Francesca DA LIO

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Personal Data :
Italian citizenship, Swiss permanent resident
Two children (2005, 2013)
Two stepchildren
Languages : *Italian (native), English (fluent), French (fluent), German (fluent)*

Academic Positions

- **September 2010-**: **Senior Scientist**, (from June 2014 **Titular Professor**), Department of Mathematics, **ETH**, **Zurich**.
- **September 2007-August 2010: Heinz-Hopf Lecturer**, Department of Mathematics, **ETH**, **Zurich**.
- **2004-2013**: **Researcher ("Ricercatore") in Mathematical Analysis**, Department of Mathematics, University of Padova (Italy).
- **2000-2004**: **Researcher ("Ricercatore") in Mathematical Analysis**, Department of Mathematics, University of Torino (Italy).
- **August 1999-February 2000**: **post-doc fellowship**, Department of Mathematics, University of Padova (Italy).
- **February 1999-July 1999**: **post-doc fellowship** financed by the TMR European Project "Viscosity solutions and their applications", University of Tours (France).

Qualification

- **June 2013:** Qualification as **Full Professor** in Mathematical Analysis, Italian Ministry of Education, University and Research.

Education

- **Ph.D in Mathematics**, University of Padova, **1998**, **Thesis :** "Propagation of maxima and uniqueness results for viscosity solutions of fully nonlinear 1st and 2nd order equations", (supervisor: Prof. M. Bardi), (*excellent*).
- **"Laurea" in Mathematics**, University of Padova, **1994**, **Thesis :** "Equazioni di Bellman per problemi di controllo ottimo illimitato", (advisor: Prof. M. Bardi), (110/110 *cum laude*).

Research Interests

Partial Differential Equations in Natural Science, Mathematical Finance and Geometry. More specifically : viscosity solutions to fully nonlinear degenerate elliptic and parabolic equations, deterministic and stochastic control, reaction diffusion equations, wave front propagations, ergodic and homogenization problems, regularity and compactness properties of critical points of nonlocal variational problems, fractional harmonic maps.

Invited Lecturer at International Conferences, Seminars and Summer Schools since 2020

- **Workshop on singularities in variational models**, Toulouse, January 8-10 **2020**.
- **Hausdorff School:** *Trending Tools for the Solvability of Nonlocal Elliptic and Parabolic Equations*, Bonn, June 28-Juli 2, **2021**.
- **Corona Seminar**, May 26, **2022**.
- **Workshop**: *Mostly Maximum Principle*, Cortona , May 30-June 3, **2022**.
- **Summer School:** *18th School on Interactions between Dynamical Systems and Partial Differential Equations*, CRM (Centre de Recerca Matematica) and Clay Mathematics Institute, Barcelona, June 27-July 1, **2022**.
- **Workshop:** *Progress in Analysis: Challenges, Zeitgeist and Key Inspirations*, University of Warsaw, February 13-17, **2023**.
- **Workshop:** *Recent Trends in Nonlinear Analysis and Geometric Analysis*, CUNY graduate Center, New York, April 3-4, **2023**.

- **Workshop:** *Non-linear PDEs*, ICMAT, Madrid, July 10-14, **2023**.
- **Freiburg- Heidelberg-Stuttgart-Tübingen Meeting on Geometry and Analysis**, **Freiburg**, July 21, **2023**.
- **Workshop:** *Recent advances in geometric analysis, Avancés récentes en analyse géométrique*, Luminy, November 6-10, **2023**.
- **Workshop:** *New trends in Nonlinear PDEs, Physics and Geometry*, Granada, January 22-26, **2024**.
- **Worshop:** *Regularity theory and free boundary problems: from PDE to interfaces*, University of Coimbra, July 22-26, **2024**.
- **Summer School**, Politecnico of Torino, Torino, June 24-28, **2024**.

