Daksh Kumar
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EDUCATION

North Carolina State University (NCSU), Raleigh, NC Dec 2027
Master of Financial Mathematics GPA: 3.66/4.0

Jawaharlal Nehru University (JNU), New Delhi June 2023
B.Tech in Electronics & Communication Engineering & M.Sc. in Management (Dual Degree) GPA: 3.64/4.0

Relevant Coursework: Linear Matrix & Transformation, Linear Algebra, Partial Differential Equations, Numerical Methods, Financial Market Operations, Options and Derivative Pricing, Probability and Stochastic for Finance

SKILLS

Languages: Python (Pandas, NumPy, SciPy, scikit-learn, PyTorch, TensorFlow, Matplotlib, Transformers), C, C++, Java
Databases: PostgreSQL, MySQL
Cloud and Tools: AWS (Lambda, EC2, ECR), GCP (BigQuery), Git, MLflow, Docker
Protocols & Systems: Linux, Bash, REST API, WebSocket, Webhook, Bloomberg Terminal and API

ACADEMIC PROJECTS

Optimal Hedging of Leveraged ETF Positions (Convexity Protection) May 2026 – Present
North Carolina State University
- Built a multi-tranche hedging engine on Tesla's 2× leveraged ETF (TSLL) short the LETF, long ATM calls, short OTM puts harvesting structural volatility decay with maximum drawdown capped by a closed-form, **model-free bound of 15.0%**.
- Derived the bound from **no-arbitrage worst-case loss limits** on each position, valid continuously rather than only at expiry; the realized equity path **never breached the bound** in-sample, out-of-sample, or across seven risk-limit configurations **(960 trading days each)**.
- Delivered **+15.7% CAGR (Sharpe 0.90, −12.3% Max Drawdown, Calmar 1.28)** vs. −81% Max Drawdown for the naked short; built the 1M+-row TSLA/TSLL option-price dataset (2020–2026).

Variance Risk Premium & Variance-Swap Replication (SPX) Jun 2026
North Carolina State University
- Replicated a 30-day SPX variance swap from option strips (model-free implied variance, CBOE VIX methodology), validating the synthetic index against the live VIX across 2017–2023 (1,676 days) to a **0.57 vol-point mean error** and **0.99 correlation**.
- Measured the variance risk premium at **+3.75 vol points** on average (positive **84%** of days), quantifying its collapse in crises — implied vol of 17% in Feb 2020 vs. ~90% subsequently realized.
- Backtested a cost-aware short-variance carry (**net Sharpe 1.84**, 18% CAGR) with modeled transaction/bid-ask costs, vega-notional sizing, and a realized-vol tail stop, capturing a **-71% maximum drawdown** during the 2020 COVID-regime collapse; shipped an interactive Streamlit dashboard.

Calibration and Hedging of Local, Stochastic, and Hybrid Volatility Models Jan 2026 – May 2026
North Carolina State University
- Developed a unified calibration and hedging framework in Python for Local (Dupire), Stochastic (Heston), and Stochastic-Local Volatility (SLV) models using 5,000+ SPX option contracts.
- Constructed an arbitrage-free volatility surface via SVI (Stochastic Volatility Inspired) parameterization, achieving an overall RMSE of **2.47%** and a **94%** convergence rate for Black-Scholes inversion using the Secant Method.
- Implemented a finite-difference PDE solver for the Dupire model and calibrated Heston model parameters to capture dynamic smile effects, reducing pricing errors by **~15%** in deep out-of-the-money strikes.
- Benchmarked Delta-hedging performance against a Black-Scholes baseline, demonstrating a **12%** reduction in P&L leakage across a 1-year backtest, and stress-tested model robustness against the 2020 COVID-19 regime, maintaining surface stability with a maximum RMSE of **3.8%** during peak VIX periods.

WORK EXPERIENCE

CBCatalyst, Delhi, India Mar 2025 – Jan 2026
Founding AI Engineer
- Built and fine-tuned a multi-modal recommendation engine using CLIP, BART, and GPT-2 models with additional custom attributes (skew factor, rank decay, etc.) boosting Top-10 recall and CTR by **35%** and **50%** respectively.
- Optimized multi-modal high-dimensional embedding spaces (CLIP) using contrastive objectives, hard-negative sampling, and similarity calibration, achieving a 37% improvement in Top-K ranking metrics under noisy, near-duplicate data conditions.
- Designed a reasoning-based RAG system leveraging Milvus vector indexing (HNSW) for candidate retrieval, cross-encoder re-ranking over Top-K results, and guard-railed LLM inference for live AI search.

PropReturns (YC S21), Mumbai, India Jan 2023 – Mar 2024
Founding Data Science Engineer
- Built a real-time Automated Valuation Model (AVM) using **XGBoost** to predict dynamic property prices across **1M+** nationwide transactions, achieving a **73.8%** PPE10 and an R^2 of **0.79** by integrating high-fidelity internal data with public records.
- Developed an automated legal-risk parsing engine leveraging Marker for **OCR** and Gemini API to extract title disputes, encumbrances, and legal history from unstructured court verdicts, seamlessly linking risk profiles to the core property database.

EXTRACURRICULARS

President and Co-Founder, De-Robotica, Robotics Club Aug 2019 – Dec 2022