STOCK PRICE PREDICTION

MINOR PROJECT REPORT
Submitted in partial fulfillment of the requirement for the Degree of
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PARUL INSTITUTE OF TECHNOLOGY VADODARA,
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Parul University
Parul Institute of Technology

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

CERTIFICATE

This is to certify that

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Students of **CSE VI Semester** of "**Parul Institute of Technology, Vadodara"** has completed their **Minor Project** Titled **"STOCK PRICE PREDICTION"**, as per the syllabus and has submitted a satisfactory report on this project as a partial fulfillment towards the award of degree of **Bachelor of Technology** in **Computer Science and Engineering** under **Parul University, Vadodara, Gujarat (India)**.

Dr. Gaurav Kumar Ameta	**Prof. Sumitra Menaria**	**Dr. Swapnil Parikh**
(Project Guide)	**Head (CSE)**	**Principal**
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DECLARATION

We the undersigned solemnly declare that the project report "**STOCK PRICE PREDICTION**" is based on our own work carried out during our study under the supervision of GUIDE **Dr. Gaurav Kumar Ameta**, Associate Professor, Computer Science and Engineering.

We assert the statements made and conclusions drawn are the outcomes of my own work. I further certify that
1. The work contained in the report is original and has been done by us under the general supervision of our supervisor.
2. The work has not been submitted to any other Institution for any other degree/diploma / certificate in this university or any other University in India or abroad.
3. We have followed the guidelines provided by the university in writing the report.

Whenever we have used materials (data, theoretical analysis, and text) from other sources, we have given due credit to them in the text of the report and given their details in the references.

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ABSTRACT

This project presents a web application designed to leverage the power of machine learning. A pre-trained machine learning model will be integrated within the web app, enabling users to interact with it directly through a user-friendly interface. This web app aims to predict stock prices and perform market analysis. By deploying the model in this way, the project seeks to make this powerful technology accessible to a wider audience and unlock its potential for better decision making, prediction and stock market tracking.

CHAPTER 1

INTRODUCTION

The stock market is a dynamic and complex system that attracts investors worldwide. Predicting stock prices accurately can be a challenging task due to various factors influencing market trends. This project aims to create a machine learning model that can predict stock prices using Yahoo Finance data and moving averages of 100 and 200 days.

Yahoo Finance is a reputable source for historical stock price data, providing highly required information such as opening and closing prices, volume, and other market indicators. This data forms the foundation of the project, enabling the model to analyze historical patterns and trends.

Moving averages are commonly used in financial analysis to smooth out price fluctuations and highlight trends. By calculating moving averages of 100 and 200 days, the project captures long-term and short-term trends in stock prices. These indicators help guide the model's predictions.

The machine learning model is implemented using Python in a Jupyter Lab, a popular platform for data analysis and visualization. Various machine learning algorithms are explored, LSTM, Sequentials and time series analysis, to predict future stock prices based on historical data.

The model generates graphical outputs that visualize the predicted stock prices against the actual prices, allowing users to evaluate the model's performance and gain insights into market trends. This project serves as a practical application for leveraging machine learning in financial data analysis, offering valuable insights and graphs for investors and financial analysts.

1.1 OVERVIEW

This project builds a web application that puts machine learning to work for you. We've trained a model to predict stock prices and analyze the market data. Integrated into a user-friendly web interface, the app allows users to easily interact with the model. Simply provide your input through the web app, and the model will generate prediction and analysis using graphs. This project aims to democratize machine learning by making this advanced technology accessible through a user-friendly web interface. This empowers users to gain market insights and stock price forecasting.

1.2 PROBLEM STATEMENT

Individual investors often lack the expertise or resources to effectively analyze complex financial data and make informed investment decisions. This project aims to bridge this gap by developing a web application that leverages machine learning for stock price prediction and market analysis. By integrating a trained model into a user-friendly interface, this application will empower users to gain valuable market insights and access stock price forecasts, even without extensive financial knowledge.

1.3 OBJECTIVE OF PROJECT

The objective of this project is to develop a robust machine learning model that can accurately predict stock prices using Yahoo Finance data and moving averages of 100 and 200 days.

