Curriculum Vitae

Pierpaolo Soravia*

- **Education.** Degree in Mathematics, University of Padua 1986 with a thesis published in Boll. Unione Mat. Italiana. PhD in Mathematics, Universities of Bologna and Padua, 1992.

- **Academic Career.** University researcher, 1990; tenured in 1993. Associate Professor, 1998. Full Professor, 2001. Author of 47 papers in international journals and 7 papers in refereed volumes, with collaborators such as M.G. Crandall and P.E. Souganidis. According to MathSciNet (Math. Reviews database), 592 citations from 363 authors. Google Scholar reports 1,472 citations. Long-term visits: Division of Applied Mathematics, Brown University, 1992-93; Department of Mathematics, University of California at Santa Barbara, 1994-95; Center of Nonlinear Analysis, Carnegie Mellon University, 1997; Department of Mathematics, Australian National University, Canberra, 1998. Invited speaker at 27 international conferences, including at the Geometry Center in Minneapolis (USA), FORTH in Heraklion (Crete), Courant Institute in New York (USA), PIMS in Vancouver (Canada), IHP in Paris (France), and the University of Tokyo (Japan). Served on the editorial board of "Mathematical Control and Related Fields" (2010-18), "Abstract and Applied Analysis" (2012-19), and "Mathematics" (2020-present). Editor for a special issue appeared in AIMS Mathematics (2024). Co-organizer with M. Bardi two sessions at the 6th ICIAM International Conference on Industrial and Applied Mathematics, Zurich, Switzerland, July 16-20, 2007, titled "Viscosity Solutions of Partial Differential Equations: Recent Advances and Applications."

- **Research Projects.** From 2001 to 2003, I coordinated the subproject "Risk-sensitive Optimal Control and its Applications to Monetary Policy Problems" within the national project "Models and Methods of Optimization: Theoretical and Computational Aspects," coordinated by Fulvio Ricci, CNR Fondi Agenzia 2000. Since 2007, I have coordinated a research fund (ex-60%) at the Department of Mathematics involving 20 professors and doctoral students. I have participated in European projects: SADCO Initial Training Network "Sensitivity Analysis for Deterministic Controller Design" (2011-2014), General Coordinator Hasnaa Zidani (Paris, France), and Training Mobility and Research Network "Viscosity Solutions and Applications" (1999-2003), Principal Investigator P.-L. Lions (Paris, France). I have also participated in national PRIN-MIUR projects: "Analysis and Control of Deterministic and

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Stochastic Evolution Equations" (1999-2000), Project Principal Investigator I. Capuzzo Dolcetta (Roma 1) and 2001-2, Principal Investigator G. Da Prato (Pisa, Scuola Normale Superiore), "Viscosity, Metric, and Control Theoretic Methods in Nonlinear PDEs" (2003-4, 2006-7, 2008-10), Principal Investigator I. Capuzzo Dolcetta, and "Viscosity, Geometric, and Control Methods for Nonlinear Diffusive Models" (2011-13), Principal Investigator I. Capuzzo Dolcetta. I participated in the Ca.Ri.Pa.Ro Foundation Excellence Project "Nonlinear Partial Differential Equations: Models, Analysis, and Control Problems" (2010-2014), Principal Investigator M. Bardi.

- **Research Interests.** My research interests focus on nonlinear differential equations, particularly the viscosity solutions theory and its applications. Recent topics and current projects include the general theory of viscosity solutions for first- and second-order Hamilton-Jacobi partial differential equations, particularly with discontinuous coefficients and related to sub-Riemannian metric properties; the dynamic programming method in optimal control and differential games; minimization problems in L^∞ and the Aronsson equation, controllability of nonlinear control systems.

- **Teaching.** Since 1990, I have taught undergraduate and graduate courses in Engineering, Mathematics, Physics, and the Galilean School of Higher Education at the University of Padua, as well as the PhD program in Mathematics. I have been a member of the Faculty Council of the former Faculty of Engineering and its academic committee, the GAV of the Chemical and Materials Engineering program, and the teaching committee of the Mathematics Department. From January 2014 to February 2017, I coordinated the PhD program in Mathematics. I supervised the PhD thesis of Cecilia De Zan, "Some New Results on Reaction-Diffusion Equations and Geometric Flows," 2012. I also supervised the final degree thesis (master thesis) of Mauro Garavello (now a professor at the University of Milan Bicocca), 1999, and the master's thesis of Cecilia De Zan, 2008, both published as papers in international journals.

