Xueyan ZHANG

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Mathematics master's student at University of Padova, with solid foundation in Riemannian geometry and 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, AMPL, Mathematica.

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 System

Bachelor of Science, **Southern University of Science and Technology "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
- **Research Method:** A theoretical study of Stein's *Real Analysis*, focusing on the Hausdorff dimension of fractals, with specific examples such as the Cantor set to illustrate and apply the concepts.

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. Found a compatible structure on the supermanifold.
- **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.

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.

Manpower Scheduling Optimization for Skyscraper Construction | **Project Files** Jan 2024

- **Objectives:** To model and minimize total construction cost by optimizing worker shift arrangements with AMPL.
- **Main Work:** Formulated the problem as a linear optimization model to minimize total labor costs while satisfying construction constraints. Implemented and solved the model using AMPL, analyzing the impact of different shift arrangements.
- **Result:** Achieved a score of 9.8/10.

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.

Awards

Scholarship for Outstanding Freshmen, Southern University of Science and Technology 2018

Volunteer Experience

Volunteer for CKOU South China Kendo Competition June 2021

- Helped keep order of the event; checked the score of the game.
- Assisted in the epidemic prevention of COVID-19 and ensured the appropriate progress of the event.

Skills & Interests

Language Skills

- English: Fluent
- Chinese: Native
- 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