Ahmer Nadeem Khan

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Education

Florida State University — PhD in Financial Mathematics Sep 2024 — May 2029

- *Current GPA: 3.93, Supervisor: Dr. Alec Kercheval*
- *Completed Coursework: Financial Engineering I/II, Monte Carlo Methods in Finance, Advanced Probability Computational Math I/II, High Performance Computing, Differential Geometry Measure Theory I, Numerical Optimization*
- *Current Coursework: Measure Theory II, Stochastic Analysis, Numerical Linear Algebra*

Lahore University of Management Sciences, Pakistan — BS in Mathematics Sep 2020 — May 2024

- *Minor in Computer Science, Minor in English Literature*
- *GPA: 3.84*
- *Graduate Coursework: Machine Learning, PDEs, Topology, Algebraic Geometry, Algebraic Topology*

Seoul National University, South Korea — Semester Abroad Sep 2023 — Dec 2023

- *Department of Mathematical Sciences*
- *Coursework: Algebraic Topology II, Korean Literature*
- *Research thesis on Schubert Calculus for algebraic and arithmetic geometry under Dr. Jun Ho Whang*

Selected Research Projects

Dynamic VIX-Based Hedging of Equity Risk during Market Stress Events Nov 2025

- *Selected as a top project from 107 projects in the Erdős Institute Fall 2025 Cohort*
- *Empirical study on volatility-regime shifts and macro-triggered tail-risk using VIX during tariff-related market shocks*
- *Constructed and backtested a dynamic hedging strategy for a long S&P 500 portfolio using VIX exposure through a short-term VIX futures index ETF (VXX)*
- *Demonstrated substantial performance improvement: 47% reduction in annualized volatility, 2.6× increase in Sharpe ratio, and max drawdown reduced from –19% to –4%*

CUDA-accelerated Monte Carlo for HPC Applications in Exotic Option Pricing May 2025

- *Developed high-frequency Monte Carlo simulations in C++ for pricing Asian, Lookback variants, and Barrier options*
- *Benchmarked CPU vs. GPU performance against NVIDIA paper on 5 million paths, achieving a speed-up factor of 10^4, and retaining 96–98% agreement with CPU baselines*
- *Analyzed the Wallace method for efficiency, variance behavior, pathwise error characteristics, and GPU memory-access patterns to optimize throughput in high-dimensional simulations*

Equities Portfolio Optimization using James-Stein Shrinkage Apr 2025

- *Empirical research project analyzing covariance shrinkage estimators for mean–variance portfolio optimization*
- *Automated large-scale data extraction from Yahoo Finance for two years of daily S&P 500 constituents and Treasury rates*
- *Implemented and compared global minimum-variance (GMV) and maximum Sharpe ratio (MSR) portfolios under classical, Ledoit–Wolf and James–Stein estimators, achieving up to 2% improvement in out-of-sample risk-adjusted performance*

Numerical and Monte Carlo Algorithms Library Development in MATLAB and Julia Sep 2024 — May 2025

- *Series of experimental projects focusing on algorithmic design, numerical stability, and convergence behavior*
- *Implemented and benchmarked canonical algorithms from the numerical analysis and Monte Carlo literature*
- *Developed a reproducible library of routines covering factorization and approximation methods, linear and non-linear system solvers, quadrature, variate-reduction, and PDE/ODE solvers*

Schubert Calculus and The Cohomology of the Grassmannian Sep 2023 — May 2024

- *Undergraduate research thesis conducted at Seoul National University (Grade: A+)*
- *Explored algebraic and combinatorial techniques in intersection theory and enumerative geometry*
- *Presented and defended thesis at Lahore University of Management Sciences*

Selected Talks and Presentations

Catalan Numbers and Their Properties, Algebra Seminar, Florida State University Feb 2026

Presentation on the combinatorial descriptions of the Catalan numbers, and proof of various bijections and results

Portfolio Optimization and Successive Convex Approximation, Florida State University Dec 2025

Presentation on recent results on the application of the SCA framework to higher order (MVSK) portfolios

