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# FinTech Forecasting Dashboard

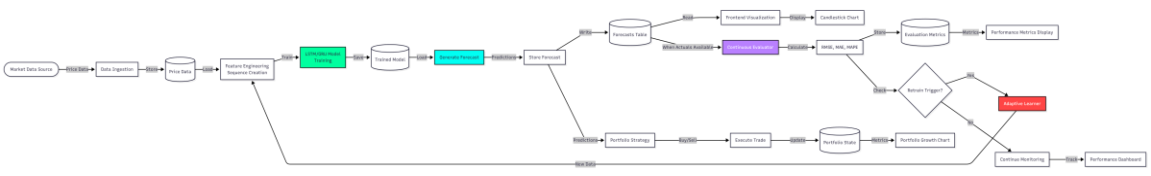
## 1. Introduction

The Extended FinTech Forecasting Dashboard is an AI-driven financial forecasting system designed to predict the prices of stocks, cryptocurrencies, and forex instruments. It leverages Long Short-Term Memory (LSTM) neural networks with an adaptive learning framework that continuously retrains and improves prediction accuracy over time.

The system integrates multiple modules — data ingestion, model training, forecast visualization, and portfolio management — into a unified dashboard. The architecture is based on a Flask backend (Python) connected to a React frontend via RESTful APIs. Data and models are stored in an SQLite database.

Core configuration:
- Model type: LSTM (optionally GRU or Transformer)
- Sequence length: 60 time steps
- Hidden units: 50
- Dropout: 0.2
- Update interval: 24 hours or performance-triggered

The dashboard provides interactive candlestick charts with forecast overlays, error bands, and portfolio growth visualizations, enabling traders and analysts to assess model performance and portfolio trends in real-time.



## 2. Adaptive / Continuous Learning Mechanism

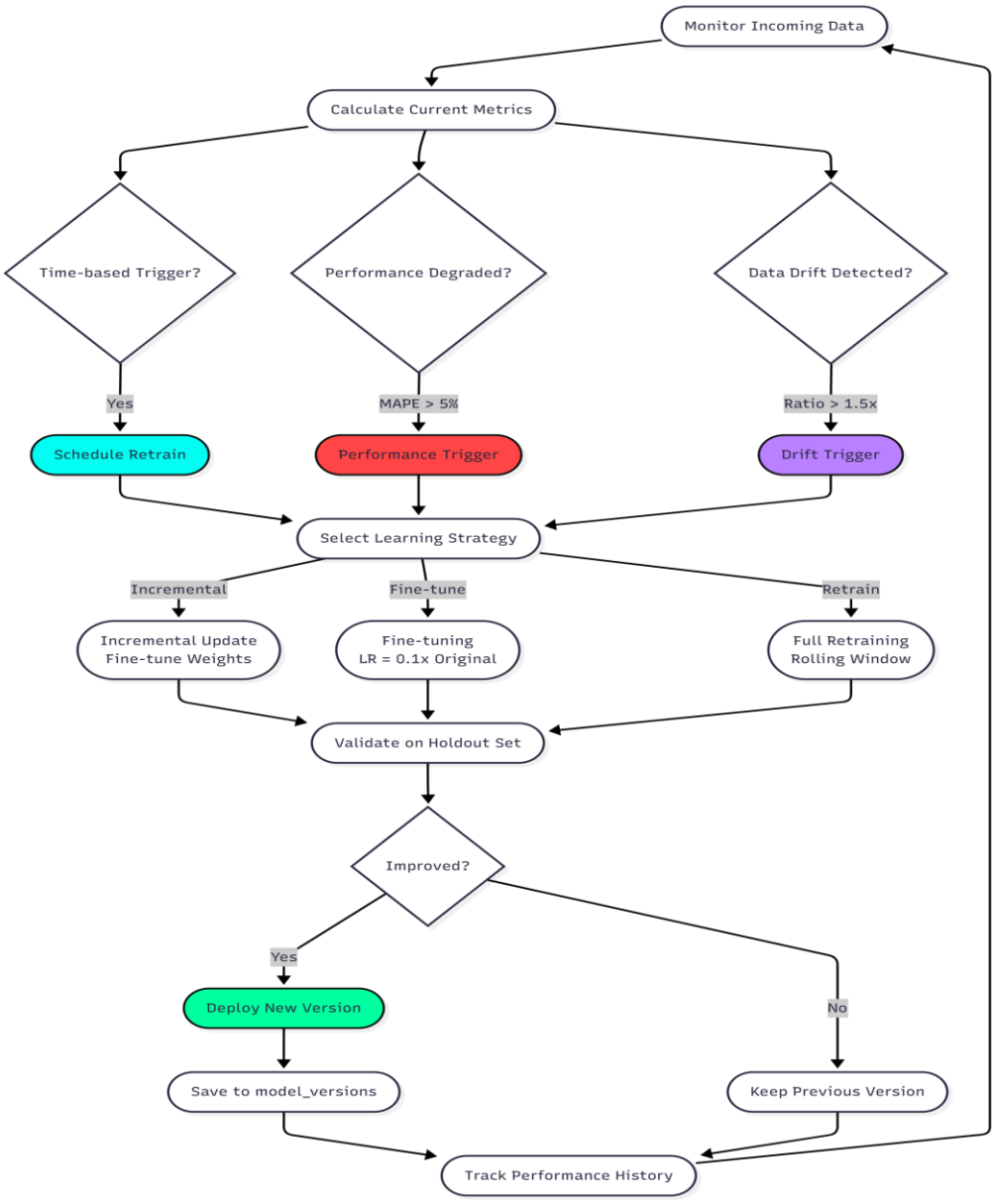
The system incorporates three adaptive learning strategies to ensure continuous improvement of predictive accuracy as new data becomes available:

