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

[8] "**The hyperbolic X-ray transform: new range characterizations, mapping properties and functional relations**", joint work with Nikolas Eptaminitakis and François Monard. Preprint, 2024. arxiv:2405.02521.

[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.

Spring 2024	Math 220-2	(Single-Variable Differential Calculus 2)
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 ($\sim$ 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)

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)

Research Talks

"A Gutzwiller Trace Formula for semiclassical Schrödinger operators with conormal potentials"

Mar 2024	Ohio River Analysis Meeting, University of Kentucky
Feb 2024	Texas Analysis and Mathematical Physics Symposium, Texas A&M University
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

Recent Conferences and Workshops Attended

Mar 2024 "13th Ohio River Analysis Meeting", University of Kentucky, Lexington, KY
Feb 2024 "Texas Analysis and Mathematical Physics Symposium"', Texas A&M University, College Station, TX
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

Seminars Organized

2023- 2024	Analysis Seminar, Northwestern University (co-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.*
Autumn 2019, to Spring 2021	TA Mentoring Program, Stanford University (5 quarters) *–Mentored first-time teaching assistants by observing sections and providing feedback.*
Autumn 2017, to Spring 2021	Directed Reading Program, Stanford University (9 quarters) *–Directed undergraduate reading projects in Fourier analysis, complex analysis, ergodic theory, geometric measure theory, Ramsey theory, Markov chains, and distribution theory.*
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

Last updated May 6, 2024