

Yuzhou (Joey) Zou

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Research Interests

Microlocal Analysis, Inverse Problems, Partial Differential Equations.

Employment

- 2022– Northwestern University, Boas Assistant Professor
Postdoctoral mentor: Jared Wunsch
- 2021–2022 University of California, Santa Cruz, Postdoctoral Scholar-Employee
Postdoctoral mentor: François Monard

Education

- 2016–2021 Stanford University, Ph.D. in Mathematics
Thesis advisor: András Vasy
Thesis title: *Microlocal analysis with applications to seismic inverse problems*
- 2012–2016 University of Chicago, B.S. with honors in Mathematics and B.A. in Chemistry
GPA: 3.83

Publications

- [7] “**Helmholtz quasi-resonances are unstable under most single-signed perturbations of the wave speed**”, joint work with Euan A. Spence and Jared Wunsch. Preprint, 2024. arxiv:2402.00843.
- [6] “**The Morse index theorem for mechanical systems with reflections**”, joint work with Jared Wunsch and Mengxuan Yang. Preprint, 2023. arxiv:2308.16162.
- [5] “**Boundary triples for a family of degenerate elliptic operators of Keldysh type**”, joint work with François Monard. To appear in *Pure and Applied Analysis*, 2023. arXiv:2302.08133.
- [4] “**The C^∞ -isomorphism property for a class of singularly-weighted X-ray transforms**”, joint work with Rohit K. Mishra and François Monard. *Inverse Problems*, Vol. 39, no. 2. 2023. DOI: 10.1088/1361-6420/aca8cb.
- [3] “**Microlocal Methods for The Elastic Travel Time Tomography Problem for Transversely Isotropic Media**”. Preprint, 2021. arXiv:2112.14455.
- [2] “**Streak artifacts from non-convex metal objects in X-ray tomography**”, joint work with Yiran Wang. *Pure and Applied Analysis*, **3** (2021), no. 2, 295-318. DOI: 10.2140/paa.2021.3.295.
- [1] “**Partial Global Recovery in the Elastic Travel Time Tomography Problem for Transversely Isotropic Media**”. To appear in *Annales de l’Institut Fourier*, 2019. arXiv:1910.01052.

Expository Papers

- [2] “**Entropy and kinetic formulations of conservation laws**”.
Written at the University of Chicago Mathematics REU 2015.
- [1] “**Modes of convergence for Fourier series**”.
Written at the University of Chicago Mathematics REU 2014.

Awards and honors

2021	Mathematics Distinguished Service Award, Dept. of Mathematics, Stanford University
2019	Robert Osserman Teaching Award, Dept. of Mathematics, Stanford University
2018, 2016	Honorable Mention, NSF Graduate Research Fellowship
2016	Paul R. Cohen Memorial Prize, University of Chicago Dept. of Mathematics Awarded to top graduating mathematics majors
2016	1st prize at the 23rd International Mathematics Competition, Blagoevgrad, Bulgaria (19th place overall)
2015	Honorable Mention, Putnam Exam

Teaching

Instructor, Northwestern University

Duties: write and give lectures, write homework and exams.

Winter 2024	Math 220-2	(Single-Variable Differential Calculus 2)
Winter 2023	Math 230-2	(Multivariable Integral Calculus)
Autumn 2022	Math 220-1	(Single-Variable Differential Calculus 1)

Instructor, University of California, Santa Cruz

Duties: write and give lectures, write homework and exams.

Spring 2022	Math 218	(Advanced Parabolic and Hyperbolic Partial Differential Equations)
Winter 2022	Math 121A	(Differential Geometry)

Instructor, Stanford University

Duties: write and give lectures, write homework and exams.

Summer* 2021	Math 19	(Single Variable Calculus 1)
Summer* 2020	Math 19	(Single Variable Calculus 1)

* - conducted online

Administrative Teaching Assistant, Stanford University

Duties: manage course logistics for a large (~ 300 students) course (e.g. arrange exam logistics, manage homework/exam grading, maintain course website, answer student emails, etc.), hold office hours, grade exams.

Spring* 2021	Math 51	(Linear Algebra and Multivariable Calculus)
Winter 2020	Math 51	(Linear Algebra and Multivariable Calculus)
Autumn 2018	Math 51	(Linear Algebra and Multivariable Calculus)

* - conducted online

Teaching Assistant, Stanford University

Duties: lead discussion sections, hold office hours, grade exams.

Winter 2018	Math 51	(Linear Algebra and Multivariable Calculus)
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Course Assistant, Stanford University

Duties: hold office hours, grade homework and exams, write solutions.

Autumn 2019	Math 205A	(Graduate Real Analysis 1)
Summer 2019	Math 19	(Single Variable Calculus 1)
Winter 2019	Math 205B	(Graduate Real Analysis 2)
Autumn 2017	Math 171	(Fundamental Concepts of Analysis)
Spring 2017	Math 172	(Lebesgue Integration and Fourier Analysis)
Autumn 2016	Math 20	(Single Variable Calculus 2)

Graduate Assistant, Stanford Online High School

Duties: help various aspects of Stanford Online High School operations, including researching high school math curricula, grading for various courses, etc..