1. Incremental Updates – Fine-tunes weights using new mini-batches of recent data without discarding prior learned patterns.

2. Fine-Tuning – Performs partial retraining with reduced learning rate (0.1×) for gradual adaptation to market changes.

3. Full Retraining – Triggered automatically when significant performance drops occur (e.g., MAPE > 5.0%) or data drift ratio > 1.5× historical average.

Retraining Workflow:
1. Monitor incoming data
2. Calculate metrics (RMSE, MAE, MAPE, Directional Accuracy)
3. Evaluate against thresholds
4. Apply selected learning strategy
5. Validate model performance
6. Deploy improved model version




## 3. Evaluation and Monitoring Approach

The system continuously measures forecast quality using key statistical indicators including RMSE, MAE, MAPE, Directional Accuracy, and Confidence Intervals. A ContinuousEvaluator module compares model predictions against actual data and logs errors in the prediction_errors table.

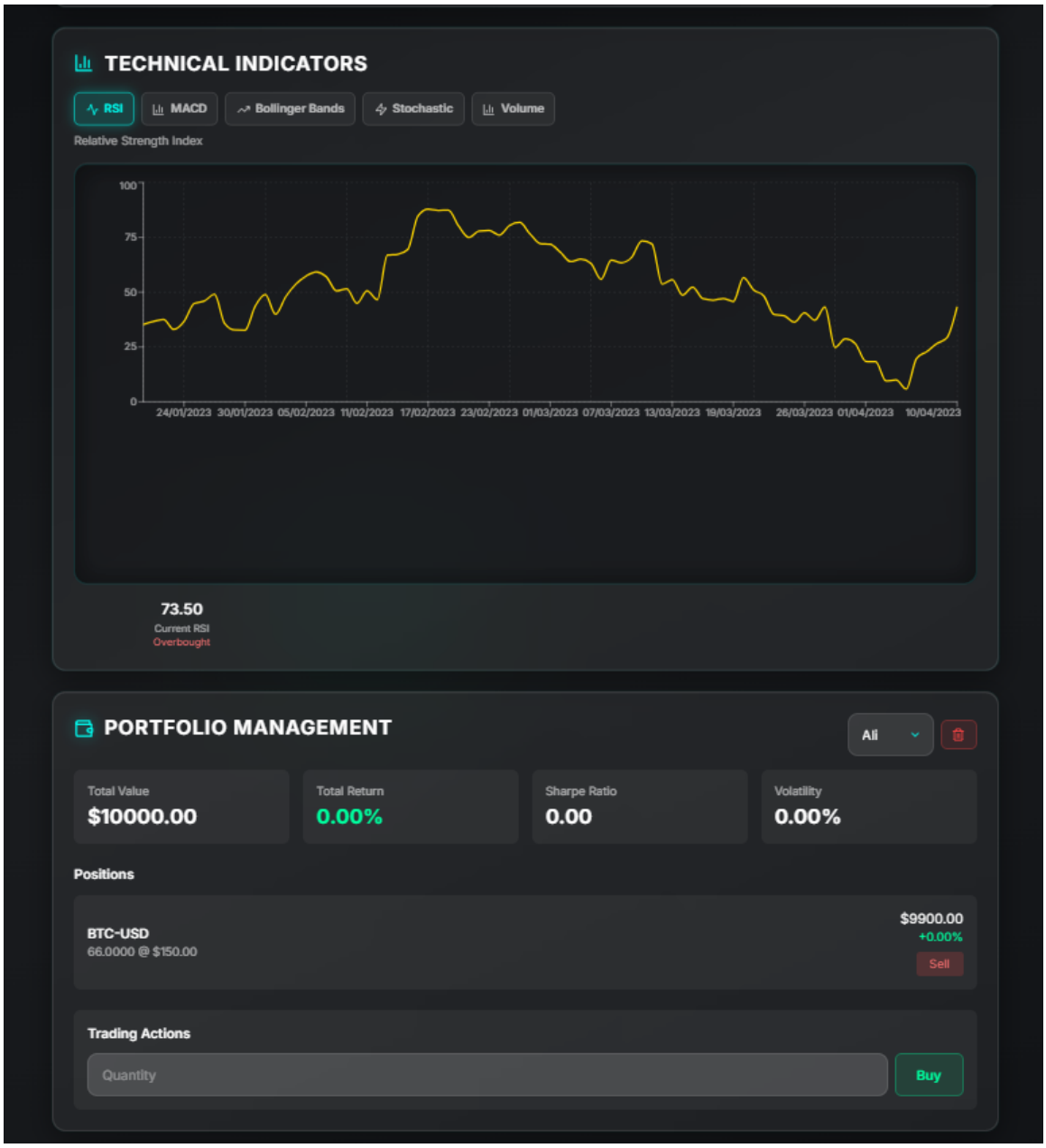
Visualization components include:
- Error Overlays on candlestick charts
- Metric Cards displaying live accuracy metrics

- Trend Graphs for model performance over time
- Retraining Alerts and degradation monitoring

## 4. Portfolio Management Strategy and Performance Visualization

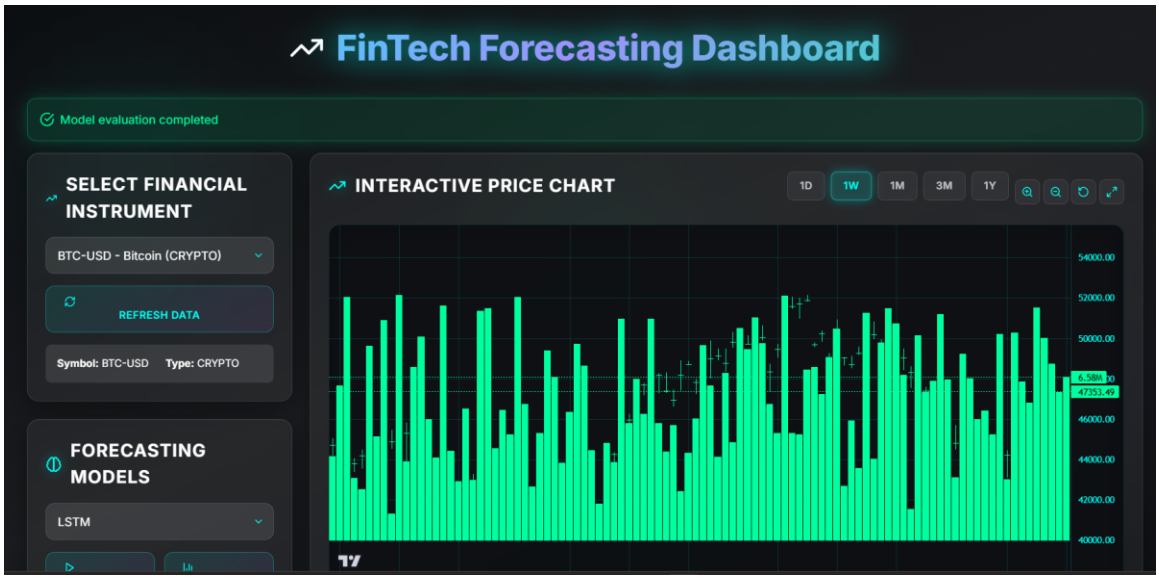
The dashboard includes simulated trading strategies such as SimplePredictionStrategy and MomentumStrategy. Trades are based on predicted returns and confidence thresholds.

