and weakly coupled systems of PDE (with F. Cagnetti, H. Tran), *ESAIM Control Optim. Calc. Var.*, 19(3), 2013
- Aubry Mather measures for non-convex Hamiltonians (with F. Cagnetti, H. Tran), *SIAM J. Math. Anal.*, 43(6), 2011
- Discrete time, finite state space mean-field games (with J. Mohr, R. Souza), *J. Math. Pures Appl.*, 93(3), 2010, 308–328
- Aubry-Mather theory and PDEs (with A. Byriuk), *S. Paulo J. Math. Sci.*, 4(1), 2010, 17–63
- Selection criteria for Hamilton-Jacobi equations and Aubry-Mather measures, *Adv. Calc. Var.*, 1(3), 2008, 291–307
- An error estimate for the approximation of the effective Hamiltonian (with F. Camilli, I. Capuzzo Dolcetta), *Appl. Math. Optim.*, 57(1), 2008, 30–57
- Perturbation theory for Hamilton-Jacobi equations and Stability of Aubry-Mather sets, *SIAM J. Math.*

Anal., 35(1), 2003, 135–147
- Regularity Theory for Hamilton-Jacobi Equations, *J. Differ. Equ.*, 187(2), 2003, 359–374
- Effective Hamiltonians and Averaging for Hamiltonian Dynamics II – Time dependent Hamiltonians (with L. C. Evans), *Arch. Ration. Mech. Anal.*, 161(4), 2002, 271–305
- A Stochastic Analog of Aubry-Mather theory, *Nonlinearity*, 15(3), 2002, 581–603
- Viscosity Solutions of Hamilton-Jacobi Equations and Asymptotics for Hamiltonian Systems, *Calc. Var. Partial Differ. Equ.*, 14(3), 2002, 345–357
- Effective Hamiltonians and Averaging for Hamiltonian Dynamics I – Time independent Hamiltonians (with L. C. Evans), *Arch. Ration. Mech. Anal.*, 157(1), 2001, 1–33

Research Projects (as PI)

PI of KAUST-funded "Mean-field games: models, theory, and computational aspects" (2022-2025) and previously "Mean-field games and applications" (2018-2021). Participating institutions: Rome I and III, Padova, Limoges, Durham, and Paris-Diderot). Earlier projects funded by FCT Portugal included work on degenerate elliptic and parabolic equations (2012-2014), non-linear degenerate systems (2011-2014), applied mathematics (2009-2013), and analysis of partial differential equations (2005-2008).

Short Courses

Coimbra University (Portugal, 2024), Tsinghua University (China, 2024), Tajik National University (Tajikistan, 2022), Instituto Superior Tecnico (Portugal, 2022), Universidade do Porto (Portugal, 2022), AIMS (South Africa, 2021, virtual), Escola Brasileira de Sistemas Dinamicos (Brazil, 2019), Vienna Doctoral School (Austria, 2019), PHBS (China, 2019), African Institute of Mathematical Sciences (Tanzania, 2018), IPAM UCLA (USA, 2018), Universidade do Porto (Portugal, 2017), Universita di Verona (Italy, 2017), Beijing Normal University (China, 2015), IMPA (Brazil, 2015), University of Bath (UK, 2014), Fukuoka University (Japan, 2013), Chinese Academy of Sciences (China, 2012), University of Warwick (UK, 2012), Universidade Federal Fluminense (Brazil, 2011), IMPA (Brazil, 2009).

Selected Recent Conferences

AIMS Conference on Dynamical Systems, Differential Equations and Applications (AIMS 2024, Abu Dhabi, UAE), MathConnect 2024 (KFUPM, Saudi Arabia, 2024), Controlo 2024 - 15th APCA International Conference on Automatic Control and Soft Computing (Porto, Portugal, 2024), 12th Bachelier Congress on Mathematical Finance (Rio de Janeiro, Brazil, 2024), Mean-Field Models in Optimal Control and Multi-Agent Dynamics Workshop (Varese, Italy, 2024), WONAPDE 2024 (Concepción, Chile, 2024), ICIAM 2023 - International Congress on Industrial and Applied Mathematics (Tokyo, Japan, 2023), Mathematics in Armenia: Advances and Perspectives Conference (Yerevan, Armenia, 2023), ISAAC 2023 - 14th International ISAAC Congress (Ribeirão Preto, Brazil, 2023), SIAM Conference on Financial Mathematics and Engineering (Philadelphia, USA, 2023), Nonlinear Partial Differential Equations: Theory, Numerics, and Applications Conference (Rome, Italy, 2023), Joint Mathematics Meeting (Boston, USA, 2023), Mean Field Games and Applications Workshop (Lagrange R& D Center, Paris, France, 2022), IST-IME Conference on Mathematics and Applications (Lisbon, Portugal, 2022), Mathematics and Financial Economics Conference (Berlin, Germany, 2022), International Symposium on Dynamic Games and Applications (ISDG 2022, Porto, Portugal, 2022), Theory and Numerics of Mean Field Games and Hamilton-Jacobi Equations Workshop (Rome, Italy, 2022), Mathematical Advances in Mean-Field Games Conference (IMSI, University of Chicago, USA, 2021), International Conference of Mathematics and Its Applications (King Khalid University, Abha, Saudi Arabia, 2021), 8th European Congress of Mathematics (2021), SIAM Conference on Financial Mathematics and Engineering (2021).