Winter 2021 Research and Teaching Assistant
Autumn 2020 Research and Teaching Assistant

Reader, University of Chicago

Duties: grade homework.

Winter 2016 Math 255 (Abstract Algebra 2)
Autumn 2015 Math 254 (Abstract Algebra 1)
Spring 2015 Math 205 (Analysis in \mathbb{R}^n 3)
Winter 2015 Math 204 (Analysis in \mathbb{R}^n 2)
Autumn 2014 Math 203 (Analysis in \mathbb{R}^n 1)

Junior Tutor, University of Chicago

Duties: lead discussion section, grade homework.

Spring 2014 Math 133 (Elementary Functions and Calculus 3)
Winter 2014 Math 132 (Elementary Functions and Calculus 2)
Autumn 2013 Math 131 (Elementary Functions and Calculus 1)

Presentations and Posters

Research Talks

“A Gutzwiller Trace Formula for semiclassical Schrödinger operators with conormal potentials”

Dec 2023 Spectral and Scattering Theory Seminar, Purdue University

Nov 2023 University College London

Oct 2023 Geometry & Analysis Seminar, UC Santa Cruz

“Weighted X-ray mapping properties on the Euclidean and Hyperbolic Disks”

Oct 2023 Analysis & PDE Seminar, UC Berkeley

Oct 2023 Analysis & PDE Seminar, Stanford University

Sep 2023 Analysis & Differential Geometry Seminar, Emory University

“The Travel Time Tomography Problem in Transversely Isotropic Media: Microlocal Methods”

Sep 2023 Applied Inverse Problems 2023, Göttingen, Germany

Aug 2021 Inverse problems and nonlinearity, Helsinki

“X-ray mapping properties and degenerately elliptic operators”

Oct 2023 Spectral Theory and Applications, Texas A&M University

Sep 2023 Applied Inverse Problems 2023, Göttingen, Germany

Apr 2023 Inverse Problems Seminar, University of Washington

“Boundary triplets and Sobolev spaces associated to degenerate elliptic operators”

Jun 2023 Special Session on Inverse Problems and Imaging,

The 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications

“Streak artifacts from non-convex metal objects in X-ray tomography”

Apr 2023 PDE Seminar, Northwestern University

Sep 2021 HADES Seminar, UC Berkeley

May 2020 Geometry and Analysis Seminar, UC Santa Cruz

- “The C^∞ -isomorphism property for a class of singularly-weighted X-ray transforms”
 Oct 2022 Analysis Seminar, Northwestern University
 Aug 2022 Inverse Problems in Analysis and Geometry, Helsinki
 May 2022 Analysis and PDE Seminar, University of Kentucky
 Apr 2022 International Zoom Inverse Problems Seminar, UC Irvine
- “Microlocal Methods for The Elastic Travel Time Tomography Problem for Transversely Isotropic Media”
 Oct 2022 Geometry and Topology Seminar, NC State University
 Jul 2022 Workshop on Microlocal Analysis & PDEs, UCL
- “Microlocal Analysis with Applications to Seismic Inverse Problems”
 Oct 2021 Geometry and Analysis Seminar, UC Santa Cruz
- “The Travel Time Tomography Inverse Problem for Transversely Isotropic Elastic Media”
 Dec 2021 Session on “Geometric Tomography and Microlocal Analysis”, 2021 CMS Winter Meeting
 Mar 2020 Differential Geometry & PDE Seminar, University of Washington
 Feb 2020 Analysis & PDE Seminar, Stanford University
 Feb 2020 HADES Seminar, UC Berkeley
 Dec 2019 Graduate Student Seminar, Microlocal Analysis Program, MSRI
- “Machinery for a Local Transversely Isotropic Elasticity Inverse Problem”
 Jan 2019 MATH+X Symposium on Inverse Problems and Deep Learning in Space Exploration

Posters

- Aug 2022 Inverse Problems in Analysis and Geometry, Helsinki
 “The C^∞ -isomorphism property for a class of singularly-weighted X-ray transforms”
 Aug 2019 Summer Northwestern Analysis Program
 “Partial Global Recovery in the Elastic Travel Time Tomography Problem for Transversely Isotropic Media”

