PilotAI Credit Spread Trading System

Project Plan & Architecture

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1. Executive Summary

PilotAI is an automated credit spread trading system that scans the options market for high-probability credit spread opportunities, generates actionable alerts, and executes paper trades automatically. The system targets a **90%+ probability of profit** per trade using disciplined delta-based strike selection on highly liquid ETFs.

Current Status: Live and operational. Dashboard deployed. Paper trading engine running. Real broker integration (Alpaca) in progress.

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2. What Is a Credit Spread?

A credit spread is an options strategy where you simultaneously sell a closer-to-the-money option and buy a further-out-of-the-money option. You collect a net credit upfront. If the underlying stays away from your strikes by expiration, you keep the credit as profit.

Two types we trade: - **Bull Put Spread** (Bullish) — Sell a put, buy a lower put. Profits if price stays above the short strike. - **Bear Call Spread** (Bearish) — Sell a call, buy a higher call. Profits if price stays below the short strike.

Why credit spreads? - Defined risk (max loss = spread width minus credit) - High probability of profit (we target 85-90%+) - Time decay works in our favor (theta positive) - Don't need to predict direction precisely — just need price to stay in a range

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3. Strategy Rules

Parameter	Value
Underlyings	SPY, QQQ, IWM
Short Strike Delta	0.10 – 0.15 (85-90% probability OTM)
Days to Expiration	30 – 45 DTE

Parameter	Value
Spread Width	$5
Minimum Credit	20% of spread width ($1.00 on $5 spread)
IV Rank Minimum	25+ (prefer elevated volatility for richer premiums)
Profit Target	50% of max credit
Stop Loss	2.5× the credit received
Max Concurrent Positions	5
Max Risk Per Trade	2% of account

Entry Criteria

1. Technical analysis confirms directional bias (RSI, moving averages, volume)
2. IV Rank ≥ 25 (options are relatively expensive)
3. Short strike delta between 0.10-0.15
4. Credit received ≥ 20% of spread width
5. 30-45 DTE for optimal theta decay
6. Liquidity check — sufficient open interest and tight bid-ask

Exit Rules

- **Winner:** Close at 50% of max profit (don't get greedy)
- **Loser:** Close if loss reaches 2.5× credit received
- **Time:** Close at 7 DTE regardless (avoid gamma risk near expiration)
- **Emergency:** Close if short strike is breached

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4. System Architecture

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│                   DATA LAYER                           │
│  yfinance (free/delayed) ← current default             │
│  Tradier API (real-time, real Greeks) ← pending         │
│  Polygon.io (historical bars) ← built                  │
│  Alpaca (paper trading execution) ← in progress        │
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              ▼                        ▼
┌───────────────────────┐  ┌─────────────────────────┐
│  STRATEGY ENGINE      │  │  PAPER TRADING ENGINE    │
│  • Technical Analysis│  │  • Auto-execute signals  │
│  • Options Analyzer   │  │  • Position tracking     │
│  • Opportunity Scorer│  │  • P&L monitoring        │
│  • Signal Generator   │  │  • Auto-exit management  │
└───────────────────────┘ │  • Alpaca API (live sim)  │
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  ┌─────────────────────┐                   │
  │ ALERT GENERATOR      │                  │
  │ • JSON/CSV/TXT       │                  │
  │ • Telegram push      │                  │
  │ • Score + PoP + Risk │                  │
  └─────────────────────┘                   │
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  ┌──────────────────────────────────────────────────┐
  │            WEB DASHBOARD                          │
  │ "Alerts by PilotAI"                               │
  │ • Live alerts feed with expandable cards          │
  │ • Paper trading portfolio view                    │
  │ • Real-time ticker tape (TradingView)             │
  │ • Performance stats (from real trade data)        │
  │ • Hosted on Railway (permanent URL)               │
  │ https://pilotai-alerts-production.up.railway.app │
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5. What's Built (Complete)

