Marko Erceg

Curriculum Vitae

Bijenička cesta 30
10000 Zagreb, Croatia
+385 (0)1 460 5739
maerceg@math.hr
http://web.math.pmf.unizg.hr/~maerceg

Education

University of Zagreb, Faculty of Science, Department of Mathematics
Bijenička 30, 10000 Zagreb, Croatia

- **PhD programme in Mathematics** 2011 – 2016
  - Doctoral thesis: *One-scale H-measures and variants*
  - Advisor: *prof. Nenad Antonić (nenad@math.hr)*
  - Examining committee: *prof. Marko Vrdoljak, prof. Nenad Antonić, prof. Luc Charles Tartar* (in June 2016)
  - Dissertation committee: *prof. Marko Vrdoljak, prof. Stevan Pilipović, prof. Darko Mitrović*
- **The Graduate University Programme in Applied Mathematics** 2009 – 2011
  - Title awarded: *Master of Science in Mathematics, Applied mathematics* (in July 2011)
  - Master thesis: *The semi-classical limit of the Schrödinger equation*
  - Advisor: *prof. Nenad Antonić (nenad@math.hr)*
  - Graduated *summa cum laude* (average: 4.96/5.0)
- **The Undergraduate University Programme in Mathematics** 2006 – 2009
  - Title awarded: *Bachelor of Science in Mathematics* (average: 4.92/5.0)

Professional experience

- **University of Zagreb, Faculty of Science, Department of Mathematics** 2011 – current
  Bijenička 30, 10000 Zagreb, Croatia
  - Positions: *Assistant professor* (from 08/2017), *Post-docotoral researcher* (02/2017 – 07/2017), *Teaching assistant* (06/2012 – 01/2017), Honorary teaching assistant (09/2011 – 05/2012)
  - Work field: *Applied mathematics and mathematical analysis*
- **Scuola Internazionale Superiore di Studi Avanzati (SISSA)** 09/2016 – 08/2017
  Via Bonomea 265, 34136 Trieste, Italy
  - Position: *Post-doctoral research associate*
  - Department: *Geometry and mathematical physics*
- **Basque Center for Applied Mathematics (BCAM)** 31/10/2013 – 05/12/2013
  Mazarredo 14, 48009 Bilbao, Spain
  - Internship within FP7 project *NUMERIWAVES* (PI: E. Zuazua)

Research interests

PDEs (homogenisation, compensated compactness, H-measures, semiclassical measures, Schrödinger equation, Friedrichs systems), Real and functional analysis, quantum mechanics

Grants and awards

Principal investigator:

- **Multiphase structures and Friedrichs systems** 2019
  University of Zagreb annual research grant
- **Topological methods in microlocal analysis and computability** 2018
  University of Zagreb annual research grant

Investigator:

- **Microlocal defect tools in partial differential equations** 2018 – 2022
  Croatian science foundation; PI: *N. Antonić*
- **Mathematical analysis and numerical methods for diffusion driven multiphase systems** 2018 – 2023
  Croatian science foundation; PI: *M. Bukal*
- **Anisotropic distributions and H-distributions** 2018 – 2019
  bilateral project Croatia–Austria; PI's: *N. Antonić, M. Kunzinger*

Postdoc/PhD student:

- **Cond-Math: Condensed Matter and Mathematical Physics** 2016 – 2017
  FIR-MIUR grant; PI (at SISSA): *A. Michelangeli*
- **Weak convergence methods and applications** 2014 – 2018
  Croatian science foundation; PI: *N. Antonić*
- **Microlocal analysis, partial differential equations and application to heterogeneous materials** 2016 - 2017
  bilateral project Croatia–Serbia; PI's: *N. Antonić, S. Pilipović*
- **Multiscale methods and calculus of variations** 2015 – 2016
  bilateral project Croatia–Montenegro; PI's: *N. Antonić, D. Kalaj*
- **Transport in highly heterogeneous media** 2013 – 2014
  bilateral project Croatia–Montenegro; PI's: *M. Lazar, D. Mitrović*
- **Oscillatory solutions of partial differential equations** 2012 – 2014
  Ministry of science, education and sports (Croatia); PI: *N. Antonić*

Award:

- **Award of Faculty of Science, Department of Mathematics** 2011
  for academic achievements and *for extracurricular activities*

Publications

Submitted:

1) N. Antonić, M. Erceg, M. Mišur: *Distributions of anisotropic order and applications to H-distributions*, 33 pp.

