

Georgiana Chatzigeorgiou

Curriculum Vitae

Contact Information

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Personal Information

Citizenship Cypriot

Date of Birth October 13th, 1992

Place of Birth Larnaca, Cyprus

Research Interests

Partial Differential Equations, Free Boundary Problems, Stochastic Homogenization

Employment

2020 - Present *Postdoctoral Researcher*, Max Planck Institute for Mathematics in the Sciences. Research group of Prof. Felix Otto

2018 - 2020 *Research Assistant*, University of Cyprus, Department of Mathematics and Statistics

2016 - 2018 *Teaching Assistant*, University of Cyprus, Department of Mathematics and Statistics

Education

2016–2020 **Ph.D in Mathematics**, *University of Cyprus*, Nicosia, Cyprus.
Ph.D Thesis: "The Nonlinear Parabolic Thin Obstacle Problem",
Advisor: Prof. Emmanouil Milakis

- 2014–2016 **MSc in Pure Mathematics**, *University of Cyprus*, Nicosia, Cyprus.
Master Thesis: "Partial Differential Equations and the Theory of De Giorgi-Moser-Nash", Advisor: Prof. Emmanouil Milakis
- 2010–2014 **BSc in Pure Mathematics**, *University of Cyprus*, Nicosia, Cyprus.

Publications

Articles in peer-reviewed journals

- [1] **G. Chatzigeorgiou, P. Morfe, F. Otto, L. Wang**, *The Gaussian free-field as a stream function: asymptotics of effective diffusivity in infra-red cut-off*, Preprint, 2023 (arXiv:2212.14244).
- [2] **G. Chatzigeorgiou**, *Locality properties of standard homogenization commutator*, *Asymptotic Anal.*, Online First, 1-18, 2022.
- [3] **G. Chatzigeorgiou**, *Regularity for the fully nonlinear parabolic thin obstacle problem*, *Commun. Contemp. Math.*, 24(3): 2150011, 2022.
- [4] **G. Chatzigeorgiou and E. Milakis**, *Regularity for fully nonlinear parabolic equations with oblique boundary data*, *Rev. Mat. Iberoam.* 37, 775-820, 2021.

Thesis

- [1] *The Nonlinear Parabolic Thin Obstacle Problem*, Ph.D Thesis, University of Cyprus (2020), 145 pages. (<https://gnosis.library.ucy.ac.cy/handle/7/64847?locale-attribute=en>)
- [2] *Partial Differential Equations and the theory of De Giorgi - Moser - Nash*, M.Sc Thesis, Depart. of Math. & Stat., University of Cyprus Repository (2015), 124 pages.

Organization of seminars

Since Jan 2023 *Arbeitsgemeinschaft Angewandte Analysis*, Max-Planck-Institute for Mathematics in the Sciences, Leipzig.

Teaching Experience

Teaching Assistant at University of Cyprus

- FW 18/19 MAS102-Analysis II, MAS012-Analysis for Computer Scientists I, MAS027-Mathematics for Engineers III
- SS 17/18 MAS101-Analysis I
- FW 17/18 MAS121-Linear Algebra I

- SS 16/17 MAS122-Linear Algebra II, MAS025-Mathematics for Engineers I, MAS027-Mathematics for Engineers III
- SS 15/16 MAS027-Mathematics for Engineers III

Conferences

- 2022 16-22 October, **Arbeitsgemeinschaft Quantitative Stochastic Homogenization**, Oberwolfach Research Institute for Mathematics (MFO), Oberwolfach, Germany.
Talk title: "Scaling laws for the commutator"
- 2022 16-27 May, **Unifying concepts in PDEs with randomness**, University of Montréal, Canada.
- 2019 24-28 June, **Mini-courses in Mathematical Analysis 2019**, University of Padova, Italy.
- 2019 6-10 May, **Contemporary Aspects of Analysis II**, Perneria Beach Hotel, Protaras, Cyprus.
- 2018 1-21 July, **The 28th Annual PCMI Summer Session**, Research Topic: Harmonic Analysis, Graduate Summer School, Prospector Conference Center, Park City, Utah, USA.
- 2017 19 May, **New Trends in Nonlinear PDEs**, Workshop at the University of Cyprus, Nicosia, Cyprus.
- 2017 1-5 May, **Contemporary Aspects of Analysis**, Perneria Beach Hotel, Protaras, Cyprus.
- 2015 22-26 June, **Mini-courses in Mathematical Analysis 2015**, University of Padova, Italy.
- 2014 29 June-3 July, **Workshop in Analysis of PDEs: Theory, Methods and Applications**, Capo Bay Hotel, Protaras, Cyprus.

