

XUWEN ZHU

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Employment:

2020 – Assistant Professor, Northeastern University
2020 Spring Lecturer, MIT
2019 Fall Uhlenbeck Postdoctoral Fellow, MSRI
2018 – 2019 Morrey Visiting Assistant Professor, UC Berkeley
2015 – 2018 Szegő Assistant Professor, Stanford University

Education:

2010 – 2015 Ph.D. Mathematics, Massachusetts Institute of Technology.
Thesis advisor: Richard Melrose
2006 – 2010 B.S. Mathematics, Peking University, China.

Papers:

1. *Existence of non-holomorphic minimal spheres in noncompact Calabi-Yau manifolds.*
In preparation.
2. *Noncollapsing degeneration of gravitational instantons.*
Joint with Yu-Shen Lin and Sidharth Soundararajan. In preparation.
3. *Tian-Yau metrics: Fredholm theory, Hodge cohomology and moduli spaces.*
Joint with Rafe Mazzeo. In preparation.
4. *Degenerating hyperbolic surfaces and spectral gaps for large genus.*
Joint with Yunhui Wu and Haohao Zhang. [arXiv:2201.03056](#)
Accepted by **Analysis & PDE**.
5. *Spherical conical metrics and harmonic maps to spheres.*
Joint with Mikhail Karphukhin. [arXiv:2104.10304](#)
Transactions of the AMS, Volume 375, Number 5, May 2022, Pages 3325–3350.
6. *Fundamental gaps of spherical triangles.* Joint with Shoo Seto and Guofang Wei.
[arXiv:2009.00229](#)
Annals of Global Analysis and Geometry 61, pages 1–19 (2022).
7. *Spectral properties of reducible conical metrics.* Joint with Bin Xu.
[arXiv:1909.00546](#)
Illinois Journal of Mathematics, Vol. 65, No. 2 (2021), 313–337.
8. *Conical metrics on Riemann surfaces, II: spherical metrics.*
Joint with Rafe Mazzeo. [arXiv:1906.09720](#)
International Mathematics Research Notices, Volume 2022, Issue 12, June 2022,
Pages 9044–9113
9. *Rigidity of a family of spherical conical metrics.* [arXiv:1902.02024](#)
New York Journal of Mathematics 26 (2020) 272–284.
10. *Spherical conic metrics and realizability of branched covers.* [arXiv:1805.03312](#)
Proceedings of the AMS, Volume 147, Number 4, April 2019, Pages 1805–1815.

11. *Conical metrics on Riemann surfaces, I: the compactified configuration space and regularity.* Joint with Rafe Mazzeo. [arXiv:1710.09781](#)
Geometry & Topology 24-1 (2020), 309–372.
12. *Boundary behaviour of Weil-Petersson and fiber metrics for Riemann moduli spaces.* Joint with Richard Melrose. [arXiv:1606.01158](#)
International Mathematics Research Notices, Volume 2019, Issue 16, Pages 5012–5065.
13. *Eleven dimensional supergravity equations on edge manifolds.* [arXiv:1507.02322](#)
Annales Henri Poincaré, Volume 19, Issue 8 (2018), 2347–2400.
14. *Eigenvalue resolution of self-adjoint matrices.* [arXiv:1504.07581](#)
Pacific Journal of Mathematics, Vol. 288 (2017), No. 1, 241–255.
15. *Resolution of the canonical fiber metrics for a Lefschetz fibration.* Joint with Richard Melrose. [arXiv:1501.04124](#)
Journal of Differential Geometry, Volume 108, Number 2 (2018), 295–317.
16. *Numerical Investigation of the Heat Partition Factor During Bolt Tightening.* Joint with Laila Guessous and Gary C. Barber.
Tribology Transactions, Volume 54, Issue 1, 2010

Honors and Awards:

- 2023 – 2026 NSF Geometric Analysis DMS-2305363
“Microlocal Analysis and Singularities”
- 2022 – 2023 College of Science Equity, Diversity, Inclusion, and Justice Faculty Award, NEU
- 2022 College of Science Excellence in Research Award, NEU
- 2019 – 2023 NSF Geometric Analysis DMS-1905398 (DMS-2041823 after transfer)
“Moduli Spaces and Geometric Microlocal Analysis”
- 2019 AWM–NSF Travel Grant
- 2017 – 2019 AMS–Simons Travel Grant
- 2017 AWM–NSF Travel Grant
- 2014 – 2015 Graduate Student Appreciation Fellowship for excellent teaching, MIT
- 2010 – 2011 Presidential Fellowship, MIT

Talks:

- 2024 Nov Conference in Geometric Analysis, Sapienza University, Italy (upcoming)
- 2024 May “From Microlocal to Global Analysis”, MIT (upcoming)
- 2024 Apr Special session “Recent Developments in Geometric Analysis”, AMS Spring Eastern Sectional Meeting, Howard University (upcoming)
- 2024 Feb
- 2024 Jan “Celebrating singularities: conference in honor of Richard Melrose”, New College of Florida
- 2023 Dec CMSA colloquium, Harvard
- 2023 Nov NEAT MAPS mini conference in topology and quantum field theory, Boston University
- 2023 Nov New England Dynamics Seminar, Boston University
- 2023 Mar Analysis Seminar, Yale University

2023 Feb	Analysis and Geometry Seminar, Northeastern University
2022 Nov	“Geometrical Inverse Problems” Workshop, ESI (online)
2022 Oct	Math Club Faculty Talk, Northeastern University (online)
2022 Aug	“Geometry and physics of ALX metrics in gauge theory” Workshop, AIM (online)
2022 June	“Spherical surfaces and related topics”, Cortona, Italy (online)
2022 June	International Conference on PDEs and Geometric Analysis, SJTU (online)
2022 Mar	March Speaker Series, AWM Northeastern (online)
2022 Jan	Webinar on Analysis & PDE (online)
2022 Jan	Analysis & PDE Seminar, UNC (online)
2021 Oct	Geometry and Physics Seminar, Boston University
2021 Sep	Topology and Geometry Seminar, UQAM (online)
2021 Sep	Topology Seminar, Northeastern University
2021 June	“What is...” Seminar, Northeastern University (online)
2021 June	“Analysis, Geometry and Topology of singular PDE”, Oberwolfach (online)
2021 May	Workshop “Analysis on Singular Spaces”, BIRS Oaxaca (online)
2021 May	Geometric Analysis Conference, Rutgers University (online)
2021 Mar	Differential Geometry Seminar, University of Iowa (online)
2020 Dec	Differential Geometry Seminar, SCMS (online)
2020 Dec	2020 Winter CMS Meeting Section “Geometric and Computational Spectral Theory” (online)
2020 Nov	Workshop “Geometry and analysis on singular spaces”, USTC (online)
2020 Sep	Analysis-Geometry Seminar, Northeastern University (online)
2020 Jun	“Spectral Geometry in the Clouds” (online)
2020 Feb	PDE/Analysis Seminar, MIT
2020 Jan	Frontier of Analysis and Geometry of Teichmuller Spaces, TSIMF, China
2019 Dec	Geometry-Topology Seminar, University of Maryland
2019 Dec	Special Seminar, Brandeis University
2019 Dec	Special Seminar, Northeastern University
2019 Nov	Mathematical Colloquium, UC San Diego
2019 Nov	Iterated structures on manifolds seminar, MSRI
2019 Oct	“Recent Developments in Microlocal Analysis”, MSRI
2019 Sep	Microlocal Analysis Regular Seminar, MSRI
2019 Aug	“Connections for Women: Microlocal Analysis”, MSRI
2019 Aug	“Connections for Women: Holomorphic Differentials in Mathematics and Physics”, MSRI
2019 July	Differentialgeometrie im Grossen, Oberwolfach, Germany
2019 June	Geometry Seminar, Tsinghua University, China
2019 June	Microlocal Analysis and Applications, SCMS, China
2019 May	Microlocal Methods in Analysis and Geometry, CIRM, France
2019 Apr	Harmonic Analysis and Differential Equations Student Seminar, UC Berkeley
2019 Apr	34th Geometry Festival, University of Maryland
2019 Apr	Topology Seminar, UC Berkeley
2019 Mar	Graduate Student Conference in Geometry and Topology, UIUC
2019 Mar	Department Colloquium, UIUC

