

Thomas Cole

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EDUCATION

Columbia University

New York, NY

Master of Arts, Mathematics of Finance | CGPA: 3.9/4.0

Sept. 2024 – Dec. 2025

- **Coursework:** Stochastic Processes, Time Series Analysis, Computational Portfolio Construction, Numerical Methods, Convex Optimization, Computational Statistics (PhD), Machine Learning (PhD)

McGill University

Montreal, QC

Bachelor of Commerce, Major in Mathematics, Minor in Finance | CGPA: 3.8/4.0

Sept. 2019 – May. 2024

- **Coursework:** Probability, Statistics, Linear Algebra, Single and Multivariable Calculus, ODE's, PDE's

WORK EXPERIENCE

Graham Capital Management

Rowayton, CT

Risk Analyst Intern

June 2025 – Aug. 2025

- Researched and implemented distributional clustering techniques such as Wasserstein K-Means to classify discretionary portfolio managers into peer groups, enabling synthetic performance benchmarking
- Applied two-stage PCA factor modeling to uncover 3 dominant drivers of portfolio manager performance (+70% variance explained) and identified portfolios with significant idiosyncratic returns for further analysis
- Reviewed and evaluated alternative methodologies from academic literature (Fed, ECB) to enhance the firm risk factor index, testing and implementing improved models for more accurate and interpretable measurements

TD Bank

Toronto, ON

Analyst Intern, Treasury Hedge Strategy

May 2024 – Aug. 2024

- Analyzed time series data of mortgage commitment hedging performance, examining the impact of factors such as interest rate fluctuations and loan terms on the propensity to fund
- Streamlined the data processing pipeline and enabled real-time access to key performance metrics through an interactive dashboard using Python with Pandas, Dash and Plotly
- Created an SQL script to parse a daily data feed of over 1 million mortgage records to track features such as funding status, while ensuring efficient storage for historical comparison

Analyst Intern, Treasury Investment Strategy and Analytics

Jan. 2024 – May 2024

- Developed a Python package to support analytics for the front office investments team, automating daily and weekly reporting procedures for portfolios exceeding \$130B, significantly reducing turnaround time on ad-hoc requests
- Led and prepared weekly Python workshops, translating complex technical concepts into practical tools

PROJECTS AND RESEARCH EXPERIENCE

Equities Statistical Arbitrage Using Clustering

Columbia University — New York, NY

- Developed a systematic, market-neutral statistical arbitrage strategy by clustering equities based on their correlation matrix and applying K-means and graph algorithms such as spectral clustering
- Optimized the number of clusters using the Marchenko-Pastur law and the explained variance threshold.
- Achieved an annualized return of 10% with a Sharpe ratio of 1.3, while effectively managing downside risk, achieving a Sortino ratio of 1.8

PCA Applications on Implied Volatility Surfaces

McGill University — Montreal, QC

- Conducted independent research under the guidance of a faculty member on the application of PCA to implied volatility surfaces of US equity options
- Benchmarked 11 principal component selection methods including Kaiser-Guttman, and the Marchenko-Pastur Law by utilizing Monte Carlo simulations and bootstrapping to identify statistically robust eigenvalue thresholds
- Efficiently processed 75GB+ of both price and implied volatility data for all options on equities in S&P500 over a multi-year period utilizing Python with scikit-learn, NumPy, Pandas, and Dask

Non-Negative Matrix Factorization with Random Projections

Columbia University — New York, NY

- Developed compressed NMF algorithms in Python/NumPy using randomized projections, achieving 40% faster computation versus standard NMF algorithms with less than 5% reconstruction error on high-dimensional datasets
- Implemented advanced numerical techniques including Randomized SVD, power iteration, and non-negative constrained least squares to optimize matrix factorization accuracy and convergence rates

SKILLS AND ACHIEVEMENTS

Computer Skills: Python, R, Java, MATLAB, SQL, Bloomberg Terminal

Language Skills: English (Native), French (Intermediate)

Achievements: Winner, 2025 IAQF Academic Competition

Interests: Guitar, Computers, Personal Finance