Short Visits/Talks

- 7-10 June 2022 *TU Dortmund, Germany*
Talk title: "Up to the boundary regularity for BVPs governed by fully nonlinear operators", Oberseminar Angewandte Analysis
- 21-25 Feb. 2022 *Ludwig-Maximilians-Universität München, Germany*
Talk title: "On the theory of fluctuations in stochastic homogenization", Probability and Variational Methods in PDEs Oberseminar
- 9 Feb. 2022 *National University of Ireland, Maynooth*
Talk title: "On the theory of fluctuations in stochastic homogenization", Mathematics and Statistics Colloquium (online)

- 23 Nov. 2021 *Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany*
Talk title: "Locality properties of standard homogenization commutator",
Angewandte Analysis Seminar
- 23-29 Aug. 2020 *Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany*
- 9-13 Feb. 2020 *Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany*
Talk title: "Regularity Theory for Viscosity Solutions of Fully Nonlinear
Parabolic Equations", Angewandte Analysis Seminar

Scholarships

- Cyprus State Scholarship Foundation, 2016/17 & 2018/19
- Graduate School (UCY) Ph.D. Scholarship, 2017/18

Awards

- Faculty of Pure and Applied Sciences (UCY) Award, 2016
- Department of Mathematics and Statistics (UCY) Award, 2014
- Cyprus Mathematical Society Award, 2014

Memberships

- 2017-Present. Member of the American Mathematical Society

Languages

Greek (native), English

Appendix I: Brief Abstracts

Articles in peer-reviewed journals

- [1] **The Gaussian free-field as a stream function: asymptotics of effective diffusivity in infra-red cut-off**, Preprint 2023 (arXiv:2212.14244)
Abstract. We investigate the effective diffusivity of a random drift-diffusion operator that is at the borderline of standard stochastic homogenization theory: In two space-dimensions, we consider the divergence-free drift with stream function given by the Gaussian free-field, with an ultra-violet cut-off at scale unity and an infra-red cut-off at a scale $L \gg 1$. We establish that the effective diffusivity diverges as $\lambda_L \approx \sqrt{\ln L}$, specifying recent results based on a Wiener chaos decomposition and a mathematical physics-type analysis in the corresponding Fock space. This amounts to the study of convection-enhanced diffusion at the borderline to anomalous diffusion. It provides a quantitative stochastic homogenization perspective, and therefore yields quenched rather than just annealed results.
- [2] **Locality properties of standard homogenization commutator**, Asymptotic Anal., Online First, 1-18, 2022
Abstract. We study stochastic homogenization for linear elliptic equations in divergence form and focus on the recently developed theory of fluctuations. It has been observed that the fluctuations of averages of the solution are captured by the so-called *standard homogenization commutator* Ξ_ϵ^o . Our aim is to study how Ξ_ϵ^o (and its higher-order analogs) decorrelates on large scales when averaged on balls which are far enough. Taking advantage of its approximate locality, we give a quantitative characterization of this decorrelation in terms of both the macroscopic scale and the distance between the balls showing that Ξ_ϵ^o inherits the correlation properties of the environment.
- [3] **Regularity for the fully nonlinear parabolic thin obstacle problem**, Commun. Contemp. Math., 24(3): 2150011, 22 pages, 2022.
Abstract. We prove $C^{1,\alpha}$ regularity (in the parabolic sense) for the viscosity solution of a boundary obstacle problem with a fully nonlinear parabolic equation in the interior. Following the method which was first introduced for the harmonic case by L. Caffarelli in 1979, we extend the results of I. Athanasopoulos (1982) who studied the linear parabolic case and the results of E. Milakis and L. Silvestre (2008) who treated the fully nonlinear elliptic case.
- [4] **Regularity for fully nonlinear parabolic equations with oblique boundary data**, Rev. Mat. Iberoam. 37, 775-820, 2021.
Abstract. We obtain up to a flat boundary regularity results in parabolic Hölder spaces for viscosity solutions of fully nonlinear parabolic equations with oblique boundary conditions.

Thesis

- [1] **The Nonlinear Parabolic Thin Obstacle Problem**, Ph.D Thesis, University of Cyprus (2020), 145 pages.
Abstract. The purpose of the present thesis is twofold. Firstly, oblique derivative boundary value problems with fully nonlinear parabolic equations inside are considered with the equation as well as the boundary condition understood in the viscosity sense. In the second

part we study the viscosity solution of a boundary obstacle problem with a fully nonlinear parabolic equation in the interior. In both cases we derive up to the boundary Hölder estimates for the solution and its derivatives.

- [2] **Partial Differential Equations and the theory of De Giorgi - Moser - Nash**, M.Sc Thesis, Depart. of Math. & Stat., University of Cyprus Repository (2015), 124 pages.

Abstract. The present thesis is essentially divided into two main parts. In the first part we present the De-Giorgi theory and the corresponding Moser iteration technique for the proof of the interior Hölder regularity of weak solutions to second order elliptic equations in divergence form with measurable coefficients. Its connection to the 19th problem of Hilbert (in variational form) is also explored.