Ermal Feleqi - CV

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Personal info

Born in Vlorë, Albania on October 23, 1983.

Married, two children, Italian and Albanian citizen.

Academic career

Associate Professor of Mathematical Analysis 01/06/2015 – present

Visiting Associate Professor January–July 2019

KAUST King Abdullah University of Science and Technology, Saudi Arabia.

Head of the Research and Teaching Group of Analysis and Differential Equations 04/2017 – present

Coordinator of an Erasmus+ agreement between the Universities of Vlora and Padova (Italy) 09/2016 – present

University of Vlorë "Ismail Qemali", Albania

Research Associate March 1, 2016 – February 28, 2017

Cardiff School of Mathematics, Cardiff University, UK

Research project title: *"Random Perturbation of Ultraparabolic Partial Differential Equations (PDE) Under Rescaling".*

Scientific Responsible: Dr. Federica Dragoni

Postdoctoral researcher June 1, 2013 – May 30, 2015

Università degli Studi di Padova, Dipartimento di Matematica, Padua, Italy;

Postdoctoral mentor: Prof. Martino Bardi;

Research project title: *Nonlinear Partial Differential Equations and Mean Field Games.*

Postdoctoral researcher January 1, 2012 – May 30, 2013

Università degli Studi di Padova, Dipartimento di Matematica, Padua, Italy;

Postdoctoral mentor: Prof. Martino Bardi;

Research project title: *Asymptotic problems is Partial Differential Equations arising in Control Theory and Differential Games.*

Teaching position January 1, 2014 - March 30, 2014

Taught the course "Mathematical Analysis II" to part-time (or working) students of Engineering disciplines at the *Università degli Studi di Padvoa*, Italy.

Postdoctoral researcher April 1, 2010 – December 31, 2011

Università degli Studi di Padova, Dipartimento di Matematica, Padua, Italy;

Postdoctoral mentor: Victor I. Burenkov;

Research project title: *Some applications of the theory of functional spaces to perturbation problems for the eigenfunctions of elliptic differential operators.*

Education

- **Ph.D. in Mathematics** January 2006 – December 2009

  University of Padova, Italy

- **M.Sc. in Mathematics** October 2005 – June 2006

  University of Bari, Italy

- **B.Sc. in Mathematics** October 2002 – June 2005

  University of Bari, Italy

Publications and preprints

[1] E. Feleqi, D. Gomes, T. Tada, Hypoelliptic Mean Field Games – a Case Study, *Minimax Theory and its Applications*, **05** (2020), No. 2, 305–326.

[2] M. Bardi, E. Feleqi, & P. Soravia, Regularity of the Minimum Time and of Viscosity Solutions of Degenerate Eikonal Equations via Generalized Lie Brackets. *Set-Valued Var. Anal.,* (2020).

[3] E. Feleqi, Joint time-state generalized semiconcavity of the value function of a jump diffusion optimal control problem, *Nonlinear Differ. Equ. Appl.*, 26:4 (2019).

[4] F. Dragoni, E. Feleqi, PDEs from ergodic Mean Field Games with Hörmander diffusion, *Calculus of Variations and PDEs*, 57: 116 (2018).

[5] E. Feleqi, F. Rampazzo, A L^∞-Chow-Rashevski's Theorem (preprint).

[6] E. Feleqi, F. Rampazzo, Iterated Lie brackets for nonsmooth vector fields, *NoDEA - Nonlinear Differential Equations Appl.,* 24: 61 (2017).

[7] Ermal Feleqi, Commutators of smooth and nonsmooth vector fields, *Proceedings Book of the First International Conference "Mathematics Days in Tirana"*, December 11 – 12, 2015 Tiranë, Albania, pp. 7–20.

[8] E. Feleqi, F. Rampazzo, Integral representations for bracket-generating multi-flows, *Discrete Contin. Dyn. Syst. Ser. A.,* **35**, No. 9, 4345–4366 (2015).

[9] E. Feleqi, Generalized semiconcavity of the value function of a jump diffusion optimal control problem, *NoDEA - Nonlinear Differential Equations Appl.,* **22**, No. 4, 777–809 (2015).

[10] E. Feleqi, The derivation of ergodic mean field game equations for several populations of players, Dyn. Games Appl., **4**, 523–536 (2013).

[11] M. Bardi, E. Feleqi, Nonlinear elliptic systems and mean-field games, *NoDEA - Nonlinear Differential Equations Appl.*, **23**, no. 4, Art. 44, 32 (2016).

[12] E. Feleqi, Estimates for the deviation of solutions and eigenfunctions of second-order elliptic Dirichlet boundary value problems under domain perturbation. *J. Differential Equations* **260**, no. 4, 3448–3476, (2016).