5.1 Core Python System

- **17 Python files, ~3,500+ lines**
- Scanner finds opportunities across SPY, QQQ, IWM
- Black-Scholes delta calculation for accurate strike selection
- Technical analysis: RSI, moving averages, volume analysis
- Scoring algorithm ranks opportunities by probability, credit, and risk
- Alert generation in JSON, CSV, and plain text formats
- Full backtest module for historical validation

5.2 Paper Trading Engine

- Auto-executes top-scored signals on each scan
- Tracks entries, exits, P&L per trade
- Position sizing: max 2% risk per trade
- Auto-closes at 50% profit or 2.5× stop loss
- Stores all data in JSON for dashboard consumption

5.3 Web Dashboard

- **Next.js 14** with TypeScript and Tailwind CSS
- PilotAI branding: purple→pink→orange gradient, light theme
- Live ticker tape via TradingView widget
- Alert cards with full trade details, expandable
- Paper trading portfolio page with positions and P&L
- Deployed on Railway at permanent URL

- Mobile responsive (900px, 600px breakpoints)

5.4 Automated Scanning

- Cron job: every 30 minutes, 10 AM – 3:30 PM ET, Mon-Fri
- Auto-scans, auto-trades, and pushes summary to Telegram

5.5 Data Providers Built

- **yfinance** — working (free, 15-min delay)
- **Tradier** — provider built, pending API key
- **Polygon.io** — provider built, free tier limited to historical data

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6. What's In Progress

6.1 Alpaca Paper Trading Integration

Status: Account created, completing setup

Alpaca provides a real paper trading environment with: - Simulated order execution against live market data - Real fill prices based on actual bid/ask - Options trading enabled by default on paper accounts - Full REST API for programmatic trading - Free — no cost for paper trading

What this gives us: - Instead of our JSON-based simulation, trades execute on Alpaca's paper trading platform - Real order fills, realistic slippage - Proper options chain data - Portfolio tracking through Alpaca's dashboard + our dashboard

6.2 Telegram Alerts

- Bot module exists, needs bot token configuration
- Will push alerts with trade details on each scan

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7. What's Next

Priority	Task	Timeline
P0	Complete Alpaca integration — real paper trading	This week
P0	First paper trades on Alpaca during market hours	Next trading day
P1	Telegram alert bot — push notifications	This week
P1	Dashboard: live P&L from Alpaca positions	This week
P2	Backtest validation — run 6-month historical test	Next week

Priority	Task	Timeline
P2	Add more underlyings (AAPL, MSFT, AMZN)	Next week
P3	Iron condor strategy (neutral market)	Week 3
P3	Live trading readiness (Alpaca live account)	After paper validation

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8. Risk Management

Per-Trade Risk

- Max 2% of account per trade
- Defined max loss (spread width - credit) × contracts
- Stop loss at 2.5× credit to cut losers early

Portfolio Risk

- Max 5 concurrent positions
- Diversified across SPY, QQQ, IWM
- No single underlying > 40% of portfolio risk
- Dashboard shows real-time portfolio risk bar

Strategy Edge

- Selling options with 85-90% probability of expiring worthless
- Time decay (theta) generates daily income
- IV Rank filter ensures we sell when premiums are rich
- 50% profit target locks in gains early, improves win rate further

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9. Access & URLs

Resource	URL
Dashboard	https://pilotai-alerts-production.up.railway.app
Paper Trading	https://pilotai-alerts-production.up.railway.app/paper-trading
Alpaca Dashboard	https://app.alpaca.markets (atlas@attix.com)
System Files	Mac Studio: ~/credit-spread-system/

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10. Technology Stack

Component	Technology
Strategy Engine	Python 3.9, scipy, numpy, pandas
Options Data	yfinance (current), Tradier/Alpaca (planned)
Technical Analysis	Custom RSI, SMA, EMA + ta-lib
Paper Trading	Alpaca Markets API
Web Dashboard	Next.js 14, TypeScript, Tailwind CSS
Hosting	Railway
Alerts	Telegram Bot API
Scheduling	OpenClaw cron (30-min intervals)

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