Zihui ZHAO

PERSONAL DATA

ADDRESS:	Department of Mathematics, 404 Krieger Hall
	3400 N. Charles Street, Baltimore, MD 21218
OFFICE:	Krieger 303
EMAIL:	zhaozh@jhu.edu
WEBSITE:	https://zhaozh.xyz

EMPLOYMENT

2023 -	Tenure-track Assistant Professor, **Johns Hopkins University**
2019 - 2023	NSF Postdoc and L.E. Dickson Instructor, **University of Chicago**
2018 - 2019	Member, **Institute for Advanced Study**
	special year program on *Variational methods in geometry*

EDUCATION

2013 - 2018	Ph.D. in Mathematics, **University of Washington**
	Thesis: Analytic and geometric aspects of the elliptic measure on non-smooth domains
	Advisor: Prof. Tatiana TORO
Spring 2017	Program associate at the Harmonic Analysis program, **MSRI Berkeley**
2011 - 2013	M.S. in Mathematics, **École Normale Supérieure/Université Paris-Sud XI**
	Thesis: Minimal mass blow-up for the critical generalized Korteweg-de Vries Equation
	Advisor: Prof. Yvan MARTEL
2007 - 2011	B.S. in Mathematics, **Peking University**

PUBLICATIONS & PREPRINTS

1. *A note on the critical set of harmonic functions near the boundary.* (with Carlos Kenig), arXiv:2402.08881

2. *Elliptic operators in rough sets, and the Dirichlet problem with boundary data in Hölder spaces.* (with Mingming Cao, Pablo Hidalgo-Palencia, José María Martell, Cruz Prisuelos-Arribas), arXiv:2311.03270

3. *Examples of non-Dini domains with large singular sets.* (with Carlos Kenig) *Advanced Nonlinear Studies Special Issue: In honor of David Jerison,* **23** (2023), no. 1.

4. *Expansion of harmonic functions near the boundary of Dini domains.* (with Carlos Kenig) *Rev. Mat. Iberoam.* **38** (2022), no. 7, 2117-2152.

5. *Elliptic measures for Dahlberg-Kenig-Pipher operators: Asymptotically optimal estimates.* (with Simon Bortz, Tatiana Toro) *Math. Ann.*, **385** (2023), 881-919.

6. *Boundary unique continuation on C^1-Dini domains and the size of the singular set.* (with Carlos Kenig) *Arch. Ration. Mech. An.*, **245** (2022), 373-374.

7. *Optimal Poisson kernel regularity for elliptic operators with Hölder-continuous coefficients in vanishing chord-arc domains.* (with Simon Bortz, Tatiana Toro) *J. Funct. Anal.*, *285* (2023), no. 5.

8. *Uniform rectifiability and elliptic operators satisfying a Carleson measure condition. Part II: the large constant case.* (with Steve Hofmann, José María Martell, Svitlana Mayboroda, Tatiana Toro) (later combined with *Part I* of the series for publication) *Geom. Funct. Anal.* **31** (2021), 325-401.

9. *Two phase free boundary problem for Poisson kernels.* (with Simon Bortz, Max Engelstein, Max Goering, Tatiana Toro) *Indiana U. Math. J.* **71** no. 1 (2022), 251-306.

10. *Dirichlet energy-minimizers with analytic boundary.* (with Camillo De Lellis) *Indiana Univ. Math. J.* **72** (2023), 1367-1428.

11. *Dirichlet problem in domains with lower dimensional boundaries.* (with Joseph Feneuil, Svitlana Mayboroda) *Rev. Mat. Iberoam.* **37** (2021), 821-910.

12. *Square function estimates, BMO Dirichlet problem, and absolute continuity of harmonic measure on lower-dimensional sets.* (with Svitlana Mayboroda) *Anal. PDE* **12** (2019), no. 7, 1843-1890.

13. *Uniform rectifiability and elliptic operators satisfying a Carleson measure condition. Part I: the small constant case.* (with Steve Hofmann, José María Martell, Svitlana Mayboroda, Tatiana Toro) arXiv:1710.06157.

14. *Boundary rectifiability and elliptic operators with $W^{1,1}$ coefficients.* (with Tatiana Toro) *Adv. Calc. Var.* **14** (2021), 37-62.

15. *BMO solvability and the A_∞ condition of the elliptic measure in uniform domains. J. Geom. Anal.* **28** (2018), no. 2, 866-908.

