Parker Patton

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Education

The University of Alabama Aug. 2025 – Present
Expected Graduation: Dec 2028 (BS/MS Pure Math) *Tuscaloosa, AL*

Experience

Undergraduate Researcher Sep. 2025 – Present
The University of Alabama *Tuscaloosa, AL*

- Designed a low–dimensional adversarial attack on video-to-video diffusion models with PyTorch, injecting perturbations into temporal attention pathways and optimizing with black-box SPSA; achieved consistent label flips on 100+ videos under strict perceptual constraints (LPIPS < 0.06, PSNR ≈ 30 dB)
- Built a fully reproducible research pipeline (PyTorch Lightning, W&B) with baselines, ablations, seed-deterministic evaluation, and automated runs; standardized all experiment logging, metrics, and visual outputs

Undergraduate Researcher June 2024 – May 2025
The University of Alabama at Birmingham *Birmingham, AL*

- Developed volatility-conditioned DDPM in PyTorch with end-to-end data ETL (pandas, SQL); Automated walk-forward evaluation with metrics (RMSE, MAE, residual/ACF plots, CRPS) for reproducible analysis
- Found higher point-forecast MAE vs. ARIMA (0.083 vs. 0.066), but demonstrated superior uncertainty calibration (CRPS = 0.057, DM $p = 0.002$) and realistic variance structure
- Presented research at ASFA Symposium; awarded Honorable Mention in CARSEF Math & CS

Lead Developer & Officer Aug. 2024 – May 2025
Computer Science Honors Society *Birmingham, AL*

- Built olympiad competition platform (Python, Flask, SQL, Docker) with custom problem grader and scoreboard; hosted challenges for 20+ external students
- Organized and led weekly AI & competitive programming workshops (avg. 30 participants) featuring industry guest speakers and hands-on coding sessions

Projects

Rural Healthcare SaaS Platform (Founder) | *Python, SQL, Git* Sep. 2025 – Present

- Prototyping interoperability layer to aggregate fragmented EHR data (FHIR/HL7 schemas, SQL backend)
- Building AI-assisted module for reimbursement code validation and claim tracking to reduce administrative burden
- Led user discovery with 10+ physicians and administrators; developed MVP feature set and database schema

Statistical Arbitrage on Illiquid Digital Assets | *Python, SQL, Git* June 2025 – Oct. 2025

- Built end-to-end pipeline (Python, SQL) to ingest and normalize order books for 20k+ illiquid digital assets
- Detected mean reversion ($p < 0.01$) and cointegration ($p < 0.04$) via ADF/Engle–Granger; generated signal set
- Implemented arbitrage backtester with cost modeling; achieved Sharpe 1.2 and controlled drawdown

Blockchain Triangular Arbitrage | *Python, C++, WebSocket, Solana* May 2025 – Aug. 2025

- Streamed tick-level data from 3 exchanges (WebSockets) for 100+ volatile assets; normalized into Postgres
- Scanned triangular arbitrage opportunities with rolling z-scores and correlation metrics; persisted fee-adjusted profitable cycles into daily trading signals
- Benchmarked execution latency across venues; Reduced slippage by 12% through order sizing and routing logic
- Deployed delta-neutral trading bot (C++, async I/O) to execute cross-exchange strategy with positive expectancy

ML–Driven Stock Analysis Platform | *Python, WebSocket* Dec. 2024 – June 2025

- Streamed 1M+ news and market docs; Applied Llama 3 for real-time sentiment scoring and feature extraction
- Automated multi-symbol options flow parser; Integrated signals into ML pipeline with live alerts
- Exposed real-time alerts via WebSocket service; containerized with Docker and deployed pipeline in production

Technical Skills

Languages: Python, C/C++, SQL (Postgres), Java
Quantitative Skills: Diffusion Models, Time-Series Forecasting, Statistical Testing, Financial Data Engineering
Developer Tools: Git, Docker, Google Cloud Platform, AWS, Linux
Libraries: PyTorch, NumPy, pandas, Matplotlib