Long Visits

- April 2001: **Courant Institute**, New York University .
- February -March 2001 and May 2001: "Laboratoire de Mathématiques et Physique Théorique", **University of Tours.**
- March 2002: "Laboratoire de Mathématiques et Physique Théorique", **University of Tours**.
- April 2002: Department of Mathematics, **the University of Texas at Austin**.
- May 2003: "Laboratoire de Mathématiques et Physique Théorique", **University of Tours** .
- April 2004: "Laboratoire de Mathématiques et Physique Théorique", **University of Tours**.
- November 2004: Department of Mathematics, **University of Paris Sud-Orsay**.
- December 2004: **University of Tokyo, University of Waseda** and **University of Osaka**.
- March 2005 :"Laboratoire de Mathématiques et Physique Théorique", **University of Tours** and **CERMICS - ENPC**, Paris.
- October 2006: Department of Mathematics, **University of Stanford** and **Courant Institute**, New York University.

- February 2008: Department of Mathematics, **University of Pennsylvania**, Philadelphia.
- June 2011: Department of Mathematics, **University of Rennes**.

Teaching

Invited Courses

- Hausdorff School: *Trending Tools for the Solvability of Nonlocal Elliptic and Parabolic Equations*, Bonn University, June 28 - July 2, **2021**.
- Summer School: *18th School on Interactions between Dynamical Systems and Partial Differential Equations*, **CRM (Centre de Recerca Matematica) and Clay Mathematics Institute**, Barcelona, June 27-July 1, **2022**.
- Summer School, **Politecnico di Torino**, Torino, June 24-28, **2024**.

At ETH, Zurich

- **Graduate Course:** *An Introduction to Viscosity Solutions: Methods and Applications I,* D-MATH, HS07.
- **Graduate Course:** *An Introduction to Viscosity Solutions: Methods and Applications II,* D-MATH, FS08.
- **Undergraduate Course:** *Mathematik III-Partielle Differentialgleichungen*, D-CHEM, HS08, HS09, HS10, HS11, HS12, HS13, HS14, HS15, HS16, HS17.
- **Bachelor-Master Course:** *Introduction to partial differential equations,* D-MATH, FS10, FS17, FS18, FS24.
- **Undergraduate Course:** *Mass und Integral*, D-MATH, FS09, FS11, FS16, FS20, FS21.
- **Undergraduate Course:** *Analysis 3*, D-MATH, HS22, HS23.
- **Undergraduate Course ("Basisjahr Vorlesung"):** *Komplexe Analysis,* D-ITET & RW, FS12, FS13, FS14, FS15, FS23.
- **Undergraduate Course:** *Analysis 3,* D-MAVT & D-MATL, HS17, HS19, HS20.
- **Undergraduate Course ("Basisjahr Vorlesung"):** *Mathematik I: Analysis I und Lineare Algebra*, D-ERDW , D-HEST, D-USYS, HS21.
- **Seminar for bachelor and master students:**

1. *Topic in Harmonic Analysis*, D-MATH, (organized in collaboration with Dr. Laura Keller), HS20.
2. *Elliptic Partial Differential Equations*, D-MATH, (organized in collaboration with Dr. Laura Keller), HS22.

At the Faculty of Sciences of Torino

- **Undergraduate Courses:** *Differential and Integral Calculus*, *Analysis 1*, *Analysis 2*, *Introduction to the study of partial differential equations*.

At the Faculty of Engineering of Torino

- **Undergraduate Course:** *Analysis 2*.

At the Faculty of Engineering of Padova

- **Undergraduate Courses:** *Mathematics 1*, *Mathematics 3*, *Analysis 2*.

Mentoring

Post-Doc

Dr. Ali Hyder (SNF Postdoc.Mobility Fellowship Return Grant, 1.11.2020-31.10.2021)

PhD Students

- **September 1, 2023**– Dominik Schlagenhauf, ETH, Zurich.
- **2019–2021** Jerome Wettstein, PhD Thesis: *Critical local and nonlocal PDEs and improved regularity results*, ETH, Zurich.
- **2015–2020** Vincenzo Ignazio, PhD Thesis: *Mean Field Game Partial Differential Equations and Measure Valued Jump Diffusions*, (co-advised with Mete Soner), ETH, Zurich.
- **2015–2021** Francesco Palmurella, PhD Thesis: *The Germain-Poisson problem and variational aspects of the Willmore Lagrangian*, (co-advised with Tristan Rivière), ETH, Zurich.