- Stock Market Analysis: Analyze the real time stock prices to give forecasting of stock price and provides insights for efficient decision making.
- Time Series Analysis: This component of the project uses historical stock prices and trends to forecast future price movements and market behavior.
- Portfolio Optimization: It involves selecting a mix of assets to maximize returns while minimizing risk.
- Market Segmentation: It involves categorizing financial markets or assets based on specific characteristics, such as sectors, regions, or performance trends.

1.4 APPLICATIONS OR SCOPE

The application and scope of this project encompass a variety of areas within the field of financial data analysis and stock market prediction, offering significant value to investors, financial analysts, and researchers. Here are the key points outlining the application and scope of the project:

Application:

1. Stock Market Analysis: The project provides a tool for analyzing stock market trends and predicting future price movements using historical data and moving averages.

2. Investment Strategy: Investors can leverage the model's predictions to inform their buying, selling, or holding strategies, optimizing their portfolios and managing risk.

3. Risk Management: The model aids in identifying potential market downturns or upturns, enabling users to adjust their strategies and manage risk more effectively.

4. Financial Education: The project serves as an educational resource for those learning about machine learning, data analysis, and stock market trends.

5. Portfolio Management: Financial analysts and portfolio managers can use the model's predictions to guide their decisions and balance portfolios based on market trends.

6. Trading Insights: Day traders and short-term investors can benefit from the project's ability to identify trends and price movements, enhancing their trading strategies.

7. Market Monitoring: The model's graphical outputs help users monitor market conditions and stay informed about trends and changes.

Scope:

1. Algorithm Exploration: The project opens opportunities to experiment with other machine learning algorithms, such as deep learning and ensemble methods, for more complex and accurate predictions.

2. Customizable Models: Users can customize the model to suit specific needs, such as focusing on industries, companies, or markets.

3. Real-Time Predictions: The project can be adapted to provide real-time predictions and insights, enabling users to react quickly to market changes.

4. User Collaboration: Financial professionals and data scientists can collaborate on improving and refining the model, sharing insights and innovations.

5. Cross-Disciplinary Application: The project's methods and techniques can be applied to other fields, such as commodity trading, currency markets, and economic forecasting.

The application and scope of this project extend beyond basic stock market analysis, offering a versatile and impactful approach to predicting and understanding market trends for various purposes and user needs.

1.5 ORGANIZATION OF REPORT

Report Structure

Introduction:
Stock market complexity necessitates prediction models. This project empowers users with predictions through a machine learning model, and this report outlines the structure.

Overview:
Using Yahoo Finance data, we implement 100-day and 200-day moving averages for trend analysis. We also introduce the machine learning model and its purpose.

Features:
Data comes from Yahoo Finance. Moving averages aid trend analysis. We explore machine learning algorithms and implement them in Python using Jupyter Lab. Finally, visualizations compare predicted and actual prices, and evaluation metrics assess model performance.

Benefits:
Improved decision-making, effective investment strategies, enhanced risk management, practical application of machine learning in finance, and a user-friendly interface benefit user.

Case Studies:
Real-world examples showcase the model applied to stock data. We analyze its performance across markets and discuss successes and learnings.

Challenges & Solutions:
We address challenges in data sourcing, model training, and prediction. Strategies for handling data quality and missing values are explored, alongside solutions for improving model performance based on evaluation metrics and case study insights.

Conclusion:
Key findings, achievements, project impact and potential, and recommendations for future improvements and research directions are summarized.

References:
All sources and references used in the report, including citations for data, research, and algorithms, are listed.

CHAPTER 2
LITERATURE REVIEW

2.1 EXISTING SYSTEMS

1. APPLICATION: Tickertape

DESCRIPTION:
Tickertape is a financial information platform that provides real-time market data, news, and analysis tools for investors and traders. It offers interactive charts, customizable watchlists, and comprehensive research reports, helping users make informed decisions and stay updated on market trends.

FEATURES:
• For basic information the cost is free but there is a premium offered for future forecasting.
• Shows portfolio, favorite stocks, stock price, graph, investments, forecasting.
• Can maintain and keep track of your stocks and investments.
• Links to your account.
• Provides screener, a tool that helps make wise and effective investment decisions.
• Security features ID, password and multi-factor authentication.

STRENGTHS:
• Syncs to your Demat accounts and checks on portfolio.
• Users can add to their favorite, the stocks they are interested in.
• Offers market analysis and forecasting, such as a future stock price prediction.

WEAKNESS:
• Some user reviews complain of ads and pro version is expensive.