INVITED TALKS

Feb. 2024	Analysis seminar, Brown University
Feb. 2024	Geometry seminar, Lehigh University
Dec. 2023	Seminar at the Morningside Center of Mathematics, Chinese Academy of Sciences
Jul. 2023	Workshop on *Applied and Computational Differential Geometry and Geometric PDEs*, Banff International Research Station (BIRS)
Jun. 2023	Workshop on the *Regularity Theory for Free Boundary and Geometric Variational Problems III*, Levico Italy
Jun. 2023	Conference on *Harmonic Analysis, PDEs, and GMT*, dedicated to Prof. Luis Escauriaza, Bilbao Spain
May. 2023	Analysis & PDE seminar, Stanford University

Apr. 2023	PDE & Analysis seminar, University of Kentucky
Mar. 2023	Applied analysis seminar, Louisiana State University
Jan. 2023	2023 Joint Mathematics Meetings, special session on *Recent Developments in Geometric Measure Theory*, Boston
Nov. 2022	Differential Geometry seminar, National Center for Theoretical Sciences in Taiwan
Oct. 2022	86th Midwest PDE seminar, University of Missouri in Columbia
Sep. 2022	Nonlinear Analysis Seminar, Rutgers University
Aug. 2022	Calculus of Variations workshop, Oberwolfach
May. 2022	CBMS Conference on *Analysis, Geometry, and PDEs in a Lower-Dimensional World*, Florida State University
May. 2022	Analysis & PDE seminar, Stanford University
Apr. 2022	2022 Joint Mathematics Meetings, special session on *Geometric Measure Theory*
Apr. 2022	Workshop on Geometric Measure Theory and Harmonic Analysis, Hausdorff Research Institute for Mathematics
Mar. 2022	AMS Spring Central Sectional Meeting, special session on *A Women in Analysis Research Network Event*
Mar. 2022	MSRI Hot Topics Workshop: *Regularity Theory for Minimal Surfaces and Mean Curvature Flow*
Feb. 2022	UK virtual harmonic analysis seminar
Feb. 2022	Analysis and Probability seminar, University of Connecticut
Dec. 2021	Analysis seminar, Yale University
Nov. 2021	Analysis and PDE seminar, MIT
Oct. 2021	Geometry and Analysis seminar, Columbia University
Oct. 2021	Center for Nonlinear Analysis seminar, Carnegie Mellon University
Oct. 2021	Analysis and Partial Differential Equations Seminar, Johns Hopkins University
Oct. 2021	Virtual analysis and PDE seminar (hosted by the University of California Irvine)
Oct. 2021	Fields Institute Geometric Analysis Colloquium, Toronto
Oct. 2021	Geometric Analysis and Applications seminar, Yale University
Sep. 2021	Workshop on the *Regularity Theory for Free Boundary and Geometric Variational Problems*, Levico Italy
Jun. 2021	Minisymposium in *Harmonic Analysis and PDE*, 8th European Congress of Mathematics, Slovenia
Jun. 2021	Analysis seminar, University of Warwick
May. 2021	Analysis & PDE seminar, Stanford University
Apr. 2021	Geometric Analysis seminar, University of California San Diego
Mar. 2021	PDE seminar, University of Minnesota
Dec. 2020	Rainwater seminar, University of Washington

Oct. 2020	Virtual Maxwell Analysis Seminar, University of Edinburgh and Heriot-Watt University
Sep. 2020	Mid-Atlantic Analysis Meeting seminar
Aug. 2020	Analysis & PDE summer seminar, University of Minnesota
Aug. 2020	Calculus of Variations workshop, Oberwolfach
Jul. 2020	Analysis and PDE online seminar
May. 2020	PDE CDT Lunchtime seminar, Center for Doctoral Training in PDEs, University of Oxford
May. 2020	(cancelled due to COVID) Geometric analysis conference, Fordham University
Jan. 2020	PDE seminar, Purdue University
Nov. 2019	Calderón-Zygmund analysis seminar, University of Chicago
Nov. 2019	2019 Prairie analysis seminar
Jun. 2019	Harmonic analysis and PDEs conference, University of Helsinki
Mar. 2019	AMS special session on *Topics at the Interface of Analysis and Geometry*, Honolulu HI
Mar. 2019	AMS special session on *Interactions between GMT, PDE and Harmonic Analysis*, Honolulu HI
Feb. 2019	IAS analysis seminar
Feb. 2019	IAS mathematical conversations
Dec. 2018	Princeton/IAS GMT seminar
Nov. 2018	Analysis seminar, University of Pennsylvania
Nov. 2018	AMS special session on *Harmonic Analysis and Partial Differential Equations*, Fayetteville, AR
Sep. 2018	Harmonic analysis and PDE's seminar, CUNY Graduate Center
Jul. 2018	Research program seminar, PCMI Harmonic Analysis program
May. 2018	Rainwater seminar, University of Washington
Apr. 2018	AMS special session on *Regularity of PDEs on Rough Domains*, Boston MA
Apr. 2018	AMS special session on *Geometric Measure Theory and Partial Differential Equations*, Portland OR
Sep. 2017	Seminario de análisis y aplicaciones, ICMAT Madrid
Jun. 2017	S.I.G.M.A. seminar, University of Connecticut
Jun. 2017	Analysis seminar, Nankai University
Mar. 2017	Student harmonic analysis and PDE seminar, University of California, Berkeley
Mar. 2017	Graduate student seminar at MSRI, Berkeley
Sep. 2016	AMS special session on *Geometric Aspects of Harmonic Analysis*, Brunswick ME