2) M. Erceg, M. Mišur, D. Mitrović: *Velocity averaging for diffusive transport equations with discontinuous flux*, 24 pp.

Published (or accepted):

1) M. Erceg, A. Michelangeli: *On contact interactions realised as Friedrichs systems*, *Complex Analysis and Operator Theory*, **13** (2019) 703–736.

2) M. Erceg, M. Lazar: *Characteristic scales of bounded* L^2 *sequences*, *Asymptotic Analysis*, **109**(3-4) (2018) 171–192.

3) M. Erceg, I. Ivec: *Second commutation lemma for fractional H-measures*, *Journal of Pseudo-Differential Operators and Applications*, **9**(3) (2018) 589-613.

4) N. Antonić, K. Burazin, I. Crnjac, M. Erceg: *Complex Friedrichs systems and applications*, *Journal of Mathematical Physics*, **58** (2017) 101508, 22 pp.

5) N. Antonić, M. Erceg, A. Michelangeli: *Friedrichs systems in a Hilbert space framework: solvability and multiplicity*, *Journal of Differential Equations*, **263** (2017) 8264–8294.

6) M. Erceg, I. Ivec: *On generalisation of H-measures*, *Filomat*, **31**(16) (2017) 5027–5044.

7) N. Antonić, M. Erceg, M. Lazar: *Localisation principle for one-scale H-measures*, *Journal of Functional Analysis*, **272** (2017) 3410–3454.

8) K. Burazin, M. Erceg: *Non-stationary abstract Friedrichs systems*, *Mediterranean Journal of Mathematics*, **13** (2016) 3777–3796.

9) K. Burazin, M. Erceg: *Estimates for mild solutions to semilinear Cauchy problems*, *Electronic Journal of Differential Equations*, Vol. 2014 (2014), No. 194, pp. 1–10.

Short scientific visits

- University of Vienna 2018
- Scuola Internazionale Superiore di Studi Avanzati (SISSA) 2017
- Scuola Internazionale Superiore di Studi Avanzati (SISSA) 2016
- University of Montenegro, University of Novi Sad 2011
- TU Chemnitz 2010

Invited talks

Seminar and colloquium talks:

- *One-scale H-distributions*; DIANA – seminar, Department of Mathematics, University of Vienna, Vienna, Austria, 23 Nov 2018.
- *Friedrichs operators as dual pairs and contact interactions*; Scientific colloquium of Croatian Mathematical Sociaty, University of Zagreb, Zagreb, Croatia, 14 Mar 2018.
- *Semiclassical distributions*; PDE seminar, BCAM, Bilbao, Spain, 5 Dec 2013.
- *Semiclassical limit*; Seminar for Mathematics at University of Montenegro, Podgorica, Montenegro, 1 Nov 2011.

Contributed presentations at schools, workshops and conferences

Conferences

- *Strong traces to degenerate parabolic equations*; The Sixth Najman Conference on Spectral Theory and Differential Equations, Sveti Martin na Muri, Croatia, 8–13 Sept 2019.
- *Friedrichs operators as dual pairs*; 90th Annual Meeting of the International Association of Applied Mathematics and Mechanics – GAMM 2019, Vienna, Austria, 18–22 Feb 2019.

- *Velocity averaging and existence of solutions for degenerate parabolic equations*; Ninth Conference on Applied Mathematics and Scientific Computing – ApplMath18, Šibenik, Croatia, 17–20 Sept 2018.
- *Friedrichs operators as dual pairs*; Applications of Generalized Functions in Harmonic Analysis, Mechanics, Stochastics and PDE, Novi Sad, Serbia, 25–27 Oct 2017.
- *Friedrichs systems in a Hilbert space framework: solvability and multiplicity*; The Fifth Najman Conference on Spectral Theory and Differential Equations, Opatija, Croatia, 10–15 Sept 2017.
- *One-scale H-distributions*; International conference on generalised functions – GF2016, Dubrovnik, Croatia, 4–9 Sept 2016.
- *The propagation principle for fractional H-measures*; 6th Croatian mathematical congress, Zagreb, Croatia, 14–17 June 2016.
- *One-scale H-measures, variants and applications*; PDEs, Potential Theory and Function Spaces, Linköping, Sweden, 13–17 June 2015.
- *Localisation principle for 1-scale H-measures*; PDEs, Continuum Mechanics and Numerical Analysis, Dubrovnik, Croatia, 26–30 May 2014.
- *Comparison of H-measures and semiclassical measures*; Eight Conference on Applied Mathematics and Scientific Computing – ApplMath13, Šibenik, Croatia, 10–14 June 2013.
- *Semiclassical distributions*; Topics in PDEs, Microlocal and Time-frequency Analysis, Novi Sad, Serbia, 3–8 Sept 2012.