Conferences and Workshops Attended

- Nov 2023 “Spectral and Resonance Problems for Imaging, Seismology and Materials Science”, University of Reims Champagne-Ardenne, France
 Nov 2023 “Mentoring in the Mathematical Sciences”, Rice University, Houston, TX
 Oct 2023 “Spectral Theory and Applications”, Texas A&M University, College Station, TX
 Sep 2023 “Applied Inverse Problems 2023”, Göttingen, Germany
 Aug 2023 “Workshop on Mathematical Trends in Medical Imaging”, University of Chicago, Chicago, IL
 Jul 2023 “Inverse Problems and Nonlinearity”, Banff International Research Station, Canada
 Jun 2023 “The 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications”, Wilmington, NC
 May 2023 “May Midwestern Microlocal Meeting”, Northwestern University, Evanston, IL
 May 2023 “TEACHx 2023”, Northwestern University, Evanston, IL
 Sep 2022 “At the Interface between Semiclassical Analysis and Numerical Analysis of Wave Scattering Problems”, MFO, Oberwolfach, Germany
 Sep 2022 “Geometric Applications of Microlocal Analysis”, Stanford University, CA
 Aug 2022 “Inverse Problems in Analysis and Geometry”, Helsinki, Finland

- Jul 2022 “Workshop on Microlocal Analysis & PDEs”, University College London, London, UK
- Jun 2022 “Conformal Geometry, Analysis, and Physics”, University of Washington, Seattle, WA
- Dec 2021 Session on “Geometric Tomography and Microlocal Analysis”, 2021 CMS Winter Meeting (online)
- Oct 2021 “Statistical Aspects of Non-Linear Inverse Problems”, Banff International Research Station, Canada (online)
- Aug 2021 “Inverse problems and nonlinearity”, Helsinki, Finland (online)
- Autumn 2019 Various seminars in the Microlocal Analysis Program, MSRI, Berkeley, CA
- Oct 2019 “Recent developments in microlocal analysis”, MSRI
- Sep 2019 “Introductory Workshop: Microlocal Analysis”, MSRI
- Jul 2019 “Summer Northwestern Analysis Program”, Northwestern University, Evanston, IL
- Jun 2019 “Microlocal Analysis and Applications”, Shanghai Center for Mathematical Sciences, Fudan University, Shanghai, China
- Jun 2019 “The 5th East Asia Section of IPIA Young Scholars Symposium”, Chinese Academy of Sciences, Beijing, China
- Apr 2019 “Mathematics in Optical Imaging”, Institute for Mathematics and its Applications, Minneapolis, MN
- Apr 2019 “Probing the Earth and the Universe with Microlocal Analysis”, Banff International Research Station, Canada
- Mar 2019 “March Midwestern Microlocal Meeting”, Purdue University, West Lafayette, IN
- Jan 2019 “MATH + X Symposium on Inverse Problems and Deep Learning in Space Exploration”, Houston, TX
- Aug 2018 “Inverse problems, PDE and geometry”, University of Jyväskylä, Jyväskylä, Finland
- Jun 2018 “An Analyst, a Geometer and a Probabilist Walk Into a Bar”, Cardiff University, Cardiff, UK
- May 2018 “ISM Discovery School in Shape Optimization and Spectral Geometry”, Université du Québec à Montréal, Montréal, Canada
- Jul 2017 “Summer Northwestern Analysis Program”, Northwestern University
- Jun 2015 “Chicago Summer School in Analysis”, University of Chicago
- Summer 2015 “University of Chicago Mathematics REU”, University of Chicago
- Summer 2014 “University of Chicago Mathematics REU”, University of Chicago

Seminars Organized

- Winter 2018 Student Analysis Seminar, Stanford University
- Autumn 2017 Kiddie Colloquium, Stanford University

Mentoring and Outreach

- Autumn 2021, Directed Reading Program, University of California, Santa Cruz
–*Directed undergraduate reading project in Fourier analysis.*
- Spring 2021, TA Mentoring Program, Stanford University
- Winter 2021, –*Mentored first-time teaching assistants by observing sections and providing*
- Spring 2020, *feedback.*

Winter 2020,
 Autumn 2019
 Spring 2021, Directed Reading Program, Stanford University
 Winter 2021, *–Directed undergraduate reading projects in Fourier analysis, complex analysis, ergodic theory, geometric measure theory, Ramsey theory, Markov chains, and distribution theory.*
 Fall 2020,
 Winter 2020,
 Winter 2019,
 Autumn 2018,
 Spring 2018,
 Autumn 2017,
 Spring 2017
 Autumn 2020, Workshop on best teaching practices for graduate students, Stanford University
–Moderated a panel regarding effective strategies for being an effective TA.
 Summer 2016 Summer Analysis Bootcamp, University of Chicago
–Teaching assistant for summer program for advanced undergraduates in analysis.
 Summer 2013 Young Scholars Program, University of Chicago
–Teaching assistant for summer math program for high school students.
 Summer 2013 SESAME Program, University of Chicago
–Teaching assistant for certification program for middle school mathematics teachers.
 Spring 2013 Neighborhood Schools Program, University of Chicago
–Tutor for after-school program at local elementary schools

Other Information

Languages (natural): Mandarin Chinese (native), English (native), Cantonese (basic)
 Languages (computer): Python (proficient), LaTeX (proficient)
 Citizenship: United States of America