# 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

[9] "**Asymptotic Expansion of the Eigenvalues of a Bathtub Potential with Quadratic Ends**". Preprint, 2024. arXiv:2408.09816.

[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. To appear in *Journal of Differential Equations*, 2024. arXiv:2402.00843.

[6] "**The Morse index theorem for mechanical systems with reflections**", joint work with Jared Wunsch and Mengxuan Yang. *Nonlinearity*, Vol. 37, no. 8. 2024. DOI: 10.1088/1361-6544/ad5636.

[5] "**Boundary triples for a family of degenerate elliptic operators of Keldysh type**", joint work with François Monard. *Pure and Applied Analysis*, Vol. 6, no. 2, 541-580. 2024. DOI: 10.2140/paa.2024.6.541.

[4] "**The $C^\infty$-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*, Vol. 3, no. 2, 295-318. 2021. DOI: 10.2140/paa.2021.3.295.

[1] "**Partial Global Recovery in the Elastic Travel Time Tomography Problem for Transversely Isotropic Media**". *Annales de l'Institut Fourier*, Vol. 74, no. 5, 2077-2139. 2024. DOI: 10.5802/aif.3617.

## 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<br>Awarded to top graduating mathematics majors |
| 2016 | 1st prize at the 23rd International Mathematics Competition, Blagoevgrad, Bulgaria<br>(19th place overall) |
| 2015 | Honorable Mention, Putnam Exam |

## Teaching

**Instructor, Northwestern University**
*Duties: write and give lectures, write homework and exams.*

| | | | |
|---|---|---|---|
| Spring | 2025 | Math 228-1 | Multivariable Differential Calculus for Engineers |
| Winter | 2025 | Math 220-2 | Single-Variable Differential Calculus 2 |
| 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.*

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|---|---|---|---|
| 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.*

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|---|---|---|---|
| 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.*

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|---|---|---|---|
| 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..*

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

**Reader, University of Chicago**
*Duties: grade homework.*

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|---|---|---|---|
| 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.*

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|---|---|---|---|
| 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 |

## Conferences Organized

Jun 2024 Microlocal Analysis and Quantum Dynamics
Summer school and conference, Northwestern University

## Seminars Organized

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|---|---|
| 2023-2024 | Analysis Seminar, Northwestern University (co-organized) |
| Winter 2018 | Student Analysis Seminar, Stanford University |
| Autumn 2017 | Kiddie Colloquium, Stanford University |

## Invited Conference Talks

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|---|---|---|
| Dec | 2024 | Harmonic and Microlocal Analysis in Partial Differential Equations, MATRIX |
| Oct | 2024 | Special Session on Harmonic Analysis, Partial Differential Equations, and Spectral Theory, 2024 AMS Fall Western Sectional |
| Oct | 2024 | Triangle Area Inverse Problems Weekend, NC State University |
| Aug | 2024 | Geometric Inverse Problems Summer School, UC Santa Cruz |
| Jun | 2024 | Great Lakes Mathematical Physics Meeting, Michigan State University |
| May | 2024 | SIAM Conference on Imaging Science, Atlanta |
| Mar | 2024 | Ohio River Analysis Meeting, University of Kentucky |
| Feb | 2024 | Texas Analysis and Mathematical Physics Symposium, Texas A&M University |
| Oct | 2023 | Spectral Theory and Applications, Texas A&M University |
| Sep | 2023 | Applied Inverse Problems 2023, Göttingen, Germany |
| Jun | 2023 | Special Session on Inverse Problems and Imaging, The 13th AIMS Conference on Dynamical Systems, Differential Equations and Applications |
| Aug | 2022 | Inverse Problems in Analysis and Geometry, Helsinki |
| Jul | 2022 | Workshop on Microlocal Analysis & PDEs, University College London |
| Dec | 2021 | Session on "Geometric Tomography and Microlocal Analysis", 2021 CMS Winter Meeting |
| Aug | 2021 | Inverse problems and nonlinearity, Helsinki |