Workshops

- *Friedrichs operators as dual pairs and contact interactions*; Mathematical Challenges in Quantum Mechanics, Rome, Italy, 19–24 Feb 2018.
- *Hilbert space approach to PDEs of Friedrichs type*; The junior Trieste quantum days 2017, Trieste, Italy, 12 and 19 May 2017.
- *Homogenisation limits for second order parabolic equations*; International Workshop on PDEs: analysis and modelling, Zagreb, Croatia, 19–22 June 2016.
- *Characteristic length of sequences via one-scale H-measures*; Mathematical Challenges in Quantum Mechanics, Bressanone, Italy, 8–13 Feb 2016.
- Poster: *One-scale H-distributions*; Optimal Transport in the Applied Sciences, Linz, Austria, 8–12 Dec 2014.
- *Estimates on the mild solution of semilinear Cauchy problems and some notes on damped wave equations*; Chemnitz-Zagreb Workshop on Harmonic Analysis for PDE, Applications, and related topics, Chemnitz, Germany, 1–4 July 2014.
- Poster: *Localisation principle for 1-scale H-measures*; Advances in Nonlinear PDEs, Vienna, Austria, 2–3 June 2014.
- Poster: *Semiclassical distributions*; New Trends in Calculus of Variations and Partial Differential Equations, Naples, Italy, 21–23 Nov 2013.
- *Semiclassical limit of Schrödinger equation*; Joint Workshop Novi Sad-Zagreb, Novi Sad, Serbia, Sept 2011.
- *Semigroups for Flows on the Infinite Network*; Joint Seminar Chemnitz-Zagreb, Chemnitz, Germany, Oct 2010.

Schools

- *One-scale H-measures*; Applied Analysis for Materials, Berlin, Germany, 25 Aug – 5 Sept 2014.

Participation in conferences, workshops and summer schools

- Analysis and PDE 2019, Hannover, Germany, 7–9 Oct 2019.
- Gran Sasso Quantum Meetings: from many particle systems to quantum fluids, GSSI, L'Aquila, Italy, 28 Nov – 1 Dec 2018.
- Trails in Quantum Mechanics and Surroundings, SISSA Trieste, Italy, 29–30 Jan 2018.
- Mathematical aspects of the physics with non-self-adjoint operators, CIRM Marseille, France, 5–9 June 2017.
- Trieste quantum days 2017, SISSA Trieste, Italy, 20–24 Feb 2017.
- Mathematical Challenges of Zero-Range Physics: rigorous results and open problems, SISSA Trieste, Italy, 7–10 Nov 2016.
- GMT, Shape Optimisation, and Free Boundaries, SISSA Trieste, Italy, 25–28 Oct 2016.
- Evolution Equations on Singular Spaces, CIRM Marseille, France, 25–29 April 2016.
- Semiclassical Analysis and Non-self-adjoint Operators, CIRM Marseille, France, 14–18 Dec 2015.
- Trends in Non-Linear Analysis 2015, SISSA Trieste, Italy, 1–3 July 2015.
- Optimal Transport in the Applied Sciences, Linz, Austria, 2–5 Dec 2014.
- Workshop on Fractional Calculus, Probability and Non-local Operators, Bilbao, Spain, 6–8 Nov 2013.
- Microlocal Analysis, Wave Fronts and Propagation of Singularities, Novi Sad, Serbia, 16–21 Sept 2013.
- Geometric Measure Theory and Optimal Transport, ICTP Trieste, Italy, 15 July – 2 Aug, 2013.
- Trends in Nonlinear Elliptic and Parabolic Equations, Cortona, Italy, 16–28 July 2012.
- Data protection, Pomorie, Bulgaria, 15–21 June 2012.
- Numerical Optimization and Applications, Novi Sad, Serbia, 27 May – 2 Jun, 2012.
- Gabor Frames and Wavelets in Local Analysis, Novi Sad, Serbia, 28 Sept – 3 Oct, 2011.
- Scuola Matematica Interuniversitaria, Perugia, Italy, 31 July – 2 Sept, 2011.
- 7th Conference on Applied Mathematics and Scientific Computing – ApplMath11, Trogir, Croatia, 13–17 June 2011.
- Multiscale Problems in Science and Technology, Dubrovnik, Croatia, 30 May – 5 June, 2010.
- Homogenisation, multi-scale methods and applications, Dubrovnik, Croatia, 30 May – 5 June, 2010.