INVITED MINI-COURSES

- Mini-course on *Almgren's regularity of area-minimizing currents and multi-valued functions*, workshop on *Geometric measure theory and applications*, University College London, Jul. 25-27, 2022

- Mini-course on the *Quantitative unique continuation of elliptic PDEs*, workshop on the *Free boundary problems and related topics*, ETH Zurich, Jul. 4-8, 2022

CONFERENCE REPORTS, SURVEYS, ETC.

- *Quantitative boundary unique continuation and the estimate of the singular set* (extended abstract), Oberwolfach Reports No. 37 (2022), https://publications.mfo.de/handle/mfo/3976

- *Boundary regularity of area-minimizing currents: a linear model with analytic interface* (extended abstract), Oberwolfach Reports No. 22 (2020), https://publications.mfo.de/handle/mfo/3792

PROFESSIONAL ACTIVITIES & SERVICE

Jul. 2023 -	**Graduate committee**, Johns Hopkins University
Apr. 2023	**Speaker** at the *Path Through Math* event organized by the UChicago's Society of Women in Math (SWiM)
Dec. 2022	**Co-organizer** of a session on *Harmonic functions and Laplace eigenfunctions* at the 2022 Pacific Rim Mathematical Association Congress, Vancouver, Canada
Summer 2021	Mentoring an undergraduate reading project on the topic of geometric measure theory, student: Oliver Thakar (Princeton University)
Oct. 2020 – May. 2023	**Co-organizer** of the Calderón-Zygmund analysis seminar, University of Chicago
Jul. 2020	Taught a **mini-course** (virtually) at the University of Chicago summer REU
Jan. 2020	**Co-organizer** of JMM session on *Interfaces between PDEs and geometric measure theory*, Denver CO
Nov. 2019 – Feb. 2021	**Committee member** at the departmental EDI (Equity, Diversity and Inclusion) committee, University of Chicago
May. 2019	**Teaching assistant** at the Women and Mathematics program *Topics in geometric analysis*, Institute for Advanced Study
	– Held regular review sessions to support the *Terng lecture series* given by Prof. T. Toro.
2018 –	**Referee** for multiple journals, including Adv. Math., Arch. Rational Mech. Anal., Commun. Part. Diff. Eq., Comm.Pure Appl.Math., Duke Math. J., Geom. Funct. Anal., Int. Math. Res. Notices, J. Geom. Anal., J. London Math. Soc., Mem. Am. Math. Soc., etc.
Apr. 2019	**Co-organizer** of AMS special session on *Regularity Theory of PDEs and Calculus of Variations on Domains with Rough Boundaries*, Hartford CT

Jul. 2018	**Teaching assistant** at the PCMI Graduate Summer School, Park City UT
	– Held regular problem sessions to support the lectures by Prof. S. Hofmann.
Summer 2018	Co-organizer of preparatory sessions for graduate students' **prelim/qualification exam** on *Real analysis*, University of Washington
May. 2018	**Panelist** at the panel on academic job market, University of Washington
2015 - 2016	**Co-organizer** of Graduate Student Analysis Seminar, University of Washington
2012	Student analysis seminar, École Normale Supérieure

Grants, Honors & Awards

2019-2023	NSF Postdoctoral Research Fellowship, Award #1902756
May. 2020	(postponed due to COVID) London Mathematical Society's *Visiting speakers to the UK*, hosted by Prof. N. Wickramasekera at the University of Cambridge (one month)
2018	College of Arts and Sciences *Graduate Medalist* in Natural Sciences, University of Washington
	– annual award to one graduating student in each of the divisions of *Humanities, Natural Sciences* and *Social Sciences*
Sep. 2017	Tanzi-Egerton Fellowship, University of Washington
Sep. 2015	Academic Excellence Award, University of Washington
2013-2016	Microsoft Scholar Award, University of Washington
2011-2013	Sophie Germain International Master scholarship, Jacques Mathematics Foundation (FMJH)
2010	Academic Innovation Award, Peking University