Limit Order Book Simulation: A Review and Recent Progress, Financial Math Seminar, Florida State University Dec 2025

Survey of point processes, agent-based models, deep learning, and generative AI for limit order book modeling

Market Microstructure and High Frequency Trading, Financial Math Seminar, Florida State University May 2025

Overview of HFT evolution, data structures, order-book mechanics, and algorithmic trading strategies

Borsuk–Ulam Theorem and its Applications, Lahore University of Management Sciences Dec 2024

Directed research (Topology) presentation on Tverberg's Theorem and the Necklace Splitting Problem

Honors and Awards

Khawaja Dil Muhammad Fellowship *(sbasse.lums.edu.pk/honorific-fellowships)* 2021 — 2024

Merit-based fellowship in Mathematics awarded for maintaining the highest departmental GPA

Dean's Honor List Awards 2021 — 2024

Annual university-wide recognition for academic excellence based on cumulative GPA

Award of High Distinction 2024

Graduated with High Distinction, ranking 2nd in BS Mathematics cohort

Technical Skills & Certifications

Programming Languages & Platforms: *Python, C++, MATLAB, Julia, R, CUDA, LaTeX*

Quantitative & Computational Methods: *Object-Oriented Programming, Numerical Methods and Modeling, Optimization, Monte Carlo Simulation, Stochastic Analysis, Quantitative Finance, Machine Learning, Data Analysis*

Libraries & Frameworks: *NumPy, Pandas, Scikit-learn, TensorFlow, PyTorch, Statsmodels, Seaborn, Regular Expressions, Matplotlib, Playwright, Beautiful Soup, STL, Boost, BLAS, LAPACK*

Certifications: *Erdős Institute Quant Finance Bootcamp, Akuna Options 101, Akuna Options 201*

Teaching, Research & Outreach Experience

Research Assistant, Department of Computer Science, Florida State University Jan 2026 — Present

- *Collaborating with researchers at Argonne National Laboratory for scientific computing applications under Dr. Kai Zhao*
- *Conducting research on sequential and warm-started randomized SVD methods for streaming high-dimensional data*
- *Developing and analyzing low-rank update models to accelerate compression pipelines for tensor data on GPUs*

Instructor of Record, Florida State University Jan 2026 — Present

- *Sole instructor for MAC 2311 (Calculus with Analytic Geometry), delivering three weekly lectures (50 min) and one weekly recitation (75 min) to a class of 29 students*
- *Designed and delivered lecture materials and recitation activities, including worksheets, problem sets, and quiz reviews*
- *Authored, administered, and graded quizzes and examinations; handled proctoring, assessment, and student communication; managed course organization via Canvas*

Graduate Teaching Assistant, Florida State University Sep 2024 — Dec 2025

- *Assisted instructors across seven undergraduate courses including Trigonometry, Pre-Calculus, and Algebra*
- *Supported grading, proctoring, weekly labs, and organization of course materials*

Finance Intern, Mahmood Group — Punjab, Pakistan Jun 2024 — Aug 2024

- *Performed NPV and financial feasibility analyses for two major projects within textile manufacturing operations*
- *Projects included solar power panels installation and new spinning factory construction*
- *Prepared public financial statements and computed financial ratios for Pakistan Stock Exchange (PSX) listings*

Teaching Assistant, Lahore University of Management Sciences Sep 2022 — May 2024

- *Assisted instruction in Discrete Mathematics, Calculus III, and Linear Algebra*
- *Conducted weekly problem-solving sessions, tutorials, and office hours, integrating LaTeX and coding exercises*
- *Designed, proctored, and graded quizzes, homework, and examinations*

8th Grade Teaching Volunteer, Syedanwala High School — Pakistan Jun 2023 — Aug 2023

- *Led a team of six volunteers teaching students in rural Punjab*
- *Designed and delivered lessons in Algebra, Number Theory, and Geometry*
- *Conducted diagnostic tests, evaluations, and teacher training sessions for local staff*