

# Real-Time Data Analytics for Stock Market Trends Using Python & Power BI with Full Stack Web Development

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## ABSTRACT

*Stock market data changes rapidly and contains complex patterns, which makes manual analysis difficult, especially for beginners. Although stock price information is easily available, understanding historical trends and market behavior requires analytical support. This project, Dynamic Stock Market Insights: Real-Time Trend Analysis using Python and Power BI, focuses on analyzing historical stock market data to classify price trends. The dataset consists of Open, Close, High, and Low prices collected from historical records. These raw values are processed into meaningful features such as price change and volatility to represent market movement. Machine learning classification techniques are applied to learn patterns from past data and predict stock trends as increase, decrease, or stable. The system does not predict exact future prices but provides trend-based insights. A user-friendly web application is developed to allow users to input values*

*and obtain predictions instantly. Data visualization techniques and Power BI charts are used to present results clearly. This project serves as an educational and analytical tool to understand stock market trends using data analytics and machine learning.*

**KEYWORDS:** *Power BI, Machine Learning, Stock Market, Decision Tree, random forest.*

## INTRODUCTION

The stock market generates a large amount of data every day in the form of price movements such as Open, Close, High, and Low values. These values reflect how stock prices change during a trading session and are widely used for understanding market behaviour. However, analysing this data in a meaningful way requires proper processing and analytical methods, especially when historical data is involved. For beginners and students, interpreting raw stock market data can be challenging without analytical support.

Stock market analysis often involves observing price movements over time to understand whether prices are moving upward, downward, or remaining stable. While basic price information is available from various sources, understanding overall trend behaviour from historical data requires additional analysis.

The project “Dynamic Stock Market Insights: Real-Time Trend Analysis with Python and Power BI” is designed to analyse historical stock market data and classify market trends in a simple and understandable manner. Instead of predicting exact future prices, the project focuses on identifying the direction of price movement based on past data. The system classifies trends as Increase, Decrease, or Stable, making it suitable for educational and analytical purposes.

In this project, raw stock price values are processed to generate meaningful features such as price change (Close – Open) and price volatility (High – Low). These features represent the direction and range of price movement during a trading session. Machine learning techniques are applied to these processed features to analyse historical patterns and perform trend classification based on the input values.

To present the results clearly, a web-based application is developed using Python and Streamlit. The application allows users to enter calculated values and view trend

predictions. Overall, this project provides a simple, practical, and educational approach to stock market trend analysis using data analytics and machine learning techniques.

## **RELATED WORK**

With the increasing availability of stock market data, understanding price movements and market behaviour has become important for students and beginners interested in financial analysis. Traditional analysis methods often require strong financial knowledge and manual interpretation of raw values such as Open, Close, High, and Low prices. These approaches can be difficult and time-consuming, especially for learners who are new to stock market concepts. This creates a need for a simple analytical system that can help users understand market trends more easily. The growth of data analytics and machine learning techniques has created new opportunities to analyse historical stock market data in a structured and meaningful way. By processing raw price values into features such as price change and volatility, it becomes possible to study market behaviour more effectively. Instead of focusing on complex price prediction, using machine learning for trend classification provides clearer and more interpretable results, which are suitable for educational and analytical purposes. The motivation for this project is to develop a

simple and user-friendly system that analyses historical stock market data and classifies trends as Increase, Decrease, or Stable. By combining data processing, machine learning techniques, and graphical visualizations, the project aims to reduce the complexity of stock market analysis. This project is driven by the goal of providing an educational and basic analytical platform that helps beginners and learners understand stock market trends in a practical and accessible manner.

