Lukas Koch

German. Born 19.01.1995 in Heidelberg, Germany

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Academic career

since 09/2024	lecturer at the University of Sussex, Brighton
10/2024-10/2024	guest researcher at MPI for Mathematics in the Sciences, Leipzig
10/2021-09/2024	Postdoc at MPI for Mathematics in the Sciences, Leipzig, in the group of Felix Otto
10/2017-10/2021	PhD student at University of Oxford, supervised by Jan Kristensen
10/2013-07/2017	studies for Master of Mathematics at Merton College, University of Oxford. (07/2017: MMath 1st class; highest achievable grade in the UK)
summer 2016	summer research project "On maximum principles for Second Order Elliptic PDE" at the Mathematical Institute, University of Oxford, supervised by Yves Capdeboscq

Extended research visits (more than one week)

28.3.-15.4.2022	"Regularity of optimal transport maps for L^p costs", Research in Paris programme of the IHP, Paris, with Michael Goldman and Felix Otto

Publications and preprints

Published or accepted

L. Koch, M. Ruf and M. Schäffner. On the Lavrentiev gap for convex, vectorial integral functionals *J. Funct. Anal. 288, 1 (2025)*

C. de Filippis, L. Koch, and J. Kristensen. Quantified Legendreness and the regularity of minima. *Arch. Rational Mech. Anal.* 248 (2024).

L. Koch. Geometric linearisation for optimal transport with strongly p-convex cost, *Calc. Var. Part. Differ. Equat. 63, 87 (2024).*

C. Irving, and L. Koch. Boundary regularity results for minimisers of convex functionals with (p, q)-growth. *ANONA, 12, 1 (2023).*

M. Goering and L. Koch. A note on improved differentiability for the Banach-space valued Finsler γ-Laplacian, *Comptes Rendus. Mathématique, 361 (2023).*

A. Guerra, L. Koch, and S. Lindberg. Nonlinear open mapping principles, with applications to the Jacobian equation and other scale-invariant PDEs. *Adv. Math. 415, 108869 (2023).*

L. Koch. Regularity for quasilinear vectorial elliptic systems through an iterative scheme with numerical applications. *Nonlinear Differ. Equ. Appl. 29, 75 (2022).*

L. Koch. Global higher integrability for minimisers of convex obstacle problems with (p,q)-growth. *Calc. Var. Part. Differ. Equat. 61 (2022).*

A. Guerra, L. Koch, and S. Lindberg. The Dirichlet problem for the Jacobian equation in critical and supercritical Sobolev spaces. *Calc. Var. Part. Differ. Equat. 60, 55 (2021).*

L. Koch. Global improved integrability for minimisers of convex functionals with (p,q)-growth. *Calc. Var. Part. Differ. Equat. 60, 63 (2021).*

A. Guerra, L. Koch, and S. Lindberg. Energy minimisers with prescribed Jacobian. *Arch Rational Mech Anal 242 (2021).*

I. Chlebicka, C. de Filippis, and L. Koch. Boundary regularity for manifold constrained p(x)-Harmonic maps. *J. London Math. Soc. 104(5)(2021).*

Preprints and lecture notes

M. Goldman and L.Koch. Partial regularity for optimal transport with p-cost away from fixed points *arXiv:2407.08846* (2024).

L. Koch and F. Otto. Lecture notes on the harmonic approximation to quadratic optimal transport. *arXiv:2303.14462* (2023).

L. Koch, and J. Kristensen. On the validity of the Euler-Lagrange system without growth assumptions. *arXiv:2203.00333* (2022).

L. Koch. On global absence of Lavrentiev gap for functionals with (p,q)-growth. *arXiv:2210.15454* (2022).

Third-party funding

2024	Walter-Benjamin stipend of DAAD, €70818 over two years (declined)
10/2017-1-/2021	EPSRC grant covering PhD fees and living stipend
10/2016-08/2017	scholar of Stiftung der deutschen Wirtschaft (SdW), covering tuition fees and living stipend. SdW is part of the German scholarship system aiming to support the top 1% of German students.

Invited seminar talks

2024	"Uniform regularity results for homogenisation problems of p-Laplace type", MASS, Sussex, 31.10.
2023	"Geometric linearisation for optimal transport with p-cost ", Obersem-inar Analysis, Halle, 14.11.

"A c^*-harmonic approximation result in optimal transport", GT CalVa seminar, Paris, 17.4.

"Partial boundary regularity for functionals with (p, q)-growth", at Seminar Analysis, Parma, Italy, on 21.2.

"Partial boundary regularity for functionals with (p, q)-growth", at Oberseminar Analysis, Konstanz, Germany, on 12.1.

2022 "Absence of global Lavrentiev phenomenon", at n-Städte Seminar, Freiberg, Germany, on 16.12.

"Absence of global Lavrentiev phenomenon", at Seminar Analysis, Bielefeld, Germany, on 6.12.

"Functionals with nonstandard-growth and convex duality", at online seminar "International Prague seminar on function spaces", https://www2.karlin.mff.cuni.cz/ pick/funspac.htm, on 3.3.

2021 "Some results on the Jacobian equation with integrable data and a nonlinear open mapping principle", at University College London/Imperial College London analysis and PDE seminar, on 29.1.

2020 "A general nonlinear mapping theorem and applications to the incompressible Euler equations", at PDE CDT lunchtime seminar, Oxford, UK, on 22.10.

