Stock Market Prediction Project

Statement:

This project is for predicting the short-term price trend from analyzing past market prices using data structure and algorithms. The final output of the system is a trend that indicates the market direction on the recent price behavior.

First, I will be using DSA (Phase 1) for better understanding and smoothly project process, after the completion of the phase 1 I will extend the project using AI integration (Phase 2).

Phase 1: DSA-Based Stick Trend Analysis

In Phase 1, the project focuses on analyzing past stock price data using data structure and algorithms. The stock prices are stored in an Array, where each value represents the closing price of a stock for a day. A Sliding window method is used to look at prices over a small number of recent days at a time. Applying the Sliding window, the Moving average of stock prices is calculated to smooth short-term fluctuations. The trend is identified by comparing the current moving average with previous one. An increase indicates an upward trend, a decrease indicates a downward, and minimal change indicates sideways trend.

- **Why use an Array instead of Stack, Queue, or Linked list?**
  - Stock price data is accessed by index (day1, day2, day3, ...).

- Array allow direct and fast access to elements using indices.
- Sliding window and moving average calculates require frequent indexing.
- Stack and Queue restrict access (LIFO/FIFO), which is not suitable.
- Linked lists have extra memory overhead and slower access compared to arrays.

- What is Sliding windows? Why is it used?

- Sliding window is a technique used to analyze a fixed-size subset of data.
- Instead of recalculating from scratch, window move one step forward.
- This reduces time complexity and improves performance.
- In stock analysis, it helps focus on recent price movements.
- Example:
  - Window size = 5 days
  - Analyze day 1-5 → move to day 2-6 → and so on.

- What is Moving Average? Why is it imported?

- A moving average calculates the average of prices over a fixed period.
- It reduces short-term fluctuation (noise).
- Helps overall price direction.
- Commonly used in real financial markets.

- What is Trend Classification? How is it done?

- Trend classification determines the direction of the stock price.

- o It is done by comparing moving average over time.
- o If average increase → **Uptrend**.
- o If average decrease → **Downtrend**.
- o If change is minimal → **Sideways trend**.

Algorithm Workflow (Phase 1)

1. Load past stock price data into an array.
2. Select a fixed window size representing recent days.
3. Apply sliding window technique to extract prices within the window.
4. Calculate the moving average of prices in the current window.
5. Compare the current moving average of prices with previous moving average.
6. Classify the stick trend as upward, downward, or sideways based on the comparison.

Input and Output Description

- What does it take in, and what does it give out?

Input:

The system takes past stock price data as input. The data consist of a sequence of daily closing prices stored in an array. A fixed window size is also provided to analyze recent price movements.

Output:

The Output of system is a classified stock market trend based on recent behavior. The trend is displayed as one of the following: upward trend, downward trend, or sideways trend.

Use Case / Applications

- Where would this actually be used?

This system can be used in basic financial analysis tools to understand short-term stock price behavior. It helps user identify whether a stock is currently trending upward, downward, or moving sideways based on recent price data. Such analysis can assist beginners, students, or analysts in studying market trends and understanding price movement patterns. The project can also serve as a foundation for more advance stock analysis systems.

Limitations

- The system only identifies short-term trends; it does not predict exact stock prices.
- The method relies on past data, so sudden market shocks cannot be captured.
- Moving averages and sliding windows smooth data, but may delay detecting abrupt trend changes.
- The system cannot automatically adapt to new patterns without manual adjustment (window size, parameters).
- Accuracy is limited compared to AI-based models, it provides a basic trend guide, not financial advice.

Future Scope / Extensions

- How can this project be improved in the future?

In the future, this project can be enhanced by incorporating advance technique for better trend prediction. Machine learning or deep learning models can be used to automatically learn complex pattern from past stock data. Additional indicators such as volume, volatility, and technical indicators may also be included to improve analysis. Real-time data integration and visualization features can further extend the system for practical financial analysis applications.