2. APPLICATION: TradingView

DESCRIPTION:
TradingView is a popular web-based platform that offers advanced charting tools, real-time market data, and social networking features for traders and investors. Users can access a wide range of financial markets, including stocks, cryptocurrencies, and forex, and utilize customizable charts, technical analysis tools, and trading strategies. TradingView also fosters a community of traders, enabling users to share ideas, insights, and analysis.

FEATURES:
- Advanced Charting Tools
- Real-Time Market Data
- Social Networking
- Paper Trading
- Integration with Brokers

STRENGTHS:
- User-Friendly Interface
- Community Engagement
- Cross-Platform Accessibility
- Extensive Market Coverage
- Innovative Tools and Features

WEAKNESS:
- Limited Free Access
- Latency for Free Data
- Overwhelming for Beginners
- Community Quality
- Occasional Technical Glitches

APPLICATION: Scanz

DESCRIPTION:
Scanz is a web app that offers advanced market analysis and trading tools for stocks and cryptocurrencies. It provides real-time data, news, charts, and customizable scanning features to help traders identify trends and opportunities. Scanz aims to streamline the trading process for users of all levels.

FEATURES:
- Real-time Market Data: Offers live updates on stocks and cryptocurrencies.
- Customizable Scanning: Allows users to tailor scans for trading opportunities.
- Advanced Charting Tools: Provides in-depth charting options for market analysis.
- News Feed: Delivers up-to-date financial news and market insights.
- Alerts: Sends alerts for specific market events or conditions.

STRENGTHS:
- Comprehensive Market Analysis: Offers a wide range of tools for in-depth analysis.
- User-Friendly Interface: Easy-to-navigate platform suitable for traders of all levels.
- Customizable Features: Enables personalization to fit individual trading strategies.
- Real-Time Data: Ensures users stay informed with the latest market trends.
- Alerts and Notifications: Keeps users updated with important market events.

WEAKNESS:
- Learning Curve: The variety of features and tools may require time for new users to fully understand and utilize effectively.
- Subscription Cost: The advanced features may come at a high price point, potentially making it less accessible for budget-conscious traders

CHAPTER 3

METHODOLOGY

3.1 BACKGROUND / OVERVIEW OF METHODOLOGY

The project uses machine learning to analyse Yahoo Finance data, calculate 100-day and 200-day moving averages, and predict stock prices for informed investment decision-making. The methodology followed can be broken down into the following phases:

Requirement Gathering and Analysis:

- Data Requirements: Collect historical stock price data from Yahoo Finance, including opening and closing prices, volume, and other relevant metrics.
- Predictive Analysis: Identify key indicators, such as 100-day and 200-day moving averages, for trend analysis and model training.

System Design and Architecture:

- Client-Server Split: Web interface for user interaction (client-side) and data processing/modelling on the server.
- Data Pipeline: Fetch historical stock data (Yahoo Finance), preprocess it, and store it securely for efficient use.
- API Integration: RESTful APIs allow user requests for predictions and visualizations, with the server delivering model outputs and performance metrics.

Development:

- Front-End: Modern web tech (HTML, CSS, JS frameworks) for user interface and visualizations with charting libraries.
- Back-End: Python web framework (Flask/Django) for data processing, model training, predictions, and API endpoints.

Testing and Deployment:

- Testing: Verify data processing, model predictions, and user interactions function flawlessly under various conditions.
- Staging Environment: Mirror the production setup for real-world application testing before deployment.
- Deployment & Monitoring: Deploy to a cloud platform for scalability. Continuously update, monitor, and improve based on user feedback and performance metrics.

Maintenance and Updates:

- Performance Monitoring: Track response times, server load, and errors to identify and fix issues for a smooth user experience.
- Regular Updates: Maintain security, fix bugs, and add features by updating the application and its components.

Additional Considerations:

- Security & Privacy: Protect user data (demat accounts, portfolios) with strong authentication and encryption.
- Compliance & Regulation: Follow financial regulations (data, authentication, trading) and privacy laws.
- User Permissions: Allow control over what data (demat, portfolio) the app can access.
- Broker/Exchange Integration: Connect with brokers/exchanges for real-time trading and portfolio management (secure data transfer).
- User Education & Support: Provide resources and user-friendly interfaces to help users connect accounts and manage portfolios effectively.

