Tongren Xiao

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Research Interests

AI agents and structured decision support; time-series forecasting and world models; tool use and auditable AI systems for financial and scientific applications.

Education

Sun Yat-sen University, School of Mathematics 2023–September 2027 (expected)
Undergraduate Student in Mathematics
GPA: 3.00/5.00; average mark: 80/100

Research Experience

Research in Quantitative Finance 2024–2026
Advisors: Associate Professor Yirong Huang and Associate Professor Yujun Lian, Sun Yat-sen University

- Studied hybrid LSTM–GARCH, geometric analog forecasting, forecast calibration, and underestimation-risk control for realized volatility.
- Designed comparative experiments and risk-sensitive diagnostics for financial time-series forecasting.

Undergraduate Research in Schubert Calculus 2024–2026
Advisor: Professor Changzheng Li, Sun Yat-sen University

- Studied positivity properties of quantum double Schubert polynomials and related algebraic-combinatorial structures.

Selected Research Projects

SRM Forecasting Agent 2026

- Designed and developed an auditable forecasting-agent interface supporting natural-language requests, data-adapter selection, information-boundary validation, geometric retrieval, and JSON audit artifacts. Coding implementation used Codex/GPT assistance.
- Added an optional cloud LLM tool-use prototype with schema validation and grounded explanations; the five-channel SRM engine and paper protocol remain unchanged.
- Code and reproducibility documentation

Probabilistic World Model for Multi-Asset Volatility 2026

- Designed an initial recurrent state-space framework with shared market dynamics and asset-specific latent representations for probabilistic realized-volatility paths; implementation used Codex/GPT assistance.
- Enforced a forward-only information boundary and evaluated joint path realism with Monte Carlo forecasts and reproducible audit manifests.
- Code and paper

Selected Manuscripts

- *Shape Is Useful: Geometric Analog Forecasting of Realized Volatility*, manuscript, 2026.
- *Graham Positivity of Quantum Double Schubert Polynomials*, manuscript under discussion, 2026.
- *Anchor-Conditioned Probabilistic World Models*, early manuscript, 2026.

Technical Skills

Python, MATLAB, NumPy, pandas, PyTorch, scikit-learn, Streamlit, FastAPI, Git, Linux, LaTeX; probabilistic modeling, time-series forecasting, reproducible experiments, structured tool interfaces.

Awards and Training

Honorable Mention, 2026 COMAP Mathematical Contest in Modeling; Guangdong Provincial Second Prize, 2025 Contemporary Undergraduate Mathematical Contest in Modeling; Introduction to Option Pricing (Johannes Ruf), grade 81.50.