Xinran Yu

University of Illinois Urbana-Champaign, Champaign, IL
xinran4@illinois.edu ◇ +1 (217) 550-2664 ◇ https://xinrany.github.io/home/

Education

University of Illinois Urbana-Champaign (UIUC), Champaign, IL 2019–2026
Ph.D in Mathematics: Expected May 2026
Research Focus: Conformal geometry, Modifying Einstein's Theory of General Relativity.

University of Liverpool, Liverpool, UK 2015–2017
BSc in Mathematics with Honors
Thesis: Analytic Continuation and Riemann Surfaces. Supervisor: Dr. Jon Woolf.

Xi'an Jiaotong-Liverpool University, Suzhou, China 2013–2015
BSc in Applied Mathematics

Preprints

Conformally Compact Metrics and the Lovelock Tensors to appear 2025

This paper explores the properties of conformally compact Lovelock metrics, confirming through elliptic regularity that a formal polyhomogeneity expansion is achieved for metrics close to the hyperbolic ball. It also examines obstructions to polyhomogeneity, the singular Yamabe-2q problem, and the metric filling problem for spin manifolds.

Witten Instanton Complex and Morse-Bott Inequalities on Stratified Pseudomanifolds 2024
with Gayana Jayasinghe and Hadrian Quan, arxiv 2412.12003

Projects

Analysis of US Mortality Data, Internship network in the mathematical sciences, UIUC Feb 2025
- Performed data cleaning, exploratory analysis, and visualization to highlight mortality trends using **Python**.
- Built predictive models (decision trees, random forests, KMeans, neural networks) to explore causes of death.

Bird-Aircraft Collision, Internship network in the mathematical sciences, UIUC Nov 2024
- Conducted statistical analysis, including multi-linear regression, log regression, and hypothesis testing.
- Modeled damage cost versus altitude and number of strikes using **Python**.

Safety Analysis of Autonomous Vehicles, ECE471 mini project, UIUC Sep 2024
- Analyzed AV safety using simulated data from Carla and real-world data from the California DMV.
- Used statistical analysis, Bayesian inference, and data visualization to assess and improve AV reliability.

Technical Skills

Programming Languages: Python (NumPy, Pandas, Matplotlib, Scikit-learn, PyTorch, Statsmodels, Seaborn), Mathematica
Data Analysis & Modeling: Statistical analysis, PDEs, machine learning, data science analytics
Languages: Chinese (native), English (fluent), German (translation project experience), Japanese (intermediate)

Related Courses: Partial Differential Equations, Differential Geometry, Functional Analysis, Machine Learning

Honors & Awards

Susan C. Morisato IML Scholarship, UIUC Summer 2025

Ruth V Shaff & Genevie I. Andrews Fellowship, UIUC Spring 2024

Teachers Ranked as Excellent by their Students, UIUC Spring and Fall 2021

Wills Prize in Mathematics, University of Liverpool Jul 2017

IMA Prize, University of Liverpool Jul 2017

Teaching & Mentoring

Instructor, Calculus II, UIUC Spring 2025 & 2022
- Delivered three weekly lectures, covering integral calculus, sequences, and series.
- Designed and managed course materials, including syllabus, assignments, quizzes, and exams.
- Provided student support through office hours, in-class discussions, and supplementary resources.

Graduate Team Leader, Illinois Math Lab, UIUC 2024–2025
Project: Historical Mathematical Models
Recipient of the Nancy D. Anderson Undergraduate Research Award for Spring 2024
- Led a team to catalog one of the worlds largest collections of historical mathematical models in collaboration with the University Library.
- Developed digital catalog descriptions using **Mathematica**, enhancing public exhibits and long-term access.
- Created educational materials and 3D print files for mathematical visualization outreach.

Graduate Team Leader, Illinois Geometry Lab, UIUC Fall 2019
Project: Simulating Multi-Soliton Solutions to NLS and KdV and Studying Interactions
- Simulated multi-soliton solutions to the nonlinear Schrdinger (NLS) equation with nonzero boundary conditions.
- Used **Python** for data visualization and model creation.
- Led the projects mid-semester presentation, open house event, and final report.

Teaching Assistant, UIUC 2019–present
- Led discussion sections for introductory and advanced Calculus courses.
- Provided individualized support to students and tutored differential equations with a focus on problem-solving.

Talks

Dirichlet-to-Neumann map for conformally compact Einstein metrics Oct 2024
Graduate Student Geometry and Topology Seminar at UIUC

Conformal geometry in Lovelock gravity theories Apr 2024
AWM Graduate Student Colloquium at UIUC

The fractional Laplacian through Dirichlet problem formulation Feb 2024
Graduate Geometry and Analysis Seminar at UIUC

Services & Enrichment

Translation Project, Mathematics Library, UIUC 2024-2025
- Revised and edited translations of the early 20th-century M. Schilling catalog from German to English.
- Collaborated with library staff to validate the documentation of mathematical models in Altgeld Hall.

Microlocal Analysis and Quantum Dynamics 2024 Summer 2024
Northwestern summer school

International TA Panel Panelist, UIUC Aug 2022
- Shared strategies for overcoming language barriers and improving communication as an international TA.
- Compared U.S. and international teaching methods, aiding adaptation to diverse academic environments.
- Provided advice on navigating cultural differences in academic expectations and classroom management.