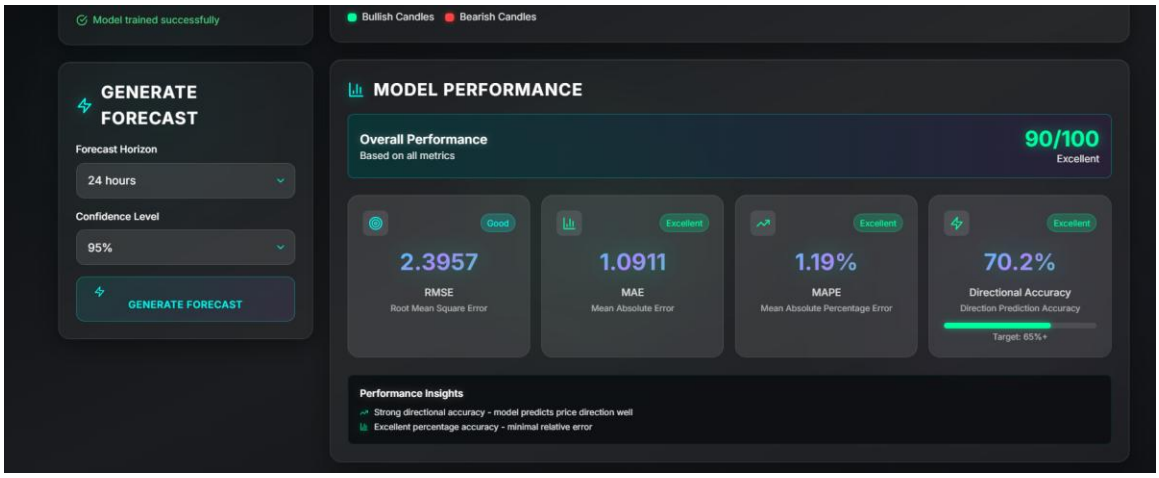
Visualization includes:
- Candlestick Chart: Historical OHLC with forecast overlays and confidence intervals
- Portfolio Growth Chart: Value trajectory visualization
- Performance Dashboard: Live portfolio metrics including return %, Sharpe ratio, and volatility




## 5. Sample Runs and Visual Outputs

Sample screenshots include:
- Candlestick Forecast Visualization (with error overlays)
- Portfolio Growth Chart (value progression)
- Evaluation Dashboard (RMSE=2.68, MAE=1.57, MAPE=2.99%, Directional Accuracy=73.7%)




These confirm the model maintains stable accuracy and adaptive learning capability.

## 6. Conclusion

The Extended FinTech Forecasting Dashboard demonstrates a successful integration of adaptive learning, continuous evaluation, and portfolio management.

Future improvements include reinforcement learning for trade decisions, multi-asset optimization, real-time streaming, ensemble forecasting, explainable AI (SHAP values), and backtesting frameworks.

The system sets a foundation for advanced AI-driven trading platforms capable of autonomous adaptation and intelligent portfolio growth.