Software Architecture Report

(TechnicalAnalysis Trading System)

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1. Input Description

The system takes as input:

- **Stock historical data CSV files**, one per stock
- **Directory path** to the data folder
- **Backtest configuration parameters** like date ranges and model type

Key Input Fields:

- `Date`: Trading day
- `Price`: Closing price
- `Open`: Opening price
- `Vol.`: Volume (e.g., '1.2M')

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2. Module & Class Architecture

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Main Program (main block)
|— Loop over files in data folder
    |— TechnicalAnalysis(file_path)
        |— load_data()
        |— calculate_indicators()
        |— generate_signals()
        |— train_tree_model() [Optional]
        |— predict_tree_signal() [Optional]
        |— backtest_model_predictions()
        |— backtest()
        |— evaluate_strategy_results()
```

Class: TechnicalAnalysis

- **Constructor**

    - Initializes with CSV file path

    - Loads and processes data

- **load_data()**

  - Converts date strings to datetime

  - Parses and standardizes volume strings

- **calculate_indicators()**

  - Computes SMA, EMA, MACD, RSI

  - Adds candlestick patterns (bullish/bearish engulfing)

- **generate_signals()**

  - Creates boolean Buy/Sell signals based on indicators

- **train_tree_model()**

  - Optional: Trains XGBoost or LightGBM model

  - Uses previous indicators as features

- **predict_tree_signal()**

  - Predicts Buy/Sell signals using trained model on out-of-sample data

- **backtest()**

  - Simulates trading strategy using signals

  - Updates portfolio value over time

  - Computes metrics like Sharpe ratio, drawdown, volatility

- **evaluate_strategy_results()**

  - Compares strategy vs. Buy & Hold

  - Outputs results to CSV

  - Saves portfolio value graph

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3. Outputs Description

Each stock generates:

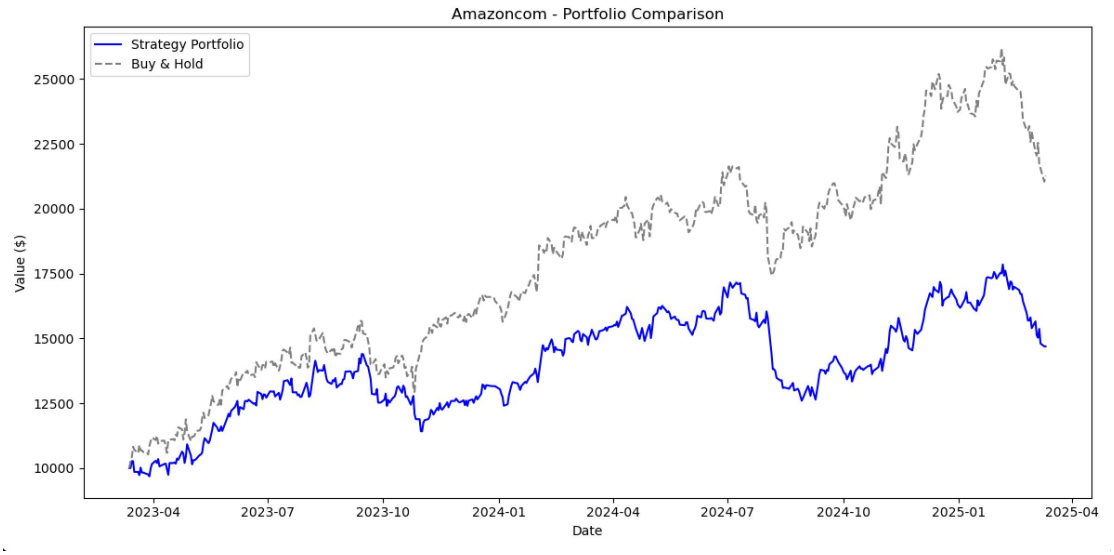
CSV file with evaluation metrics: final portfolio value, Sharpe ratio, etc.

PNG chart comparing strategy vs. Buy & Hold

Key Metrics:

- Annualized Return
- Sharpe Ratio
- Maximum Drawdown
- Volatility
- Buy & Hold benchmark results

Example Graph: `amazoncom_comparison.png`



X-axis: Time

Y-axis: Portfolio Value

Lines: Strategy vs Buy & Hold

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4. Software Design Notes

Modular structure for ease of extension (e.g., adding new indicators)

OOP encapsulation using the `TechnicalAnalysis` class

Compatible with ML models (XGBoost/LightGBM) as optional enhancement

Reusable on any stock with proper CSV input

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5. Suggested Improvements

Integrate live data fetching using yfinance or Alpha Vantage

Add GUI or CLI interface

Include transaction log export (e.g., trade dates, buy/sell prices)

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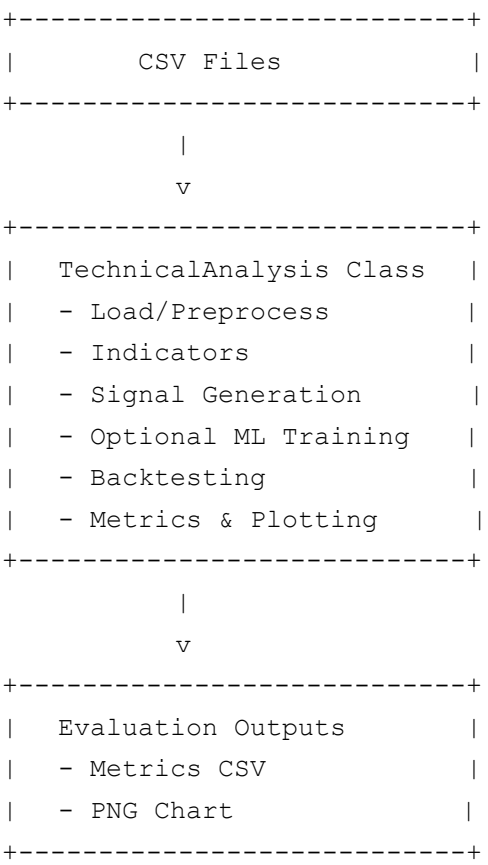
6. Architecture Diagram



End of Report