

Zihui ZHAO

PERSONAL DATA

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EMPLOYMENT

(EXPECTED) 2023 - | Assistant Professor (tenure track), **Johns Hopkins University**
2019 - | 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. *Expansion of harmonic functions near the boundary of Dini domains.* (with Carlos Kenig) arXiv:2107.06324
2. *Elliptic measures for Dahlberg-Kenig-Pipher operators: Asymptotically optimal estimates.* (with Simon Bortz, Tatiana Toro) to appear on *Math. Ann.*, arXiv:2105.12200
3. *Boundary unique continuation on C^1 -Dini domains and the size of the singular set.* (with Carlos Kenig) to appear on *Arch. Ration. Mech. An.*, arXiv:2102.07281
4. *Optimal Poisson kernel regularity for elliptic operators with Hölder-continuous coefficients in vanishing chord-arc domains.* (with Simon Bortz, Tatiana Toro) arXiv:2010.03056

5. *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
6. *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
7. *Dirichlet energy-minimizers with analytic boundary.* (with Camillo De Lellis) to appear on *Indiana. U. Math. J.*, arXiv:1906.10097
8. *Dirichlet problem in domains with lower dimensional boundaries.* (with Joseph Feneuil, Svitlana Mayboroda) *Rev. Mat. Iberoam.* **37** (2021), 821-910
9. *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
10. *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
11. *Boundary rectifiability and elliptic operators with $W^{1,1}$ coefficients.* (with Tatiana Toro) *Adv. Calc. Var.* **14** (2021), 37-62
12. *BMO solvability and the A_∞ condition of the elliptic measure in uniform domains.* *J. Geom. Anal.* **28** (2018), no. 2, 866-908

INVITED TALKS

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| 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 <i>Analysis, Geometry, and PDEs in a Lower-Dimensional World</i> , Florida State University |
| May. 2022 | Analysis & PDE seminar, Stanford University |
| Apr. 2022 | 2022 Joint Mathematics Meetings, special session on <i>Geometric Measure Theory</i> |
| 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 <i>A Women in Analysis Research Network Event</i> |
| Mar. 2022 | MSRI Hot Topics Workshop: <i>Regularity Theory for Minimal Surfaces and Mean Curvature Flow</i> |
| 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*, 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

- Dec. 2022 (upcoming) **Co-organizer** of a session on *Harmonic functions and Laplace eigenfunctions* at the Pacific Rim Mathematical Association Congress 2021, Vancouver, Canada
- Summer 2021 Mentoring an undergraduate reading project on the topic of geometric measure theory, student: Oliver Thakar (Princeton University)

- Oct. 2020 – **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 – **Committee member** at the departmental EDI (Equity, Diversity and Inclusion) committee, University of Chicago
- Feb. 2021
- 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.*, *Int. Math. Res. Notices*, *J. Geom. Anal.*, *J. London Math. Soc.*, *Mem. Am. Math. Soc.*, *Potential Anal.* 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

- 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)
- 2019-2022 NSF Postdoctoral Research Fellowship, Award #1902756
- 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 2020 **Instructor** of *Honors Calculus*, in hybrid form (in-person and virtual), University of Chicago
Winter 2021
– 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

- 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