**Stock market prediction**

**Empathy: -**

Investors rely on stock price predictions to make informed decisions about buying, holding, or selling stocks. Investors want accurate predictions to minimize risk and maximize returns. Predictions should align closely with actual stock price movements. They expect insights into whether a stock is in an uptrend, downtrend, or consolidation phase. Real-time news and event analysis can be vital, especially for short-term traders. Transparent and interpretable models can help investors understand why a particular prediction was made, fostering trust in the prediction system.

**Problem Definition: -**

Predicting stock prices is a challenging task due to the complexity of financial markets and the influence of various factors. Stock price data highly exhibits non-stationarity. Ensuring the quality of historical stock price data is difficult it includes heavy noise. Models perform well on training data but generalize poorly to new data. "Black Swan" events, can have a sudden and dramatic impact on stock prices. Changes in financial regulations or policies can affect market dynamics and require adjustments to prediction models.

**Idea: -**

Utilize historical stock price data to create time series models like ARIMA or Seasonal Decomposition of Time Series (STL) to make short-term predictions and models like Prophet or LSTM networks for longer-term predictions. Apply machine learning algorithms like linear regression, decision trees, random forests, or gradient boosting to predict stock prices. Analyse a company's financial statements, earnings reports, and economic indicators to assess its intrinsic value and make long-term predictions. Monitor social media platforms, financial news, and online forums to gauge market sentiment and investor opinions. Develop a simulation framework to test the performance of various prediction models and trading strategies over historical data.

**Design: -**

Analysing stock market data using time series analysis techniques like ARIMA (Auto Regressive Integrated Moving Average) and LSTM (Long Short-Term Memory) can provide valuable insights and help make predictions.

**ARIMA Model:**

Using tools like ACF and PACF plots to determine the model's parameters. Fit the ARIMA model to the training data by apply differencing (d) to make the time series stationary if necessary.

**LSTM Model:**

Prepare the data by creating sequences of historical stock prices, which will serve as input features. Set up an LSTM neural network for time series forecasting. Design the architecture of the LSTM network and train the LSTM model on the training data.

**Evaluate And Iterate: -**

**ARIMA Model Evaluation:**

Evaluate the model's performance using metrics like Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and visualizations like actual vs. predicted plots.

**LSTM Model Evaluation:**

Evaluate the model's performance using the same metrics (MAE, MSE, RMSE) and visualizations.

**Model Comparison:**

Compare the performance of the ARIMA and LSTM models. Consider factors like accuracy, computational complexity, and ease of implementation.