## LITERATURE SURVEY

As a result, researchers have explored automated systems that utilize data analytics, machine learning algorithms, and visualization tools to analyze stock market trends more effectively. Patel et al., 2015 – “Predicting Stock and Stock Price Index Movement using Trend Deterministic Data Preparation and Machine Learning Techniques” This study analyses stock market data using machine learning algorithms to predict stock price movements. The research demonstrates that predictive models can improve the accuracy of stock market analysis compared to traditional methods. Fischer and Krauss, 2018 – “Deep Learning with Long Short-Term Memory Networks for Financial Market Predictions” This paper explores the use of deep learning models for

financial time-series prediction. The study shows that neural networks can effectively identify patterns in historical stock data to predict market trends. Zhang et al., 2019 – “Stock Market Prediction using Machine Learning Algorithms” The research compares different machine learning algorithms for stock market prediction. It highlights how predictive analytics can help investors make better financial decisions by analysing historical price data. Ballings et al., 2017 – “Evaluating Multiple Machine Learning Algorithms for Stock Price Prediction”

This study evaluates several machine learning techniques such as Random Forest and Support Vector Machines for predicting stock prices. The results indicate that machine learning models can significantly improve prediction performance. Bollen et al., 2011 – “Twitter Mood Predicts the Stock Market” This paper investigates the relationship between public sentiment and stock market movements. It demonstrates that analysing social media data can provide additional insights for predicting financial market behaviour.

## EXISTING METHOD

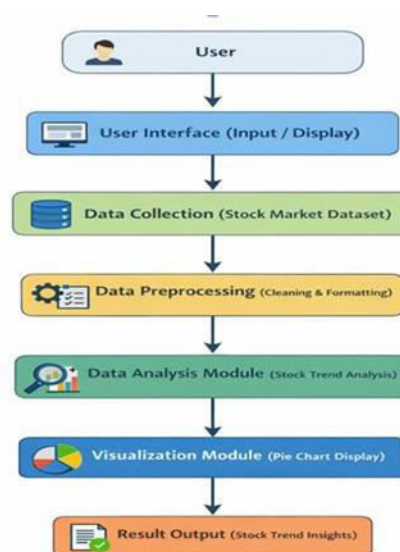
Stock market prediction and trend analysis have attracted significant attention in recent years due to the increasing availability of financial data and advancements in

machine learning techniques. Traditional stock analysis methods mainly relied on manual observation of historical price charts and technical indicators, which required expert knowledge and considerable time. However, these methods often fail to handle large datasets and complex patterns present in financial markets.

## PROPOSED METHOD

The proposed system is a Stock Trend Prediction System designed to analyze historical stock market data and predict future stock price trends using machine learning techniques. The system helps users understand market behavior by processing stock data and identifying patterns that influence price movements. By applying machine learning algorithms, the system can provide predictions about whether a stock price is likely to increase or decrease. The platform allows users to load stock market datasets, preprocess the data, and train a machine learning model to analyse the patterns in stock prices. Users can then enter input values such as stock parameters, and the system predicts the future trend of the stock. The system also displays graphical representations of stock trends, helping users visualize the prediction results clearly. This automated prediction approach assists users in making better decisions based on data-driven insights.

## SYSTEM ARCHITECTURE



**Fig 1: Block Diagram**

## METHODOLOGY DESCRIPTION

**Data Collection:** The first step in the system design is collecting stock market data. The data may include stock prices, trading volumes, company names, and time information. This data can be obtained from financial datasets or online stock market sources.

**Data Preprocessing:** After collecting the dataset, the data must be cleaned and prepared. Data preprocessing includes removing missing values, correcting inconsistent data, and converting the dataset into a suitable format for analysis.

**Feature Selection:** In this step, important attributes from the dataset are selected for analysis. These features may include opening price, closing price, highest price, lowest price, and trading volume. These features help in identifying the stock market trends.

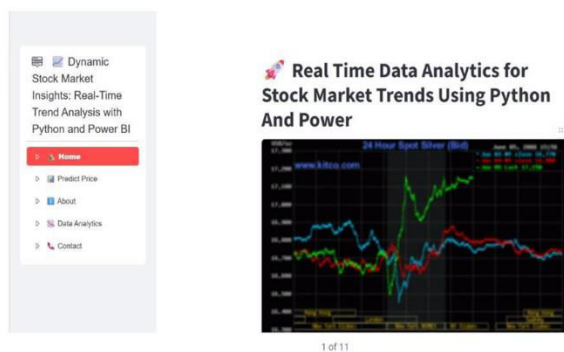
**Model Selection:** Machine learning algorithms are used to analyze patterns in stock market data. In this project, appropriate algorithms are selected to identify trends and patterns in stock prices.

