ML-Driven Trading System for Sonata Software

FinStreet Hackathon

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Overview

A rule-based trend-following trading system for NSE equities. The strategy trades in the direction of the prevailing trend and enters on controlled pullbacks, using ATR-based risk management.
A lightweight machine learning layer is used only to filter low-quality trades. The system prioritizes consistency, low drawdowns, and realistic execution.

Core Trading Philosophy

Price action during the study period showed clear continuation behaviour: trend expansion followed by shallow pullbacks and trend resumption. Pure mean reversion was avoided.
Trades are taken strictly in the direction of the trend. Pullbacks are treated as entry opportunities, not reversal signals.

Trend and Entry Logic

Trend Identification:

- EMA(10) and SMA(20) are used to identify directional bias
- The slope of both averages is monitored to gauge trend strength
- Market state is classified as uptrend, downtrend, or non-trending

Pullback Entry:

- Trades are considered only during established trends
- Price is required to retrace approximately 18–20% of the recent move
- The pullback must respect the moving average structure

Confirmation:

- Momentum must stabilize and begin to turn back in the trend direction
- A single confirmation bar is required to reduce noise
- The ML model acts as a final approval check

Machine Learning Component

Model: XGBoost classifier (Up / Neutral / Down).
The model does not predict prices. It acts as a validation filter to reject trades where historical patterns do not support the technical setup.

Risk Management

Risk control is treated as a first-class component of the system.

- Risk per trade is capped at **2%** of total capital
- Stop-loss levels are set using recent volatility (ATR-based)
- Profit targets are wider than stops to maintain favorable risk-reward
- All positions are closed by end of day

$$\text{Position Size} = \frac{0.02 \times \text{Capital}}{\text{Stop Distance}}$$

Backtesting and Results

Backtest Setup:

- Daily OHLCV data via FYERS API
- Walk-forward evaluation on Nov–Dec 2025
- Entry at next-day open
- SL/TP evaluated using daily high/low

Performance Summary:

Metric	Value
Total Trades	11
Win Rate	72.73%
Total Return	0.88%
Sharpe Ratio	2.49
Maximum Drawdown	0.48%
Calmar Ratio	11.42
Final Equity	100,880

Results show stable performance with minimal drawdowns. Returns are intentionally conservative due to strict risk controls.

Conclusion

This project demonstrates that disciplined trend-following with pullback entries and strict risk management can deliver stable, repeatable performance.
The system emphasizes robustness and execution realism over aggressive optimization.