Selected Teaching Experiences

Autumn 2023	**Instructor** of *Real Analysis*, Johns Hopkins University
	– first-year graduate course in real analysis
Autumn 2022 Winter 2023	**Instructor** of IBL-style *Honors Calculus*, University of Chicago
Autumn 2020 Winter 2021	**Instructor** of *Honors Calculus*, in hybrid form (in-person and virtual), University of Chicago
	– IBL (Inquiry-based learning) style for highly selective first-year undergraduate students, with a strong emphasis on students presentations and class discussions
July 2020	**Instructor** of a mini-course on *Harmonic measures*, University of Chicago summer REU

Summer 2018	**Instructor** of *Introduction to Differential Equations*, University of Washington
Autumn 2017	**Grader** for *Complex Analysis*, University of Washington
Autumn 2016	**Instructor** of *Introduction to Differential Equations*, University of Washington
Autumn 2015	**Grader** for *Fundamental Concepts of Analysis*, University of Washington
Spring 2015	**TA** for *Calculus with Analytic Geometry III*, University of Washington
Winter 2014	**TA** for *Application of Calculus to Business and Economics*, University of Washington
	– calculus class for students majoring in business and economics, where we focus more on problem-solving techniques with applications in economics and finance
Spring 2014	**TA** for *Calculus with Analytic Geometry II*, University of Washington

Conferences & Workshops Attended

- Oberwolfach workshop on Partial Differential Equations, Jul. 23-28, 2023

- Joint Northwestern-UChicago Geometric Analysis Seminar, Apr. 22, 2023

- Zhentong Chern-Weil symposium, University of Chicago, Oct. 7-9, 2022

- Summer school on *Geometric analysis and calibrated geometries*, ETH Zurich, Jun. 13-17, 2022

- *Geometric Measure Theory and its Applications*, a conference on the occasion of Bob Hardt's retirement, Rice University, Mar. 17-20, 2022

- Trimester program on the *Interactions between Geometric measure theory, Singular integrals, and PDE*, Hausdorff Research Institute for Mathematics, Bonn, Jan. 10 - Apr. 22, 2022

- *Geometric measure theory and applications*, Cortona (Italy), Palazzone SNS, Aug. 30 - Sep. 3, 2021

- FRG *New Challenges in GMT*, University of Washington, Seattle, Aug. 24 - Sep. 4, 2020

- Oberwolfach workshop on the *Calculus of Variations*, Aug. 2-8, 2020

- *The 27th Southern California geometric analysis seminar*, University of California, Irvine, Feb. 8-9, 2020

- Workshop on *Illustrating Geometry and Topology*, ICERM, Brown University, Sep. 16-20, 2019

- *Geometric measure theory and applications: from geometric analysis to free boundary problems*, Cetraro (Italy), Sep. 2-6, 2019

- Nonlinear PDEs discussion group at Courant Institute, Apr. 19, 2019

- Workshop on *Variational methods in geometry*, IAS, Nov. 5-9, 2018 and Mar. 4-8, 2019

- Allen-Cahn/Ginzburg-Landau reading group, IAS, Sep.-Dec. 2018

- PCMI Summer Session on harmonic analysis, Park City, Jul. 1-21, 2018

- *Harmonic analysis and geometric measure theory*, conference in honor of Guy David, CIRM Marseille, Oct. 2-6, 2017

- *Recent developments in harmonic analysis* workshop, MSRI, May. 15-19, 2017

- *Harmonic analysis and elliptic equations on real Euclidean spaces and on rough sets*, MSRI summer graduate school, Jun. 13-24, 2016

- Introductory workshop: *Randomness and long-time dynamics in nonlinear evolution differential equations*, MSRI, Aug. 24-28, 2015

- *Reflectionless measures, Wolff's potentials and rectifiability*, NSF-CBMS Regional Conference in the Mathematical Sciences, North Dakota State University, Jul. 27-31, 2015

- Workshop for women in analysis and PDE, Institute for Mathematics and its Applications, May. 28-31, 2015

- The eighteenth Rivière-Fabes symposium on Analysis and PDE & Spring 2015 Midwest PDE conference, University of Minnesota, Apr. 17-19, 2015

- *Uniqueness in analysis and geometry*, Massachusetts Institute of Technology, Dec. 10-11, 2014

- *Harmonic analysis and PDEs recent developments and future directions*, conference in honor of Carlos Kenig, University of Chicago, Sep. 19-21, 2014

- *Dispersive partial differential equations*, MSRI summer graduate school, Jun. 16-27, 2014

- International conference on nonlinear PDEs and satellite workshop *Free surface & interface problems*, University of Oxford, Sep. 10-15, 2012

- *Inverse problems and partial differential equations* summer school, University of Washington, Jul. 2-20, 2012

- Hadamard lectures on *Error estimates in stochastic homogenization* by Prof. Felix Otto, University of Paris-Sud XI, Mar.-Apr. 2012