[13] V. I. Burenkov, E. Feleqi, Spectral stability estimates for the eigenfunctions of second order elliptic operators, Math. Nachr., **285**, No. 11–12, 1357–1369 (2012).

[14] V. I. Burenkov, E. Feleqi, Extension of the notion of a gap to differential operators defined on different open sets, Math. Nachr. **286**, No. 5–6, 518–535 (2013).

[15] E. Feleqi, *Spectral stability estimates for the eigenfunctions of second order elliptic operators*, Ph. D. thesis, *Università degli Studi di Padova, Padua, Italy* (2009).

[16] E. Feleqi, *On the abstract approximation of functions* (Italian) M.Sc. Thesis, *Università degli Studi di Bari, Bari, Italy* (2006).

Teaching

2019–2020 **Higher Analysis**, a MSc Math Course (topics: measure and integration theory, functional analysis), University of Vlora, 75 hours.

Mathematical Control Theory, a MSc Math Course, University of Vlora, 75 hours.

Numerical Analysis, a BSc Math Course, University of Vlora, 75 hours.

Differential Equations 2, a BSc Math Course, Univeristy of Vlora, 75 hours.

2018–2019 **Weak Solutions of PDE**, a graduate level course, KAUST – King Abdullah University of Science and Technology, 60 hours.

Real Analysis 1, a BSc in Mathematics course, University of Vlora, Albania, 75 hours.

Numerical Methods, a MSc in Mathematics course, University of Vlora, Albania, 105 hours.

General Mathematics, A BSc in Economics course, University of Vlora., 60 hours.

2017–2018 **Real Analysis 2**, a BSc in Mathematics course, University of Vlora, Albania, 75 hours.

Applied Mathematics, a BSc in Economics Course, University of Vlora, Albania, 60 hours.

Numerical Methods, a MSc in Mathematics course, University of Vlora, Albania, 105 hours.

Differential Equations 2, an undergraduate Mathematics course, University of Vlora, Albania, 75 hours.

2016–2017 **Elements of Mathematical Control Theory**, a PhD course, Cardiff University, 10 hours.

Analysis, a first-year Master course on measure and integration theory and Functional Analysis, University of Vlora, Albania, 105 hours.

Real Analysis 2, a second-year BSc course, University of Vlora, Albania, 75 hours.

2015–2016 **Analysis 1**, a first-year Master course on measure and integration theory and Hilbert spaces, University of Vlora, Albania, 105 hours.

Real Analysis 1, a second-year BSc course, University of Vlora, Albania, 75 hours.

General Mathematics, a first-year BSc in Economics course, University of Vlora, Albania, 30 hours.

2014-2015 **Numerical Methods**, a first-year MSc in Mathematics course, University of Vlora, Albania, 45 hours.

2013-2014 **Mathematical Analysis II**, a second-year BSc in Engineering course, University of Padova, Italy, 52 hours, 2013/14.

Mathematical Analysis II, Teaching Assistant of Prof. Franco Rampazzo, a first-year BSc in Physics and Astronomy course, University of Padova, Italy, 25 hours.

2012-2013 **A theorem of Chow and Rashevski and nonsmooth extensions**, a PhD course, University of Padova, Italy, 8 hours.

Semigroups of Lévy and jump-diffusion processes, a PhD course, University of Padova, Italy, 8 hours.

2011-2012 **Some results in Mean Field Games theory**, a PhD course, University of Padova, 8 hours.

2009-2010 **Calculus II**, Peer tutor, A first-year BSc in Statistical Sciences course, University of Padova, 100 hours.

Research interests

- Mean Field Games
- Iterated Lie brackets for non-smooth vector fields
- Geometric Control Theory, sub-Riemannian Geometry, PDEs of Hörmander type,
- PDEs, mostly arising from optimal control and differential games
- Stability estimates for solutions of elliptic boundary value problems under domain perturbation

Talks

2023 • *Sharing the love of mathematics; an online initiative*, First National Conference of Mathematics, Academy of Sciences of Albania, 29–30 September 2023.

• *Aspects of LaTeX*, Summer School for Future STEM Leaders, Petrovac, Montenegra, 15–20 September, 2023.

2019 • *Mean Field Games with Hörmander diffusions*, South Wales Network of Analysis and Probability, Swansea University, UK, September 24, 2019.

2018 *A nonsmooth Rashevsky-Chow Theorem*, Optimization, State Constraints and Geometric Control, Conference on the occasion of Giovanni Colombo and Franco Rampazzo's 60th birthday, Department of Mathematics "Tulio Levi-Civita", Univerisity of Padova, Italy, May 24 - 25, 2018.