Mentoring

PhD students

- Sandeep Kumar Soni (Dec 2019 –), co-mentoring with N. Antonić

Master students

- Antonio Lukačević: *Linear programming* (in Croatian), 27 Nov 2019.
- Marija Mihaljević: *Application of networks in transport models* (in Croatian), 27 Nov 2019.
- Barbara Polić: *Combinatorial problems of distributions* (in Croatian), 25 Apr 2019.
- Karla Mikec: *Numerical methods for linear systems* (in Croatian), 24 Sept 2018.
- Manuela Jurić: *Some applications of linear algebra in geometry* (in Croatian), 17 July 2018.

Professional activities

Organisation

- **International Workshop on PDEs: analysis and modelling** — Zagreb, Croatia
  co-organiser — *17–20 June 2018*
- **SISSA seminar: Analysis, Math-Phys, and Quantum** — Trieste, Italy
  co-organiser — *2016/2017*
- **International Workshop on PDEs: analysis and modelling** — Zagreb, Croatia
  co-organiser — *19–22 June 2016*

Reviewing

- Referee for journals: Applications of Mathematics, Discrete Dynamics in Nature and Society, Journal of Function Spaces, Mathematical Communications, Springer INdAM Series
- Reviewer of teaching materials:
  - Zvonimir Tutek, Marko Vrdoljak: *Ordinary differential equations* (in Croatian), Department of Mathematics, Faculty of Science, University of Zagreb, 18 Oct 2019.
  - Boris Muha: *Calculus of variations and applications* (in Croatian), Department of Mathematics, Faculty of Science, University of Zagreb, 31 Oct 2017.

Faculty services

- Member of Quality committee of Faculty of Science, University of Zagreb (2019 – 2020).

Teaching

University of Zagreb, Faculty of Science, Department of Mathematics
Bijenička 30, 10000 Zagreb, Croatia

- **Doctoral programme**
  - *Selected topics in Sobolev spaces* (Autumn 2017/18)
- **Graduate (masters) programmes**
  - *Calculus of variations and applications* (Autumn 2018/19)
  - *Convex analysis with applications* (Spring 2018/19)
- **Undergraduate (bachelor) programmes)**
  - *Applied mathematical analysis* (Autumn 2017/18, 2018/19, 2019/2020)
  - *Methods od mathematical physics* (Spring 2017/18, 2018/19, 2019/2020)
  - *Mathematical analysis in space* (Autumn 2019/2020)
  - *Mathematics* (for biologists) (Autumn 2019/2020)
- **Teaching assistant for:**
  - *Calculus of variations and applications* (Autumn 2018/19)
  - *Convex analysis with applications* (Spring 2018/19)
  - *Partial differential equations I* (Autumn 2011/12, 2012/13, 2014/15, 2015/16, 2017/18, 2018/19)
  - *Partial differential equations II* (Spring 2011/12, 2012/13)
  - *Theory of elasticity* (Autumn 2011/12)

  - *Applied mathematical analysis* (Autumn 2018/19, 2019/2020)
  - *Mathematical analysis in space* (Autumn 2019/2020)
  - *Calculus I* (for Physicists) (Autumn 2017/18)
  - *Programming II* (Spring 2013/2014, 2014/15, 2015/16, 2017/2018)
  - *Programming I* (Autumn 2013/2014, 2014/15, 2015/16)
  - *Linear algebra I* (Spring 2011/12, 2012/13, 2013/2014, 2014/15, 2015/16)
  - *Linear algebra II* (Autumn 2011/12, 2012/13, 2013/2014, 2014/15, 2015/16)
  - *Discrete mathematics* (Autumn 2012/13, 2013/2014, 2014/15, 2015/16)
  - *Ordinary differential equations* (Autumn 2012/13)

University of Zagreb, Faculty of Electrical Engineering and Computing
Unska 3, 10000 Zagreb, Croatia

- **Teaching assistant for:**
  - *Mathematics I* (Autumn 2011/12)
  - *Probability and statistics* (Spring 2011/12)

Languages

- *Croatian* - mother tongue
- *English* - fluent
- *Italian* - basic