XIAO (ANTHONY) HONG

+1 (314)-857-4211 | email: hong.x@wustl.edu
website: https://anthonyhongxiao.github.io/

EDUCATION

Washington University in St. Louis — St. Louis, United States
B.S. in Economics & Computer Science; Double Major in Mathematics — *Aug 2021 – May 2025*

- **Overall GPA**: 3.99/4.00; **Major GPA**: 4.00/4.00
- **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)
- **Selected Courses**: Math5047 Differential Geometry (A+); Math5052 Measure Theory and Functional Analysis II (A); Math5031 Algebra I (A+); Math547 Theory of Polytopes (A+); CSE543T Algorithms of Nonlinear Optimization (A); Math5440 High-dimensional Probability (A+); Math586 Network Statistics (A); Math494 Mathematical Statistics (A+); CSE417T Introduction to Machine Learning (A); Math350 Dynamical Systems and Chaos (A)

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

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 – Present*
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, 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

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

Image Classification Using Wasserstein Distance from Monge-Kantorovich Solvers (CSE543 Algorithms of Nonlinear Optimization) *May 2023*

- Reviewed the isometry groups, automorphism groups, and curvature properties of the three Riemann surfaces classified in the uniformization theorem

Split Spoils: Solution to the Stolen Necklace Problem (Math4181 Topology II) *May 2022*

- Solved the two-dimensional Necklace division problem using the Borsuk-Ulam Theorem

Work Experience

Department of Mathematics, Washington University in St. Louis St. Louis, United States
Teaching Assistant, Math5046 Differential Topology, Prof. Rachel Roberts *Jan 2024 – May 2024*

- Conducted weekly office hours to support students and graded assignments to ensure academic progress

Grader, Math4111 Introduction to Analysis, Prof. Ari Stern *Aug 2022 – Dec 2022*
Grader, Math4171 Topology I, Prof. Xiang Tang *Aug 2023 – Dec 2023*
Grader, Math5051 Measure Theory and Functional Analysis I, Prof. Henri Martikainen *Aug 2024 – Dec 2024*

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
- Reading Group FL23: Representation Theory
- Reading Group SP23: Algebraic Geometry
- UNC Undergraduate Analysis and PDE Online Seminar FL22-SP23
- Convention on Stan Programming and Bayesian Modeling 23 Workshop
- WUSTL Metamorphic Architecture Workshop 2019

Additional Information

Computer and Language Skills

- Software skills: Python, LaTeX, Java, MATLAB, Adobe Illustrator, Octave, R, Stata
- Languages: Fluent in Chinese and English

Interests

- Classical Music, Chinese Calligraphy, Printmaking, Travelling, Tennis & Table Tennis