**Model Training:** The selected machine learning model is trained using the processed stock market dataset. Training helps the system learn patterns from historical data.

**Model Evaluation:** After training the model, it is evaluated to check its performance and accuracy in analyzing stock market trends.

**Result Visualization and Output:** The final results are presented to the user through visual representations such as charts or graphs. In this project, pie charts are used to display stock market trend insights clearly.

## RESULTS AND DISCUSSION

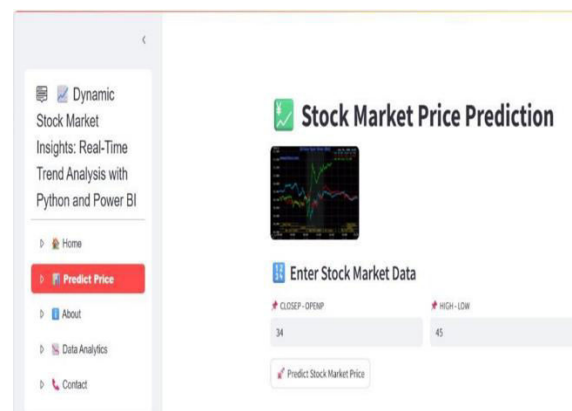


**Fig 2: Home Page**

The above figure shows the home page of the Dynamic Stock Market Insights system, developed using Python and Streamlit. The interface provides a user-friendly environment where users can navigate through different sections of the application such as Home, Predict Price, Data

Analytics, About, and Contact. The main objective of this interface is to allow users to easily interact with the system and analyse stock market trends using real-time or historical data.

The system processes stock market data and displays the trends using graphical visualization. In the figure, a stock trend graph is shown which represents variations in stock prices over a period of time. These visual insights help users understand market behaviour and make better analytical decisions. The interface integrates data analysis techniques and visualization tools to present meaningful insights about stock market performance.

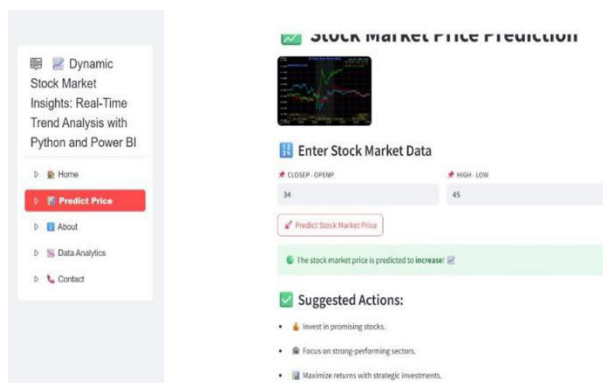


**Fig 3: Enter Values**

This screen shows the Stock Market Price Prediction module of the system. In this module, the user can enter stock market values such as the difference between closing price and opening price (Close – Open) and the difference between highest and lowest price (High– Low). These values are used by the system to analyse the

stock market data and process it through the trained model.

After the user enters the required values and clicks on the Predict Stock Market Price button, the system processes the input data and generates the prediction result. The prediction helps users understand the possible trend or movement in the stock market based on the provided data. This module provides a simple interface for users to interact with the system and obtain stock market insights easily.



**Fig 4: predict stock market price  
(Increase)**

The above figure shows the prediction result generated by the Stock Market Price Prediction module of the system. After entering the stock market values such as the difference between closing and opening price and the difference between highest and lowest price, the user clicks on the Predict Stock Market Price button. The system processes the entered data and generates the prediction result based on the analysis performed by the model. In this example, the system predicts that the stock