2018 Oct	Riverside Mathematics Workshop for Excellence and Diversity, UC Riverside
2018 May	Informal Geometry & Topology Seminar, Stanford University
2018 Mar	Bay Area Microlocal Analysis Seminar, UC Berkeley
2017 Dec	Differential Geometry Seminar, UC Santa Barbara
2017 Oct	Informal Complex Analysis & PDE Seminar, Columbia University
2017 Oct	Differential Geometry & Geometric Analysis Seminar, Princeton University
2017 Oct	Geometry/Topology Seminar, Rutgers University
2017 Sep	PDE/Analysis Seminar, MIT
2017 Aug	Workshop “The Analysis of Gauge-Theoretic Moduli Spaces”, BIRS, Canada
2017 Aug	SURIM, Stanford University
2017 July	Third Symposium on Spectral and Scattering Theory, Florianópolis, Brazil
2017 June	Workshop “Analysis and Topology in Interaction”, Cortona, Italy
2017 June	Workshop “Sen Conjecture and Beyond”, UCL, UK
2017 June	Geometric Analysis Seminar, Peking University, China
2017 June	Geometry and Physics Seminar, Tsinghua University, China
2017 June	Geometric Analysis Seminar, Shanghai Jiaotong University, China
2017 May	Differential Geometry/PDE Seminar, University of Washington
2017 May	May Midwestern Microlocal Meeting, Purdue University
2017 May	Geometry and Analysis Seminar, UC Santa Cruz
2017 Apr	PDE/Analysis Seminar, MIT
2017 Mar	PDE/Analysis Seminar, ANU, Australia
2017 Feb	Moduli Space Learning Seminar, Stanford University
2016 Dec	Workshop on “Geometric and Spectral Methods in Partial Differential Equations”, CMO, Mexico
2016 Jul	Analysis Seminar, Shanghai Jiaotong University, China
2016 May	Paris/Berkeley/Bonn/Zurich Analysis Seminar, UC Berkeley
2015 Dec	Geometry and Analysis Seminar, UC Santa Cruz
2015 Nov	Departmental Colloquium, HKUST, Hong Kong
2015 Oct	Analysis & PDE Seminar, Stanford University
2015 Aug	Workshop on “Semi-classical Analysis: Spectral Theory and Resonances”, Erwin Schrödinger Institute, Austria
2015 Jul	Workshop on Metric and Analytic Aspects of Moduli Spaces, Isaac Newton Institute, UK
2015 Apr	Student Harmonic Analysis and Differential Equations Seminar, UC Berkeley
2015 Apr	Bay Area Microlocal Analysis Seminar, Stanford University
2015 Feb	Mathematical Physics and Harmonic Analysis Seminar, Texas A&M University
2015 Jan	Mini-workshop on Semiclassical and Microlocal Analysis, USTC, China
2014 Nov	Geometric Analysis Reading Seminar, UCL, UK
2014 Nov	Geometric Scattering Theory and Applications Workshop, BIRS, Canada
2014 Nov	Students Analysis Seminar, MIT
2014 Oct	Analysis and Geometry Seminar, Northeastern University
2014 Oct	Scattering and Spectral Theory Seminar, Purdue University
2014 Oct	PDE/Analysis Seminar, MIT
2014 Oct	Student Differential Geometry Seminar, Harvard University

2013 Mar Pure Math Graduate Student Seminar, MIT

Mini-courses:

2024 Jun MSRI Graduate Summer School Week long Minicourse (upcoming)
 2019 Sep MSRI Introductory Workshop: Microlocal Analysis
 2016 Jul Analysis Minicourse, YMSC, Tsinghua University, China

Conference and Program Organization:

2024 Summer Co-organizer, Workshop “Moduli spaces and Singularities”, CRM, Montreal (upcoming)
 2024 Fall Co-organizer, Program “Special Geometric Structures and Analysis”, MSRI (upcoming)

Teaching Experience:

Northeastern:

2024 Spring Math 1342 Calculus II for Science and Engineering Section 2 and Section 8
 2024 Spring Math 7771 Reading in Geometry
 2023 Fall Math 5101 Graduate Analysis I
 2023 Fall Math 7771 Reading in Geometry
 2023 Spring Math 5122 Graduate Geometry I
 2022 Fall Math 7771 Reading in Geometry
 2021 Fall Math 1342 Calculus II for Science and Engineering Section 1 and Section 5
 2020 Fall Math 1342 Calculus II for Science and Engineering Section 1
 2020 Fall Math 5101 Graduate Analysis I: Functions of One Variable

UC Berkeley:

2019 Spring Math 104 Introduction to Analysis Section 2 & 3, lecturer
 2018 Fall Math 104 Introduction to Analysis Section 6, lecturer

Stanford:

2018 Spring MATH 205C Graduate Real Analysis, lecturer
 2018 Spring MATH 171 Fundamental Concepts of Analysis, lecturer
 2017 Winter MATH 20 Introductory Calculus, lecturer
 2017 Winter MATH 131P Partial Differential Equations I, lecturer
 2016 Winter MATH 20 Introductory Calculus, lecturer
 2016 Fall MATH 171 Fundamental Concepts of Analysis, lecturer
 2015 Winter MATH 131P Partial Differential Equations I, lecturer
 2015 Fall MATH 131P Partial Differential Equations I, lecturer
 2015 Fall MATH 175 Functional Analysis, lecturer

MIT:

