Stock Analysis Program Design Report

Goals

- **Automated Data Processing**: The program should be able to automatically process input Excel stock data files.
- **Technical Analysis-Based Trading Recommendations**: Generate buy and sell recommendations based on historical stock data and technical analysis.
- **Visualization**: Provide meaningful visual representations of stock trends and trading signals.

Planned Methods

1. Data Processing

- Read stock data from an Excel file using pandas.
- Perform data cleaning, including handling missing values and ensuring proper date formatting.
- Store data efficiently for quick access and computation.

2. Technical Analysis for Trading Decisions

Implement common technical indicators:

- Moving Averages (SMA, EMA)
- Relative Strength Index (RSI)
- Moving Average Convergence Divergence (MACD)
- Bollinger Bands
- Average True Range (ATR)

Define buy and sell signals based on these indicators. Apply simple rule-based strategies for decision-making.

3. Visualization

- Use matplotlib and plotly for dynamic and interactive charts.
- Plot stock price trends with overlays of moving averages and trading signals.
- Display buy/sell points on stock price charts.

Expected Additional Features

1. Backtesting Strategy Performance

Allow users to input a time range and evaluate strategy performance.

Compute key performance metrics:

- Total Return
- Annualized Return
- Sharpe Ratio
- Maximum Drawdown
- Volatility

Generate visualizations of backtesting results, including equity curves.

2. AI and Reinforcement Learning for Enhanced Decision-Making

Implement machine learning models to improve decision accuracy.

Explore reinforcement learning techniques (e.g., Deep Q-Learning, PPO) for adaptive strategy optimization.

Train models using historical stock data and simulate trading performance.

3. Automated Data Retrieval

Develop a web crawler capable of automatically fetching input data from online sources.

Reduce the need for manual uploads by integrating real-time data collection.

4. Expansion to Additional Stock Data

Extend the tool's capabilities to handle a wider variety of stock data and financial records.

Broaden the application scope to support diverse investment strategies.

5. Real-time Data Stream Analysis

Introduce features for real-time data streaming and live analysis.

Allow users to make decisions based on up-to-the-minute information.

Conclusion

This program aims to automate stock data analysis, provide technical analysis-based recommendations, and offer advanced backtesting and AI-enhanced decision-making capabilities. By integrating robust data processing, visualization, and machine learning methodologies, the project seeks to improve trading strategies and maximize investment returns. The inclusion of automated data retrieval, expanded data handling, and real-time streaming further enhances the tool’s effectiveness and usability.