"Global higher integrability for minimisers of convex functionals with (p,q)-growth", at online seminar "Monday's Nonstandard Seminar", https://www.mimuw.edu.pl/˜ichlebicka/nonstandard-seminar.html, on 16.11.

"A nonlinear open mapping principle, with applications to nonlinear PDEs", at Oberseminar Analysis, Regensburg, Germany, on 30.11.

"A nonlinear open mapping principle, with applications to nonlinear PDEs", at Oberseminar Analysis, Hamburg, Germany, on 9.12.

"A nonlinear open mapping principle, with applications to nonlinear PDEs", at Oberseminar Analysis, Heidelberg, Germany, on 10.12.

"Some results on the Jacobian equation and a nonlinear open mapping principle", at Seminar der Arbeitsgruppe Analysis, Leipzig, Germany, on 14.12.

Conferences

Invited talks Calculus of Variations - Old Problems and New Directions (Edinburgh), 17-21.2.2025

Nonuniformly elliptic PDEs and variational problems (Trento), 2-6.9.2-2024

	Lavrentiev's phenomenon, approximation, and regularity (Warsaw), 20-22.11.2023
Organiser	mini-symposium on Optimal Transport: Theory and Applications at SIAM Material Science 24 (Pittsburgh), 18-23.5.2024
Contributed talks	11th Workshop of the GAMM Activity Group "Analysis of Partial Differential Equations" (Eichstätt), 18.-20.9.2023
	Calculus of Variations: Regularity Theory and Limiting Spaces (Konstanz), 20.-22.3.2023
	Workshop on Nonuniformly elliptic problems (Warsaw), 5.- 9.9.2022
	Calculus of Variations in Lille (Lille), 4.-6.7.2022
	Joint CDT student conference (Oxford, Cambridge, Edinburgh, Warwick), online, 7.-10.12.2020
Posters	Summerschool on Analysis and Applied Mathematics (Münster), 12.-16.9.2022
	Winterschool on Analysis and Applied Mathematics (Münster), online, 22.-26.2.2021
Attended	PDE & Probability in interaction: functional inequalities, optimal transport and particle systems (CIRM, Marseille) 22-26.1.2024
	Analysis and beyond: a conference in honour of Luigi Ambrosio's 60th birthday (Zürich), 11.-15.9.2023
	Advances in Nonlinear Analysis and Nonlinear Waves, a conference in honor of Frank Merle (IHES, Paris), 22.5.-26.5.2023
	Journées EDP (Obernai), 30.6.-3.7.2022
	XXXI Convegno Nazionale di Calcolo delle Variazioni (Levico), 9.-13.5.2022
	International Conference on Fluids and Variational Methods (Budapest), 10.-14.6.2019
	Mathematics and Science: In Honour of Sir John Ball (Oxford), 17.-19.5.2018
	Oxbridge PDE conference (Oxford, Cambridge), annually 2018-2021

Reviewer for

Adv. Calc. Var. , Adv. Nonlinear Anal., Arch. Ration. Mech. Anal., Calc. Var. Part. Differ. Equat., Int. Math. Res. Not., J. Optimiz. Theory App., MathSciNet, Nonlinear Anal., Sci. China Math.

Collaborators

Iwona Chlebicka (Warsaw), Cristiana de Filippis (Parma), Franz Gmeineder (Konstanz), Max Goering (MPI Leipzig), Michael Goldman (LJLL Paris), André Guerra (ETH Zürich), Rishab Gvalani (MPI Leipzig), Christopher Irving (Dortmund), Jan Kristensen (Oxford), Sauli Lindberg (Helsinki), Francesco Mattesini (MPI Leipzig and Münster), Felix Otto (MPI Leipzig), Matthias Ruf (EPF Lausanne), Mathias Schäffner (Halle)

Teaching experience

04/2023-07/2023	lecturer for third-year course "Calculus of Variations", University of Leipzig, Leipzig
10/2022-01/2023	advanced lecture course on "Nonlinear Potential Theory for degenerate elliptic PDE" at MPI MiS, Leipzig
10/2019-10/2021	annual stipendiary lectureship at St. Hilda's College, University of Oxford, renewed for the academic year 2020/21. Marking and teaching three 1-hour problem classes per week with 2-3 students each covering second-year undergraduate Mathematics courses in Metric spaces and Complex Analysis, Numerical Analysis, Integration, Integral Transforms, Calculus of Variations
summer 2019	tutor for second year course Calculus of Variations; marking and teaching bi-weekly problem classes for 2-3 students
spring 2019	tutor for second year courses on differential equations and integral transforms; marking and teaching bi-weekly problem classes for 2-3 students
fall 2018	teaching assistant for 4th year undergraduate course on Functional Analytic Methods for PDEs; marking and some teaching for a bi-weekly problem class of 10-15 students.
fall 2018	teaching assistant for graduate level introductory course to function spaces and distribution; marking and some teaching for a weekly class of 10-15 students

Academic and outreach activities

06/2019-06/2020	co-organiser of the weekly Oxford CDT in PDEs lunchtime seminar series
summer 2016	tutor for Problem Solving Matters (outreach program by the Mathematical Institute, Oxford preparing students for MAT)

Languages

languages	German: native speaker. English: fluent. French: beginner.

Non-academic internships

06/2015-09/2015 Internship with Morgan Stanley, London, United Kingdom: Proof of concept for a dynamic failover mechanism

Brighton, 23 October 2024