2020 Spring 18.03 Differential Equations, recitation instructor and course administrator
 2015 Summer 18.089 Review of Mathematics, lecturer
 2014 Spring 18.06 Linear Algebra, recitation instructor and course administrator
 2013 Fall 18.01 Calculus, recitation instructor and course administrator
 2013 Spring 18.100C Real Analysis, course assistant
 2012 Fall 18.01A/02A Calculus, recitation instructor

Mentoring Experience:

- 2021 – PhD advising:
Xuezhu Lu (co-advising with Ting Zhou, 2021-2023)
Xin Shen (co-advising with Ting Zhou, 2023-)
- 2022 - Undergraduate & Master Research:
Nick Payne (2022 Spring - 2023 Spring)
Molly Sager (2023 Fall -)
- 2022 - Undergraduate thesis committee member:
Zhenxun Liu (2022)
- 2021 - First-year graduate student mentor:
Connor Anderson (2021-2022)
Hongqin Zou (2022-2023)
Alia Yusaini (2023-)
- 2021 - Department of Mathematics Graduate Student Mentoring Program, Mentor:
Changchang Liu, Esha Srivastava (2021-2022)
Haolin Ji (2022-2023)
Jared Hutchison, Vandan Pokal, Shixu Luo (2023-)
- 2014 Winter Directed Reading Program (DRP)
- 2014 Summer Summer Program in Undergraduate Research (SPUR), MIT, preprints available
- 2013 Winter Directed Reading Program (DRP)
- 2012 Summer Summer Program in Undergraduate Research (SPUR), MIT, project results
available at <http://math.mit.edu/research/undergraduate/spur>

Other Conferences Attended:

- 2023 Jul “Spectral Theory and Mathematical Relativity”, ESI, Austria
- 2022 Aug “Analytic and Geometric Aspects of Spectral Theory”, BIRS, Oaxaca (online)
- 2021 Feb “Recent Advances in Global Analysis” in Honor of Gerardo Mendoza (online)
- 2020 Oct “Special holonomy and branes” Workshop, AIM (online)
- 2019 Nov “Holomorphic Differentials in Mathematics and Physics” Workshop, MSRI
- 2019 Aug MSRI Introductory Workshop: Holomorphic Differentials in Mathematics and Physics
- 2017 July Analytical aspects of hyperbolic flows, Nantes, France
- 2016 June “Analysis, Geometry and Topology of Stratified Spaces” Workshop, CIRM, France
- 2015 May May Midwest Microlocal Meeting, Northwestern University
- 2012 Sep “Weyl Law at 100” Workshop, Fields Institute, Canada
- 2012 Jul Workshop on Spectral Invariants on Singular Spaces, CRM, Canada
- 2012 Jun Inverse Problems Conference in honor of Gunther Uhlmann, UC Irvine
- 2011 Oct Microlocal Methods in Scattering and Spectral Theory, Northwestern University

Outreach:

- 2023 – Faculty advisor, Graduate Women-in-Math at Northeastern

- 2021 – Organizer, Graduate student mentoring program in Mathematics Department
- 2021 Dec: Academic Career Panel
- 2022 Mar: Industry Career Panel (virtual)
- 2022 Oct: Kick-off Dinner
- 2022 Nov: PhD/Postdoc Application Lunch Panel
- 2023 Feb: Mid-year Lunch
- 2023 Apr: End-of-Year Lunch
- 2023 Oct: kick-off lunch
- 2023 Oct: PhD/Postdoc Application Virtual Panel
- 2021 – Faculty advisor, AWM Northeastern University Chapter
- 2020 – Founder and faculty advisor, Northeastern University MathEMA (Mathematics Engagement and Mentorship Association)
- 2021 Faculty reviewer, New England Future Faculty Workshop
- 2019 Fall Panelist, MSRI Connection for Women Workshop
- 2016 – 2017 Organizer, Stanford Women in Math
- 2013 – 2015 Organizer, MIT Friends of the Arts
- 2011 – 2013 Chair, Graduate Women of MIT Mentoring Program

Service:

- 2018 – Referee: Int. Math. Res. Not, J Geom Anal, Proc. Am. Math. Soc, Adv. Math., Contemporary Mathematics series of the AMS, J.Éc. polytech. Math, Scientific Report
- 2023 Co-organizer, Math REU program
- 2021 Outside reviewer, NSERC
- 2020 - 2023 Member, INVEST hiring committee
- 2020 - 2023 Member, Department of Mathematics Graduate Committee
- 2020 Panelist, NSF-DMS
- 2014 – 2015 Organizer, Graduate Student Analysis Seminar

Miscellaneous experiences:

- 2013 Quantitative Research Intern, Citadel
- 2009 Undergraduate Researcher, Oakland University