- **Main Research Results.** Characterization of the minimum time function as the unique solution of a Hamilton-Jacobi type equation in control theory and differential games, for both continuous and discontinuous cases; proof of Wulff's conjecture on the asymptotic behavior of crystal growth in nonlinear models; characterization of the solvability of the nonlinear H_∞ control problem in both finite and infinite dimensions; a result of global time convergence for a singular perturbation problem in a reaction-diffusion system; convergence estimates for a numerical algorithm for calculating the minimum time function in control theory and differential games; uniqueness for certain classes of first- and second-order degenerate elliptic Hamilton-Jacobi equations with discontinuous coefficients; existence results for the Aronsson equation.

- **Selected Publications.** (For the complete list, see MathSciNet.)

  Highly impactful publications:

1. Soravia, Pierpaolo *Discontinuous viscosity solutions to Dirichlet problems for Hamilton-Jacobi equations with convex Hamiltonians.* Comm. Partial Differential Equations 18 (1993), no. 9-10, 1493–1514.
2. Soravia, Pierpaolo $\mathcal{H}_\infty$ *control of nonlinear systems: differential games and viscosity solutions. SIAM J. Control Optim.* 34 (1996), no. 3, 1071–1097.
3. Crandall, M. G.; Kocan, M.; Soravia, P.; Swiech, A. *On the equivalence of various weak notions of solutions of elliptic PDEs with measurable ingredients.* Progress in elliptic and parabolic partial differential equations (Capri, 1994), 136–162, Pitman Res. Notes Math. Ser., 350, Longman, Harlow, 1996.
4. Bardi, Martino; Falcone, Maurizio; Soravia, Pierpaolo *Numerical methods for pursuit-evasion games via viscosity solutions.* Stochastic and differential games, 105–175, Ann. Internat. Soc. Dynam. Games, 4, Birkhäuser Boston, Boston, MA, 1999.
5. Soravia, Pierpaolo *Boundary value problems for Hamilton-Jacobi equations with discontinuous Lagrangian.* Indiana Univ. Math. J. 51 (2002), no. 2, 451–477.
6. Soravia, Pierpaolo *Generalized motion of a front propagating along its normal direction: a differential games approach.* Nonlinear Anal. 22 (1994), no. 10, 1247–1262.
7. Soravia, Pierpaolo *Optimality principles and representation formulas for viscosity solutions of Hamilton-Jacobi equations. II. Equations of control problems with state constraints.* Differential Integral Equations 12 (1999), no. 2, 275–293.
8. Soravia, Pierpaolo *Pursuit-evasion problems and viscosity solutions of Isaacs equations.* SIAM J. Control Optim. 31 (1993), no. 3, 604–623.
9. Soravia, Pierpaolo *Optimality principles and representation formulas for viscosity solutions of Hamilton-Jacobi equations. I. Equations of unbounded and degenerate control problems without uniqueness.* Adv. Differential Equations 4 (1999), no. 2, 275–296.
10. Bardi, Martino; Soravia, Pierpaolo *Hamilton-Jacobi equations with singular boundary conditions on a free boundary and applications to differential games.* Trans. Amer. Math. Soc. 325 (1991), no. 1, 205–229.

Other significant publications:

1. Soravia, Pierpaolo *Existence of absolute minimizers for noncoercive Hamiltonians and viscosity solutions of the Aronsson equation.* Math. Control Relat. Fields 2 (2012), no. 4, 399–427.
2. De Zan, Cecilia; Soravia, Pierpaolo *Cauchy problems for noncoercive Hamilton-Jacobi-Isaacs equations with discontinuous coefficients.* Interfaces Free Bound. 12 (2010), no. 3, 347–368.

3. Soravia, Pierpaolo *Uniqueness results for fully nonlinear degenerate elliptic equations with discontinuous coefficients.* Commun. Pure Appl. Anal. 5 (2006), no. 1, 213–240.

4. Soravia, Pierpaolo; Souganidis, Panagiotis E. *Phase field theory for a FitzHugh-Nagumo type system.* Siam J. Math. Anal. 27 (1996) no. 5, pp. 1341-1359.