2017 • *Mean Field Games with Hörmander Diffusions*, Equazioni Diferenziali e Applicazioni, Paodva, Italy, December 4, 2017.

• *Hypoelliptic PDEs arising from Mean Field Games*, Conference of Natural Sciences of the University of Tirana, KSNTEK 2017, November 17 - 18, 2017.

• *Mean-Field Game PDEs with Hörmander type operators*, David Lawrence Convention Center SIAM Conference on Control and Its Applications (CT17), Pittsburgh, Pennsylvania, 10-12, 2017.

2016 • *Eikonal equations structured on non-smooth Hörmander type vector fields*, Third Meeting of the London Mathematical Society South-West Network on "Generalised Solutions for Nonlinear PDEs", Bath, UK, July 11, 2016.

• *Hölder continuity for solutions of eikonal equations*, New Trends on Nonlinear PDEs: From Theory to Applications, Cardiff, UK, 20–24 June 2016.

2015 • *Commutators of smooth and non-smooth vector fields*, The First International Conference "Mathematics Days in Tirana", Tirana, Albania, December, 11-12, 2015.

• *High order controllabilty results for nonsmooth vector fields*, University of Bath, UK, January 21, 2015.

2014 • *A set-valued iterated Lie bracket,* Analysis and Geometry in Control Theory and its Applications (with a special tribute to Hélène Frankowska and Hector J. Sussmann), Istituto Nazionale di Alta Matematica (INdAM), University of Rome "La Sapienza", June 9-13, 2014.

• *Ergodic MFG equations for several populations of agents as a "continuum limit" of games with a finite but large number of agents*, Workshop on Mean field Games, University of Rome"Tor Vergata", April 14–15, 2014.

• *Generalized semiconcavity of the value function in (stochastic) optimal control*, Differential Equations and Applications, University of Padova, February 7, 2014.

2013 • *Stability estimates for the deviation of solutions and eigenfunctions of second-order elliptic Dirichlet BVPs under domain perturbation*, Minicourses in Mathematical Analysis 2013, University of Padova, June 10-14, 2013.

• *Domain perturbation problems and estimates for the eigenfunctions of Dirichlet second-order elliptic BVPs*, Karl-Franzenes-Universität, Graz, Austria, February 13, 2013.

• *A brief introduction to the theory of mean field games*, Karl-Franzenes-Universität, Graz, Austria, February 13, 2013.

2012 • *Some aspects of mean field games*, RWTH-Aachen, Germany, July 25, 2012.

2011 • *Extension of the notion of a gap to linear differential operators defined on different domains and spectral stability estimates*, 8th International Congress of the ISAAC (International Society for Analysis, its Applications, and Computation), People's Friendship University of Russia, Moscow Russia, August 22-27, 2011.

2011 • *Stability bounds for the spectral subspaces of the Dirichlet Laplacian under domain perturbation*, Minicourses in Mathematical Analysis 2011, Università degli Studi di Padova, Italy, June 13-17, 2011.

• *Extension of the notion of a gap to linear differential operators defined on different domains and spectral stability estimates*, Operators in Morrey Type Space and Applications - OMTSA 2011, Ahi Evran University, Turkey, May 20-27, 2011.

Organising activity

- Co-organizer of the "Summeer School for Future STEM Leaders" in Montenegro, founded by EU, September, 2023.

- Member of the organizing committee of the workshop and school "Mini-courses in Mathematical Analysis", which is held each year, usually on June, at "Università degli Studi di Padova" in Padova, Italy.

- Member of the organizing committee of a cycle of seminars entitled "Differential equations and applications" which is held regularly at the Department of Mathemamtics at

"Università degli Studi di Padova", Padova, Italy (roughly each month, an internationally renown expert in differential equations and their applications is invited to deliver a talk).

- Engaged in representation activities on behalf of post docs at the Department of Mathematics at "Università degli Studi di Padova", Padova, Italy.

Served as referee for

- *Indiana University Journal of Mathematics*,
- *Dynamic Games and Applications*

Grants

2016 – NOW Coordinator of an Erasmus+ Inter-institutional Agrement between Padova and Vlora

2010 – 2015 Involved in several big research projects (PRIN) financed by Italian Ministry of Education

2011 A 350 euros grant for travel experiences from INdAM, Italy

Particular achievements

2002–2016 Completed BSc and MSc studies a year in advance with ca 50 ECTS more than the required 300.

2002 Third Prize in the National Physics Olympiad for High School Students in Albania

2002 Honorable Mention in the International Physics Olympiad for High School Students, Bali, Indonesia