Xuechen ZHANG

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EDUCATION

Columbia University   **New York, NY**
MA in Mathematics of Finance   *09/2024 - 12/2025(Expected)*
- **Courses:** Stochastic Process, Stochastic Methods, Numerical Methods, Partial Differential Equations, Advanced Machine Learning for Finance
- **GPA: 4.00/4.00**

University of Michigan--Ann Arbor   **Ann Arbor, MI**
BS in Statistics, Minor in Mathematics   *08/2020 - 05/2024*
- **Courses**: Data Structures and Algorithms, Algorithms for ML & DS, Intro to Computer Organization, Applied Regression Analysis, Data Mining and Machine Learning, Bayesian Data Analysis, Linear Algebra, Multivariable Calculus
- **GPA: 4.00/4.00**; Graduated with Highest Distinction; James B. Angell Scholar 2024; University Honors 2020 - 2024

PROFESSIONAL EXPERIENCE

TD Securities   **New York, NY**
Global Markets Quantitative Summer Associate   *06/2025 - Present*
- **High-Dimensional PDE Modeling:** Developed deep learning frameworks (Deep BSDE, DGM, MDN) using PyTorch to solve high-dimensional Fokker–Planck and Kolmogorov PDEs, enabling fast and scalable modeling of vol–forward dynamics under stochastic volatility
- **Option Pricing:** Trained parameterized neural networks to price options and compute Greeks (Δ, Γ, Vega) via automatic differentiation, allowing amortized inference and real-time risk monitoring across market regimes
- **Risk Estimation:** Replaced costly Monte Carlo simulations with differentiable neural density estimators to approximate joint distributions of multi-asset stochastic processes, significantly accelerating risk assessment workflows
- **Model Benchmarking:** Benchmarked neural PDE solvers against Monte Carlo and closed-form methods, achieving <0.1% pricing error and demonstrating superior numerical stability in high-dimensional settings
- **Python Dashboard Upgrade & Market Data Visualization:** Upgraded a Python dashboard to visualize option market data (implied volatility, dividends, forward), enabling pricing validation and strategic volatility analysis. Automated the workflow and generated daily reports to support timely, data-driven decisions across trading teams.
- **Risk Mapping with Vega Profiles:** Built a desk-level tool to visualize Vega maps and Gamma profiles for structured notes by applying area-based bumps on the underlying assets' volatility surface, enabling traders to assess risk sensitivities and key Greeks exposure.

Sparken Capital   **New York, NY**
Quantitative Analyst Intern   *05/2024 - 07/2024*
- **Machine Learning for Auto-coding:** Created a workflow using Microsoft's Autogen Studio to autonomously generate and refine Python code, improving code efficiency and accuracy by 30%. Utilized machine learning algorithms for error correction and robustness
- **Autonomous Data Retrieval & Reporting:** Trained an autogen workflow via Python to autonomously gather a specific company's trading history and related news from the internet and automated the generation of annual reports, including visualizations of share performance, company situation analysis, and risk assessments

Tencent   **Shenzhen, China**
Data Research Intern   *05/2023 - 08/2023*
- **SQL Optimization & System Design**: Improved data retrieval by 20% with optimized SQL queries and designed a feature scoring system, boosting user engagement by 5%
- **XGBoost Modeling & Data Imbalance:** Built and fine-tuned an XGBoost model with sentiment analysis, achieving 0.86 accuracy and enhancing customer contact classification for targeted strategies

RESEARCH EXPERIENCE

AI Fairness in Financial Decision-Making Systems, University of Michigan   *03/2024 - 08/2024*
- **Fairness Testing:** Utilized a bank loan dataset, varying applicant attributes such as race and gender to examine the impact of sensitive factors on approval rates
- **Bias Detection:** Revealed that the model displayed a bias, approving a higher percentage of applicants from a specific race group, even when all other variables were held constant
- **Ethical AI:** Highlighted potential risks of bias in AI-driven decision-making processes, providing insights for developing fairer and more equitable machine learning models

Temporal Leakage Evaluation in LLMs, University of Michigan   *11/2023 - 07/2024*
- **Temporal Evaluation:** Designed and implemented a dual-pipeline evaluation framework to analyze temporal information leakage in LLMs (GPT-4o, Claude-3.5, Gemini-1.5), revealing an 80% leakage rate in financial predictions
- **RAG System Development:** Developed a Retrieval-Augmented Generation (RAG) validation system leveraging Google Custom Search API to collect 3,000+ news articles per S&P 500 company, automating the detection of future information usage in LLMs' reasoning
- **Reinforcement Learning:** Applied reinforcement learning to fine-tune LLMs toward temporally consistent behavior, reducing future-information leakage by discouraging reliance on post-publication cues during training
- **Automated Verification:** Built automated verification workflows integrating historical financial data from Yahoo Finance to assess the accuracy and temporal consistency of LLMs' stock price predictions

TECHNICAL SKILLS

- **Computer Programming**: C++, Python, R, Matlab, SQL, Deep Learning, MS Office Suite
- **Mathematics & Statistics:** Statistical Modeling, Probability, Regression Analysis, Numerical Method, Monte-Carlo Simulations, Time Series Analysis, Bayesian Inference, Hypothesis Test
- **Interests:** Chess, Football, Skiing, Surfing, Hiking, Horse Riding, Piano, Traveling