XIAO (ANTHONY) HONG

📞 +1 (314)-857-4211 | ✉ ah282@rice.edu | 🔗 https://anthonyhongxiao.github.io/ | 📍 Houston, Texas

OBJECTIVE

Math PhD student building research depth in image processing and inverse problems (tomography, reconstruction, and computational imaging) with a strong theoretical foundation in PDE/geometry and statistical learning theory. Interested in translating rigorous ideas into practical systems via algorithm design, scalable implementation, and careful EDA/experimental validation, including applications in computer vision, computer graphics, and scientific imaging.

EDUCATION

Rice University   Houston, United States
Ph.D. in Mathematics | Supervisor: Maarten V. de Hoop | GPA: 4.00/4.00   *Aug 2025 – present*
- **Selected Courses**: Partial Differential Equations, Deep Learning, Quantum Ergodicity

Washington University in St. Louis   St. Louis, United States
B.S. in Economics & Computer Science; Double Major in Mathematics | GPA:3.99/4.00   *Aug 2021 – May 2025*
- **Selected Honors**: Brian Blank Award (awarded to distinguished junior(s) in mathematics), Dean's List (FL2021, SP2022, FL2023, SP2024), Freiwald Scholar, Tau Beta Pi Engineering Honor Society invitation (Top 8% of the McKelvey School of Engineering)

PUBLICATIONS

1. **Xiao Hong**, (2024, December). "The 2-Sheeted, 3-Sheeted, and Universal Coverings of Corresponding 2-Oriented Graph of Rank-2 Free Group." *MathStat Conference: Focusing on Mathematics and Statistics (FMS 2024).* Dean & Francis, https://doi.org/10.61173/0recy351.
2. **Xiao Hong**. (2020, December). "Study of Intergenerational Mobility and Urbanization Based on OLS Method and Ordered Probit Model." *2020 International Conference on Management Science Informatization and Economic Innovation and Development (MSIEID 2020).* IEEE, 10.1109/MSIEID52046.2020.00092.

RESEARCH EXPERIENCES

Rice University   Houston, United States
Research project with Prof. Maarten V. de Hoop   *Feb 2026 – Present*
Feature Dynamics and Bayesian Imaging
- Investigate feature dynamics / representation stability for computational imaging and inverse problems, emphasizing robustness to noise, model mismatch, and ill-posedness.
- Study Bayesian reconstruction methods based on conditional injective flows, focusing on posterior sampling and uncertainty quantification beyond point estimates.

California Institute of Technology   Remote
Group project supervised by Prof. Thomas Hutchcroft   *Nov 2024 – Mar 2025*
Universality Phenomena in Phase Transitions
- Investigated critical behavior in phase transitions using Euclidean and hierarchical models with long-range interactions through numerical experiments
- Developed efficient simulation algorithms for long-range loop-erased random walks, focusing on optimizing computation and analyzing scaling exponents to validate universality

Washington University in St. Louis   St. Louis, United States
Undergraduate thesis supervised by Prof. Xiang Tang   *Feb 2024 – Mar 2025*
Symplectic and Statistical Manifolds
- Currently writing a report on the Atiyah-Guillemin-Sternberg theorem on connectedness and convexity properties for the moment map of $\mathbb{T}^n$-action on compact symplectic manifolds
- Aiming to investigate the moment map in information geometry, connecting estimation to dual structures and optimization insights through Barbaresco's generalization of Koszul-Souriau models and Shuhao Li's work on representation theory of statistical manifolds

Imperial College London   Remote
Group project supervised by Prof. Jeroen Lamb   *Aug 2024 – Sep 2024*
Multifractals
- Reviewed theorems on the Hausdorff dimension of the α-level set of the local dimension of self-similar measures
- Led teammates in writing a report that interpreted and visualized $f(\alpha)$ and $\tau(q)$ plots of multifractals in financial market data using Matplotlib

Summer Geometry Initiative, Massachusetts Institute of Technology   Remote
Group projects   *Jul 2024 – Aug 2024*
Deforming Mesh (Dr. Nickolas Sharp)
- Computed and compared the Gromov-Hausdorff distance and Chamfer distance as shape dissimilarity measures

Signed Distance Functions (Prof. Oded Stein and Prof. Silvia Sellán)
- Designed and reconstructed signed distance functions (SDFs) using the marching squares algorithm
- Proved characterization theorem of SDF on plane by the Eikonal equation and closest point condition

Fitting Inconsistent Input with Noise Regularization (Prof. Amir Vaxman)
- Used shallow neural networks and adversarial modules to reconstruct surfaces from Poisson disc samples, visualized using Polyscope

Winding Numbers Vectorization (Prof. Edward Chien)
- Computed winding numbers as harmonic functions on torus and its universal cover via C++ and CMake
- Utilized intrinsic triangulations to resolve color region disconnections on the mesh and optimized edge lengths in the feature space embedding

Freiwald Scholars Program, Washington University in St. Louis   St. Louis, United States
Independent study supervised by Prof. Renato Feres   *Feb 2023 – Dec 2023*
Optimal Transport and Curvature of Cayley Graphs
- Developed efficient algorithms for computing the Ollivier-Ricci curvature of Cayley graphs of abelian and nilpotent groups, leveraging symmetries of Cayley graphs
- Studied Wasserstein distance of point measures evolving along geodesics of complete Riemannian manifolds
- Presented at the Midstates Consortium for Math and Science 23 at the University of Chicago and the WashU SP24 Undergraduate Research Symposium

COURSE PROJECTS

Generalization Bounds via Rademacher Complexity for Barron Space   *Mar 2026*
- Reviewed Rademacher complexity bounds for Barron space and interpreted implications for controlling empirical-to-population error in machine learning.

Beyond Geography: Redefining City Boundaries through Social Interaction and Spatial Data (CSE416A Data Science for Complex Networks)   *Nov 2024*
- Collaboratively designed a fractal-based metric to evaluate TIN (Delaunay triangulated network), Barabási-Albert (BA), and Erdős-Rényi (ER) models, demonstrating TIN's superior ability to redefine urban boundaries

TALKS AND SEMINARS

University of Chicago   Chicago, United States
Speaker at Midstates Consortium for Math and Science 23   *Nov 2023*
- Presented work on curvature of Cayley graphs of abelian and nilpotent groups, focusing on algorithmic efficiency and geometric interpretations

Washington University in St. Louis   St. Louis, United States
- WashU SP24 Undergraduate Research Symposium
- Speaker at Online Early Career Morning Sessions held by Prof. Henri Martikainen
- UNC Undergraduate Analysis and PDE Online Seminar FL22-SP23
- Convention on Stan Programming and Bayesian Modeling 23 Workshop
- WUSTL Metamorphic Architecture Workshop 2019