Daniel Hughes

Software Engineer · Market-data and trading systems

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Profile

Software engineer who builds and runs the data infrastructure behind live trading decisions. Over five years in Python and PHP, largely self-directed, on top of an eleven-year mechanical engineering career. I design, deploy and operate production market-data systems solo: a reference and analytics platform that reconciles 10+ vendor feeds for ~2,600 paying members, and a real-time options engine that consumes the full OPRA tape for 29 symbols at 3.1k messages a second.

What I bring to a quant trading firm: a working understanding of instruments, expiries, settlement calendars and exchange conventions from trading them; a habit of guarding every number against stale, missing or inconsistent inputs before it reaches a user; and the ownership that comes from being the only person on call when a pipeline breaks.

Data and trading systems built

All designed, built and operated by me, in production, with real users or real capital behind them. Full write-ups at danhughestest.co.uk.

TradingEdge: market-data and analytics platform · Aug 2025 to present · ~2,600 paying members · ~1,800 commits, ~120k lines, 109 test files

- Ingests 10+ market-data providers (option chains and greeks, options flow, fundamentals, macro, the VIX complex) on a dense US-market scheduler: overnight pipelines, pre-market cache warm, intraday scans every 10 minutes, end-of-day and weekly jobs. 95 scheduled and CLI jobs run behind single-server and no-overlap locks.
- Data-quality guards built into the pipeline: chains filtered by capture time so stale pre-market marks cannot break put-call parity; IV levels taken from interpolated ATM IV rather than the chain average; a liquidity floor so odd-lot prints on thin names do not trigger alerts; quantised outputs to resist scraping.
- Instrument and calendar handling: per-expiry and per-strike dealer exposure, constant-maturity volatility term structure, futures carry annualised on actual settlement dates, and expiry selection by the first contract covering a full period.
- Operational robustness for a paying user base: nightly account reconciliation against the community's member export, mail allow-lists so staging never emails real members, release-based deploys, audit trail, WebSocket delivery via Reverb.
- Stack: PHP 8.3, Laravel 12, MySQL, Redis, Alpine.js, ThetaData, FMP, Unusual Whales, FRED, DigitalOcean.

Real-time dealer gamma engine · Mar 2026 to present · 29 symbols · 30-second snapshots · load-tested to 3.1k msg/s · 642 tests

- Streams the full OPRA options tape (every trade and quote, all strikes and expiries) through a non-blocking relay that routes frames by root symbol into sharded engines, each with a bounded drop-oldest queue so a slow consumer can never back-pressure the others.
- Keeps a dealer-signed position book per strike and expiry; pairs multi-leg prints into spreads before they reach the books; rolls session flow into the baseline at end of day so the book carries across sessions.
- Trade-side classification with a LightGBM model trained against Cboe Open-Close dealer volume (5-fold-by-day cross-validation; 0.65 sign accuracy vs 0.54 for Lee-Ready on SPX). Train/serve parity enforced by tests comparing the streaming accumulator to the batch pipeline.

- Arbitrage-checked SVI volatility surface per expiry (Zeliade quasi-explicit calibration, Durrleman butterfly check, forwards from put-call parity), run in a process pool with tests proving results identical to the threaded path.
- Reliability: watchdog with two-stage escalation and a circuit breaker, per-symbol starvation detection, an alerter that shares no code with what it monitors, and a shadow engine compared snapshot for snapshot against production (median correlation 1.000).
- Tick recorder writing hourly Hive-partitioned Parquet, archived nightly, which now feeds a pre-registered research programme.
- Stack: Python 3.11, asyncio, NumPy, SciPy, LightGBM, pandas, PyArrow/Parquet, orjson, TypeScript/Express, Docker, systemd.

Research and execution systems · 2022 to present

- GEX Reverter: S&P 500 mean reversion at dealer-gamma walls, live on a prop-firm account. Python engine computes levels every 15 minutes and drives an MQL5 expert advisor over a TLS socket; the broker is the source of truth for positions. 4-year backtest, 499 trades, walk-forward profit factor 2.72.
- IB Agent: intraday Nasdaq-futures strategy on IBKR with the same engine code making every decision in backtest and live, so there is no research implementation to drift. Mirrored to four prop accounts through an MT5 bridge.
- Research log of nine killed ideas, each with sample, result and the reason it failed.

Engineering career

Eleven years designing physical products for manufacture, where every decision meets hard constraints, tolerances and real-world failure. That is where I learned to build things that have to work first time and to find the root cause when they do not.

- **Freelance Metrology Technical Operator (contract), offshore energy** · 2023 to 2026
- **Mechanical Design Engineer, Origin Global, High Wycombe** · Oct 2021 to Oct 2023
- **QA Product Technologist, Addo Play, Amersham (toy industry)** · Oct 2020 to Oct 2021
- **Engineering Team Leader, Airflow, High Wycombe** · Sep 2013 to Aug 2019

Technical skills

- **Languages:** Python (5+ years, production systems: asyncio, pandas, NumPy, SciPy, pydantic, FastAPI, pytest), PHP/Laravel, TypeScript/Node, SQL, MQL5
- **Data infrastructure:** PostgreSQL, MySQL, SQLite, Redis, Parquet/PyArrow with Hive partitioning, scheduled pipelines with locking and idempotent jobs, WebSocket and webhook ingestion, signed inter-service messaging
- **Market and reference data:** options chains and greeks, expiry and settlement calendars, futures curves, corporate fundamentals, macro series; vendor integrations with ThetaData (OPRA), Cboe, FMP, Unusual Whales, FRED, Interactive Brokers, MetaTrader 5, Alpaca
- **Operations:** Docker, systemd, Linux, DigitalOcean, TLS and WireGuard, watchdogs and circuit breakers, shadow deployments, release-based deploys, monitoring and alerting
- **Quant and research:** backtesting with walk-forward and Monte Carlo validation, pre-registered hypothesis testing, block bootstraps, volatility-surface fitting (SVI), trade-side classification, LightGBM
- **Other:** React/Next.js, LLM agents with structured outputs, SolidWorks (Advanced certified)

Education and certifications

- **BEng Mechanical Engineering, First Class Honours** · Buckinghamshire New University, 2013
- **HNC and HND Electronic Engineering, Distinction**
- **A-levels: Maths, Chemistry, Biology** · John Hampden Grammar School