Selected Recent Seminars

Yerevan State University (Armenia, 2024), CUHKSZ (China, 2024), Peking University (China, 2024), Chinese Academy of Sciences (China, 2024), University of Limoges (France, 2024), University of Catania (Italy, 2024), University of Rome I (Italy, 2023), NYU Abu Dhabi (UAE, 2023), UCLA (USA, 2023), Purdue University (USA, 2022), University of Padova (Italy, 2022), University of West Virginia (USA, 2021, virtual).

Selected Recent Scientific Events Organized

Recent Advances in Mean Field Games for Crowd Dynamics, AIMS Meeting (UAE, 2024), Advanced Perspectives in Nonlinear PDEs Course Series, KAUST (Saudi Arabia, 2024), Advances in Nonlinear Elliptic and Parabolic PDEs (Saudi Arabia, 2023), 5th Conference on Mathematical Sciences and Applications (Saudi Arabia, 2021), Workshop on Mean Field Games and Applications, IPAM UCLA (USA, 2020).

Editorial Service (Associate Editor)

Mathematical Control and Related Fields (2025-present), Portugaliae Mathematica (2022-present), SIAM Journal of Mathematical Analysis (2022-present), SN - Partial Differential Equations (2019-present), Journal of Dynamics and Games (2017-present), Dynamic Games and Applications (2016-present), Minimax Theory and its Applications (2014-2024).

Community Service

Scientific Council Member, Exact Sciences and Engineering, Portuguese Science and Technology Foundation (2010-2012), Scientific Director of Mathematics, ICTI Carnegie Mellon-Portugal Program (2009-2012), Director of Mathematics, CoLab UTAustin-Portugal Program (2007-2012), Vice President, Portuguese Mathematical Society (2004-2008).

University Service

AMCS Chair, KAUST (2017-2024), PSE and CEMSE Dean Search Committees, KAUST (2022), Academic Council, KAUST (2013-2016), Member of General Council, Universidade Técnica de Lisboa (2012), President of Mathematics Department, Instituto Superior Técnico (2007-2008)

Publications

10 most important publications of the candidate and their Google Scholar citations

1. The large-time profile for Hamilton-Jacobi-Bellman equations (with H. Mitake, H. Tran), *Math. Ann.*, 384(3/4), 1409–1459, 2022. **Citations - 2**

2. A mean-field game approach to price formation (with J. Saude), *Dyn. Games Appl.*, 11(1), 29–53, 2021. **Citations - 31**

3. The Hessian Riemannian flow and Newton's method for Effective Hamiltonians and Mather measures (with X. Yang), *ESAIM: Math. Model. Numer. Anal.*, 54(6), 2020. **Citations - 9**

4. Existence of solutions to stationary mean-field games through variational inequalities (with R. Ferreira), *SIAM J. Math. Anal.*, 50(6), 5969–6006, 2018. **Citations - 76**

5. Time dependent mean-field games in the superquadratic case (with H. Sanchez-Morgado, E. Pimentel), *ESAIM Control Optim. Calc. Var.*, 22(2), 562–580, 2016. **Citations - 102**

6. A new method for large time behavior of degenerate viscous Hamilton–Jacobi equations with convex Hamiltonians (with F. Cagnetti, H. Mitake, H. Tran), *Ann. Inst. H. Poincaré Anal. Non Linéaire*, 32(1), 183–200, 2015. **Citations - 76**

7. Time dependent mean-field games in the subquadratic case (with H. Sanchez-Morgado, E. Pimentel), *Commun. Partial Differ. Equ.*, 40(1), 40–76, 2015. **Citations - 103**

8. Continuous time finite state space mean-field games (with J. Mohr, R. Sousa), *Appl. Math. Optim.*, 68(1), 99–143, 2013. **Citations - 198**

9. Discrete time, finite state space mean-field games (with J. Mohr, R. Souza), *J. Math. Pures Appl.*, 93(3), 2010, 308–328. **Citations - 304**

10. A Stochastic Analog of Aubry-Mather theory, *Nonlinearity*, 15(3), 2002, 581–603. **Citations - 106**