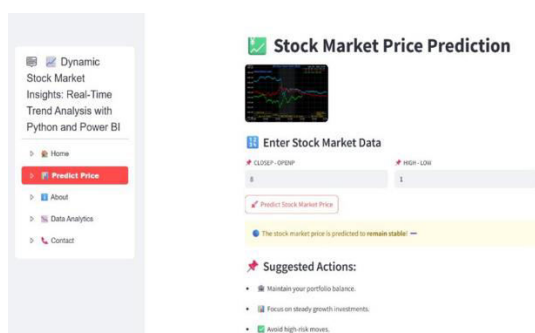
market price is likely to increase. Based on the prediction, the system also provides suggested actions to help users understand possible investment strategies. These suggestions guide users to invest in promising stocks, focus on strong-performing sectors, and maximize returns through strategic investments. This feature helps users interpret the analysis results easily and supports better decision-making. The above figure shows another prediction result from the Stock Market Price Prediction module. In this case, the user enters stock market values such as the difference between closing price and opening price and the difference between highest and lowest price. After clicking the Predict Stock Market Price button, the system analyses the given data and generates the prediction result based on the trained model.

In this example, the system predicts that the stock market price is expected to remain stable. Along with the prediction, the system also displays suggested actions to guide users. These suggestions recommend maintaining portfolio balance, focusing on steady growth investments, and avoiding high-risk moves. This helps users understand the market situation and supports better financial decision-making based on the analysis results

The above figure shows the prediction result when the entered stock market values

indicate a negative market trend. After the user inputs the required values such as the difference between the closing price and opening price, and the difference between the high and low price, the system processes the data using the trained machine learning model. Based on the input values, the system predicts that the stock market price is likely to decrease. The prediction result is clearly displayed to the user along with a visual indicator to show the market trend.

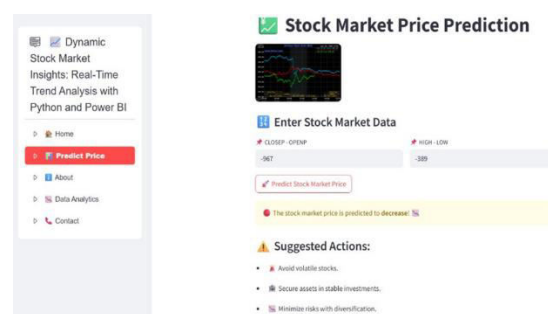
In addition to the prediction result, the system also provides suggested actions to help users make better investment decisions. These suggestions include avoiding highly volatile stocks, securing investments in stable assets, and minimizing risks by diversifying investments. By providing both prediction and guidance, the system helps users understand market behavior and make more informed decisions regarding stock market investments.



**Fig 5: About this App**

The above figure presents the information module of the application, titled "About

This App." This section serves as an educational resource within the platform, providing users with a fundamental understanding of Stock Market Theory. By including this comprehensive guide, the system ensures that even novice investors can grasp the essential mechanics of financial markets and global exchanges. This integration of theoretical knowledge alongside technical tools enhances the overall user experience and provides context for the data-driven insights found elsewhere in the app.



**Fig 6: Stock Market Movement Analysis**

The above figure demonstrates the Data Analytics module of the system, which focuses on visualizing historical performance through the "Stock Market Trends Analysis" interface. This component is designed to provide a granular view of market movements by plotting stock price fluctuations over a specific duration, such as the last 30 days. By utilizing time-series data, the system generates a line graph that allows users to observe patterns, peaks, and troughs in stock pricing, which is essential for conducting technical analysis and identifying potential market trends.

## CONCLUSION

This project titled “Dynamic Stock Market Insights: Real-Time Trend Analysis using Python and Power BI” focuses on analysing stock market data and predicting possible price trends using machine learning techniques. The system collects stock market data, performs preprocessing, selects important features, and applies machine learning algorithms to identify patterns in stock prices. The results are then displayed through visualizations and prediction outputs to help users understand market behaviour. The developed system helps investors and analysts understand stock market trends more easily by converting raw stock data into meaningful insights. The prediction module provides an indication of whether the stock price may increase, decrease, or remain stable based on the input values. Visualization techniques such as charts and graphs improve the understanding of the data. Overall, this project demonstrates how data analytics and machine learning can support decision-making in stock market investments.

## FUTURE SCOPE

The proposed system can be further enhanced with additional features and advanced technologies to improve its accuracy and usability. In

the future improvements may include advanced dashboards using Power BI or other visualization tools to provide more interactive charts, trend comparisons, and historical performance analysis. Overall, the project can be expanded into a complete stock market analytics platform that helps investors make better financial decisions.

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