# Xueyan ZHANG

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Mathematics master's student at University of Padova, with solid foundation in Riemannian geometry and a strong interest in mathematical physics and algebraic topology, with hands-on experience in theoretical research. Experienced in independent research, theoretical modeling, and programming with Python, Mathematica, SageMath, etc.

## Education

Master in Mathematics, **Università di Padova**, Italy — Oct 2022 – Ongoing

- **Field of Study:** Mathematics, with a focus on Riemannian Geometry
- **Thesis:** Frobenius Manifolds and Flat Pencils of Metrics
- **Supervisor:** Prof. Paolo Rossi
- **Relevant Coursework:** Differential Geometry, Homology and Cohomology, Algebraic Topology, Introduction to Partial Differential Equations, Dynamical Systems

Bachelor of Science, **Southern University of Science and Technology (SUSTech) "Double First-Class Construction"**, China — Sept 2018 – July 2022

- **Field of Study:** Mathematics and Applied Mathematics, with a focus on Real Analysis
- **Thesis:** An Example of Hausdorff Dimension
- **Supervisor:** Prof. Bochen Liu
- **Relevant Coursework:** Representation Theory of Finite Groups, Real Analysis, Numerical Analysis, Probability Theory

## Selected Theoretical Research Experience

**Frobenius Manifolds and Flat Pencils of Metrics** (Master Thesis) | **Thesis Draft** — Dec 2024 – Ongoing

- **Objectives:** To establish the equivalence between Frobenius manifolds and flat pencils of metrics, following the foundational framework established by Boris Dubrovin; to construct Frobenius structures and study their associated bihamiltonian systems with examples of Hurwitz spaces; to conduct original research to expand the research to supermanifolds.
- **Main Work:** Conducted a theoretical investigation using tools from Riemannian geometry (including connection and Lie derivative computations) and complex analysis. Explored the geometric framework underlying Frobenius manifolds and their role in integrable systems.
- **Result:** Developed a comprehensive framework linking flat pencils of metrics with Frobenius manifold structures. Currently applying this to concrete examples to identify corresponding bihamiltonian hierarchies.

**Seminar: Distinguished Triangles and Triangulated Categories** | **Info** | **Notes** — Apr 2025

- **Objectives:** To introduce the concept of triangulated categories from a categorical perspective.
- **Main Work:** Studied definition, axioms and propositions of distinguished triangles and triangulated categories, highlighting the categorical foundations; prepared and delivered an expository talk.
- **Result:** Delivered a compact 60-minute seminar clarifying the foundational structures of triangulated categories; received positive feedback for clear exposition.

**An Introductory Study on Well-Posedness for Moreau's Sweeping Process** | **Notes** — Sept 2023

- **Objectives:** To prove the existence, uniqueness, and stability of solutions for Moreau's sweeping process in a Hilbert space.
- **Main Work:** Modelled the process with a Lipschitz moving convex set, constructed approximate solutions via the catching-up algorithm, and proved their convergence to a unique Lipschitz continuous solution.
- **Result:** Established well-posedness with unique solutions continuously depending on initial data. Presented the proof clearly and effectively.

## Selected Computational Research Experience

**Research of Pendulums with Specific Characteristics** | **Project Files** Sept 2024

- **Objectives:** To model and analyze dynamical systems of pendulums with varying physical properties with Mathematica.
- **Main Work:** Studied pendulums with oscillating suspension points, periodic length variation, and external forcing. Derived period shift maps, plotted parameter spaces, analyzed fixed points, and computed Lyapunov indicators to interpret dynamical behavior.
- **Result:** Well-received project; course grade: 26/30.

**Crime Analysis and Housing Price Prediction in Washington D.C.** | **Project Files** June 2021

- **Objectives:** With Python, to analyze criminal case data (2008–2021) to identify factors influencing crime distribution, and to predict housing prices based on relevant variables.
- **Main Work:** Conducted data exploration and preprocessing in Python; analyzed correlations between crime patterns and variables such as time and location using visualization tools. Applied and evaluated a kNN algorithm for both crime analysis and housing price prediction.
- **Result:** Gained a good mastery of data analysis with python; project score: 93/100.

## Work Experience

**Data Analyst (Intern)**, Tencent – Shenzhen, China July 2021 – Aug 2021

- Developed Python scripts and web crawlers to automate data collection and cleaning processes.
- Contributed optimization ideas for user interface and webpage functionality to enhance user experience.
- Streamlined workflows, reducing manual effort and improving team efficiency.

**Personal Math Tutor**, Individual Sept 2018 – Jan 2023

- Provided on-demand academic assistance in mathematics, addressing a wide range of questions from secondary school topics to university-level calculus, linear algebra, operations research, etc.
- Supported students from various disciplines by explaining key mathematical concepts clearly and efficiently.
- Assisted 20+ university/college students and 15+ high school students through individual support.

## Scholarships & Awards

Scholarship for Outstanding Freshmen, SUSTech 2018

## Extracurricular Practical Activities

Volunteer, CKOU South China Kendo Competition June 2021

Publicity Director and Vice President, Esports Club, SUSTech Oct 2018 – June 2022

## Skills & Interests

**Language Skills**

- Chinese (native), English (B2-C1), Italian (basic user), Japanese (basic user)

**Computer skills**

- **Programming & Tools:** Python, C++, Java, SageMath, Mathematica
- **Modeling & Optimization:** MATLAB, AMPL
- **Other Software:** LaTeX, Adobe Photoshop, Adobe Premiere

**Interests**

- Photography, Kendo, Guzheng, Bass guitar, Rubber stamp sculpture, Rubik's cube