Master Theses

- **Nuo Chen**, Master Thesis: *Viscosity solutions of fully nonlinear elliptic partial differential equations*, September 2023, ETH, Zurich.
- **Matasci Luca**, Master Thesis: *Viscosity Methods for the Homogenization of First Order Partial Differential Equations*, April 2010, ETH, Zurich.

Bachelor Theses (last 5 years)

- **Nina Goldhirsch**, Bachelor Thesis: *Introduction to Nonlinear Analysis: Inversion Theorems and Applications*, June 2023, ETH, Zurich.
- **Flavio Dalessi**, Bachelor Thesis: *An overview of Jordan measure*, May 2023, ETH, Zurich.
- **Lorenz Zauter**, Bachelor Thesis: *The Cauchy-Kovalevskaya Theorem*, April 2023, ETH, Zurich.
- **Samuel Huber**, Bachelor Thesis: *An Introduction to Littlewood-Paley Theory*, January 2023, ETH, Zurich.
- **Lukas Hoffer**, Bachelor Thesis: *An excursion into Sobolev and Poincaré inequalities*, July 2022, ETH, Zurich.
- **Nuo Chen**, Bachelor Thesis: *Isoperimetric inequalities*, July 2022, ETH, Zurich.
- **Samuel Kunz**, Bachelor Thesis: *Covering theorems and applications*, May 2022, ETH, Zurich.
- **Antonio Casetta**, Bachelor Thesis: *An Introduction to the Fixed Point Theorems*, May 2022, ETH, Zurich.
- **Silvan Suter**, Bachelor Thesis: *An Introduction to Capacity and Applications to Sobolev Functions*, December 2021, ETH, Zurich.
- **Enea Rossi**, Bachelor Thesis: *Lorentz Spaces: Interpolation and Duals*, August 2021, ETH, Zurich.
- **Sabrina Galfetti**, Bachelor Thesis: *Some pathological sets in the standard theory of Lebesgue measure*, June 2021, ETH, Zurich.
- **Matteo Salerno**, Bachelor Thesis: *Functions of Bounded Variation in One Dimension*, May 2021, ETH, Zurich.

- **Nadja Aoutouf**, Bachelor Thesis: *Poisson kernel and Hardy spaces*, February 2019, ETH, Zurich.
- **Daniel Paunovic**, Bachelor Thesis: *The wave equation and some related applications*, February 2019, ETH, Zurich.
- **Adrien Weihs**, Bachelor Thesis: *Proof of an Isoperimetric Inequality through Couplings*, June 2018, ETH, Zurich.

Semester and Reading Papers (last 5 years)

- **Federica Casanova**, Semester paper, ongoing, ETH, Zurich.
- **Luca Giudici**, Semester paper, ongoing, ETH, Zurich.
- **Leonardo Comi**, Semester paper: *Introduction to Optimal Control and Hamilton-Jacobi-Bellman equations*, January 2023, ETH, Zurich.
- **Sabrina Galfetti**, Semester paper: *Caldéron Zygmund Theory*, January 2023, ETH, Zurich.
- **Eric Ströher**, Semester paper: *Maximum principle type properties of second order PDE's*, June 2022, ETH, Zurich.
- **Zhanfeng Lim**, Reading course: *Ishii's Lemma in the theory of viscosity solutions to second order elliptic PDEs*, January 2021, ETH, Zurich.
- **Jonathan Junné**, Reading paper: *Generalized functions and tempered distributions*, November 2020, ETH, Zurich.
- **Michele Caselli,** Reading paper: *Proof of De Giorgi's theorem via Moser's iteration scheme*, September 2020, ETH, Zurich.
- **Francesco Fiorani**, Reading paper: *Classical maximum principles*, September 2020, ETH, Zurich.
- **Tim Möbus**, Semester paper: *Existence of a Regular Solution of the Semi-geostrophic Equations via Monge-Ampère*, November 2019, ETH, Zurich.
- **Karan Khazanchi**, Reading paper: An extension problem related to the fractional Laplacian, September 2019, ETH, Zurich.
- **Lauro Silini**, Reading paper: Some results about regularity of solutions to elliptic PDEs, November 2018, ETH, Zurich.
- **David Aleman Espinosa**, Semester Paper: *The dynamic programming principle and the finite horizon problem*, July 2019, ETH, Zurich.