## Invited Seminar Talks

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|---|---|---|
| Mar | 2025 | Colloquium, Oakland University |
| Oct | 2024 | Baby Inverse Problems Seminar (online) |
| Oct | 2024 | Inverse Problems Seminar, UC Irvine |
| Sep | 2024 | Analysis and Applied Mathematics Seminar, University of Illinois, Chicago |
| Dec | 2023 | Spectral and Scattering Theory Seminar, Purdue University |
| Nov | 2023 | University College London |
| Oct | 2023 | Analysis & PDE Seminar, UC Berkeley |
| Oct | 2023 | Geometry & Analysis Seminar, UC Santa Cruz |
| Oct | 2023 | Analysis & PDE Seminar, Stanford University |
| Sep | 2023 | Analysis & Differential Geometry Seminar, Emory University |
| Apr | 2023 | PDE Seminar, Northwestern University |
| Apr | 2023 | Inverse Problems Seminar, University of Washington |
| Oct | 2022 | Analysis Seminar, Northwestern University |
| Oct | 2022 | Geometry and Topology Seminar, NC State University |
| May | 2022 | Analysis and PDE Seminar, University of Kentucky |
| Apr | 2022 | International Zoom Inverse Problems Seminar, UC Irvine |
| Oct | 2021 | Geometry and Analysis Seminar, UC Santa Cruz |
| Sep | 2021 | HADES Seminar, UC Berkeley |

May 2020 Geometry and Analysis Seminar, UC Santa Cruz
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

Dec 2024 "Harmonic and Microlocal Analysis in Partial Differential Equations", MATRIX Institute, Australia
Oct 2024 "AMS Fall Western Sectional Meeting", UC Riverside
Oct 2024 "Triangle Area Inverse Problems Weekend", NC State University
Aug 2024 "Summer School: Geometric Inverse Problems and Inverse Problems for Elliptic Equations", UC Santa Cruz
Jul 2024 "NU Trends in Ergodic Theory", Northwestern University
Jun 2024 "Microlocal Analysis and Quantum Dynamics', Northwestern University
Jun 2024 "Great Lakes Mathematical Physics Meeting", Michigan State University
May 2024 "SIAM Conference on Imaging Sciences (IS24)", Atlanta, GA
May 2024 "From Microlocal to Global Analysis @ MIT", MIT
Mar 2024 "13th Ohio River Analysis Meeting", University of Kentucky
Feb 2024 "Texas Analysis and Mathematical Physics Symposium", Texas A&M University
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
Oct 2023 "Spectral Theory and Applications", Texas A&M University
Sep 2023 "Applied Inverse Problems 2023", Göttingen, Germany
Aug 2023 "Workshop on Mathematical Trends in Medical Imaging", University of Chicago
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
May 2023 "TEACHx 2023", Northwestern University

## Service to Profession

Peer reviewer for the following journals:

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| Transactions of the American Mathematical Society | (1 article refereed) |
| Inverse Problems | (1 article refereed) |
| SIAM Journal on Mathematical Analysis | (1 article refereed) |
| Inverse Problems and Imaging | (1 article refereed) |

## Mentoring and Outreach

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|---|---|---|
| Summer | 2025 | Northwestern Dynamics RTG REU (planned) |
| Summer | 2024 | Microlocal Analysis and Quantum Dynamics Summer School<br>*–Organized summer school for undergraduates, graduate students, and early career researchers, covering topics in semiclassical analysis and applications, in preparation for the conference of the same name. Planned logistics for lectures, problem sessions, and social activities for the participants.* |
| Autumn | 2021 | Directed Reading Program, University of California, Santa Cruz<br>*–Directed undergraduate reading project in Fourier analysis.* |
| Autumn | 2019 | TA Mentoring Program, Stanford University (5 quarters) |
| to Spring | 2021 | *–Mentored first-time teaching assistants by observing sections and providing feedback.* |
| Spring | 2017 | Directed Reading Program, Stanford University (9 quarters) |
| to Spring | 2021 | *–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<br>*–Moderated a panel regarding effective strategies for being an effective TA.* |
| Summer | 2016 | Summer Analysis Bootcamp, University of Chicago<br>*–Teaching assistant for summer program for advanced undergraduates in analysis.* |
| Summer | 2013 | Young Scholars Program, University of Chicago<br>*–Teaching assistant for summer math program for high school students.* |
| Summer | 2013 | SESAME Program, University of Chicago<br>*–Teaching assistant for certification program for middle school mathematics teachers.* |
| Spring | 2013 | Neighborhood Schools Program, University of Chicago<br>*–Tutor for after-school program at local elementary schools* |

## Other Information

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

*Last updated March 26, 2025*