

ARNAV MALHOTRA

Researcher & Engineer

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RESEARCH & PATENTS

System and Method for Dynamic State Transposition and Preemptive Evasion of Spatially Correlated Errors *Provisional Patent Filed*

- A novel hardware architecture that allows quantum processors to physically "dodge" errors. Unlike traditional error correction which reacts to noise after it happens, this system utilizes a dynamic lattice topology to preemptively transpose quantum states into a "safety manifold" before impact. This active evasion protocol preserves coherence without the massive overhead of standard correction cycles.

High Fidelity Synthetic Financial Universes (fsynth)

Python Package, Preprint

- This paper introduces fsynth, a multi-factor synthetic engine that integrates a Heston-based stochastic volatility model with Merton jump diffusion, governed by a hidden Markov regime-switching process. By using macro-regime states alongside company specific "genes," the engine generates plausible universes containing both price action and fundamental accounting data.

Empirical Tests for a Hedging Framework for the Quantum Binomial Options Pricing Model

Preprint

- This paper derives and tests analytical formulae for hedging with the Quantum Binomial Options Pricing Model. The simulation reveals that the Quantum Binomial Options Pricing model is, at least in its current state, not viable for usage in actually hedging derivatives. This is due to numerical instabilities, particularly in the Quantum Theta and Quantum Vega. We conclude that the single period Quantum Binomial Options Pricing Model is currently unsuitable for practical applications of hedging.

PROJECTS & OPEN SOURCE

yfinance (Library Contributor) | 30M+ Monthly Downloads

- Contributor to yfinance, the industry-standard Python library for accessing Yahoo! Finance market data.

EVE Online Market Strategies

- Used for making ISK in the game EVE online, a popular MMORPG known for its intricate economy closely resembling the real world. There is an intraregional arbitrage calculator, as well as a market price prediction and opportunities calculator.

EXPERIENCE

The Stuyvesant Spectator

New York, NY

Web Department Lead

- Directing the digital infrastructure for an award-winning high school publication. I lead the web department in maintaining site reliability, optimizing the editorial deployment pipeline, and ensuring 24/7 uptime for the student body and readership.

EDUCATION

Stuyvesant High School

New York, NY

Class of 2028 (Sophomore)

- **Courses:** AP Calculus BC, AP Precalculus, AP Statistics, AP Human Geography, AP Environmental Science