Editorial work

– 2022-present: Editorial Board Member of *Advances in Calculus of Variations*.

Research Projects

– Swiss National Fund, SNF 200020_219429/1 : **Critical Surfaces in Conformally invariant Variational Theory**, 1.10.2023-30.09.27.

– Swiss National Fund, SNF 200020_192062 : **Variational Analysis in Geometry**, 1.04.2020-31.01.23.

– Swiss National Fund, SNF 200020_1788320 : **Geometric Analysis of Scalar and Non Scalar Conformally invariant Variational Problems**, 1.04.2018 - 31.01.2021.

– Member of MIUR projects PRIN: **Viscosity, metric, and control theoretic methods in nonlinear PDEs**, 2003-4, 2006-7, 2008-10 .

– Member of GNAMPA Project 2004 : **Equazioni alle derivate parziali, campi vettoriali, e controlli**.

– Member of GNAMPA Project 2003 : **Equazioni alle derivate parziali, campi vettoriali, e controlli**.

– 2002-2004: Member of Murst Project **Metodi di viscosità, metrici e di teoria del controllo in equazioni alle derivate parziali nonlineari**.

– 2000-2002: Member of Murst Project : **Analisi e controllo di equazioni di evoluzione deterministiche e stocastiche**.

– Member of the European Project TMR (Training and Mobility of Researchers): **Viscosity Solutions and Applications** (terminated in March 2002).

Academic services

– Expert advisor for **Cofund MathInGreaterParis** (cofund post-doctoral fellowships).

– Referee of **Swiss National Fund projects**.

– Referee of several international peer-reviewed journals.

– September 2022-August 2024: Member of **selection committee of Hermann Weyl Instructors**, ETH, Zurich.

– August 2020: co-examiner of Manuela Gehrig's PhD thesis (supervisor Michael Struwe), ETH, Zurich.

– 2020: member hiring committee for **full professor in Mathematical Physics**, ETH, Zurich.

– 2017-2020: **Coordinator of the analysis group** at ETH, Zurich.

– December 2019: co-examiner of Marc Pigon's PhD thesis (supervisor: Vincent Millot), Paris 6, France.

– 2019: member hiring committee for **full professor in Mathematical Finance**, ETH, Zurich.

– 2015-2018 : **chair of the postdoc selection committee**, ETH, Zurich.

– 2014: member hiring committee for **assistant professor in Mathematical Finance**, ETH, Zurich.

– December 2014: co-examiner and jury member PhD thesis of Jean-Paul Daniel (supervisors: Sylvia Serfaty and Scott Amstrong), Paris 6, France.

– 2011: member hiring committee for **assistant professor in Analysis**, ETH, Zurich.

Organization of Conferences and Seminars

– Organizer (in collaboration with Annamaria Montanari) of *Topics in sub-elliptic and elliptic PDEs*, (MS - ID 31), 8ECM, 20-26 June, **2021**.

– Member of the Scientific Committee of *METE - Mathematics and Economics: Trends and Explorations*, a conference celebrating Mete Soner's 60^{th} birthday and his contributions to Analysis, Control, Finance and Probability, ETH, Zurich, June 4-8, **2018**.

– Member of the Scientific Committee of *Recent advances in non-local and non-linear analysis: theory and applications*, ETH, Zurich, June 10-14, **2014**.

– Since **2008**, co-organizer of *Analysis Seminar*, ETH, Zurich.

– Co-organizer of Workshop : *Equazioni alle derivate parziali, campi vettoriali, e controlli,* Padova, February 20-22, **2004**.

– Co-organizer of Workshop : *Equazioni alle derivate parziali, comportamento asintotico, soluzioni stazionarie e regolarità*, Torino, October 23-25, **2003**.

– Co-organizer of TMR Conference 2002: *Viscosity Solutions and Applications*, Tours, March 6-8, **2002**.

– Co-organizer of *Viscosity solutions and Applications,* Bressanone, July 3-5, **2000**, and *Analysis and control of deterministic and stochastic evolution equations*, Bressanone, July 6-7, **2000**.