3.2 PLATFORMS USED IN PROJECT

Web Application:

- The Stock Price Prediction is a web application that mainly focuses on prediction of stock prices with the help of charts.
- It is a dynamic web application that can be run on any system be it mobile or computer.

Development Languages and Technologies:

- **HTML:** HyperText Markup Language is used to create the structure and content of web pages, including text, images, and links.
- **CSS:** Cascading Style Sheets styles HTML content, allowing for design and layout customization such as colours, fonts, and positioning.
- **JavaScript:** JavaScript is a scripting language used to add interactivity and dynamic behaviour to web pages, enabling animations, form validations, and user interactions.

Machine Learning with Python: Machine learning is a branch of artificial intelligence that uses algorithms and statistical models to enable computers to learn patterns from data and make predictions or decisions.

- **LSTM:** Long Short-Term Memory (LSTM) is a type of recurrent neural network (RNN) designed to handle time-series data and long-term dependencies.
- **Dropout:** Dropout is a regularization technique in neural networks that prevents overfitting by randomly dropping a fraction of units during training.
- **Sequential:** Sequential is a model in Keras that allows layers to be added in a sequence, making it easy to build and manage neural network architectures.
- **Dense:** Dense is a layer in neural networks where each input is connected to every output, allowing for complex transformations of the data.

Integrated Development Environment (IDE):

- **Anaconda (Python Distribution):** Anaconda is a distribution of Python and R programming languages, providing a comprehensive environment for data science and machine learning.
- **Jupyter Notebook:** Jupyter Notebook is an interactive environment for writing and executing code, visualizing data, and creating narrative-driven documents.
- **VS Code:** Visual Studio Code (VS Code) is a lightweight code editor with powerful features such as debugging, intelligent code completion, and version control integration.

Software Development Kit (SDK):

- For the software development for frontend HTML and CSS is used. Taking the reference of Tickertape.
- These codes are run in Visual Studio Code IDE.
- The Machine learning model is being deployed to the web application for proper function and results.

Version Control System:

- **Git:** Git is used to track code changes, manage project versions, enable collaboration, and revert to previous states when needed.

Database Management System:

- Excel: The data from Yahoo finance is being downloaded in excel sheet. At first the codes and practices are being performed on these small datasets.
- Yfinance: It is a library provided by python. Using this the data from Yahoo Finance is being imported directly to Jupyter Notebook.

3.3 PROPOSED METHODOLOGY

Proposed Methodology for Stock Price Prediction

1. Requirement Analysis: This phase gathers user needs through surveys and market research. Based on this feedback, the project defines functional requirements (what the app should do) and non-functional requirements (how it should perform). It may also involve experimenting with different machine learning models to find the one that delivers the best predictions and analysis.

2. Design and Prototyping: Here, the focus is on creating wireframes and prototypes to visualize the user interface (UI) and user experience (UX). Stakeholder and user feedback are incorporated to refine the design until it meets everyone's needs.

3. Development and Implementation: The development team selects suitable technologies and frameworks to build the application. Agile development practices are adopted, allowing for iterative coding and quick responsiveness to changes.

4. Quality Assurance and Testing: This stage involves creating and executing test plans and cases to ensure the application functions as intended. Any bugs or issues are identified and resolved to guarantee a high-quality and performant application.

5. Deployment and Launch: A well-defined deployment strategy ensures a smooth transition from development to production. After launch, the team monitors the application's performance and optimizes it as needed.

6. Post-Launch Support and Maintenance: A dedicated support team is established to address user inquiries and resolve any issues that may arise. Finally, a maintenance and update strategy are implemented to continuously improve the application and address future needs.

3.4 PROJECT MODULES

The proposed modules are as follows:

- **Stock Market Analysis:** This module focuses on analyzing stock market data to identify trends, patterns, and opportunities.

- **Portfolio Optimization:** This module helps users create and manage investment portfolios for optimal returns while minimizing risk.

- **Anomaly Detection:** This module identifies unusual or unexpected patterns in stock market data that could indicate opportunities or risks.

- **Correlation Analysis:** This module examines the relationships between different financial instruments to assess how they move relative to each other.

- **Time Series Analysis:** This module studies data points collected over time to identify trends, seasonality, and patterns.

- **Market Segmentation:** This module divides the market into distinct groups based on criteria such as industry, company size, or geographic location.

3.5 DIAGRAMS

Below given diagrams are the important diagrams used in this project during development phase.
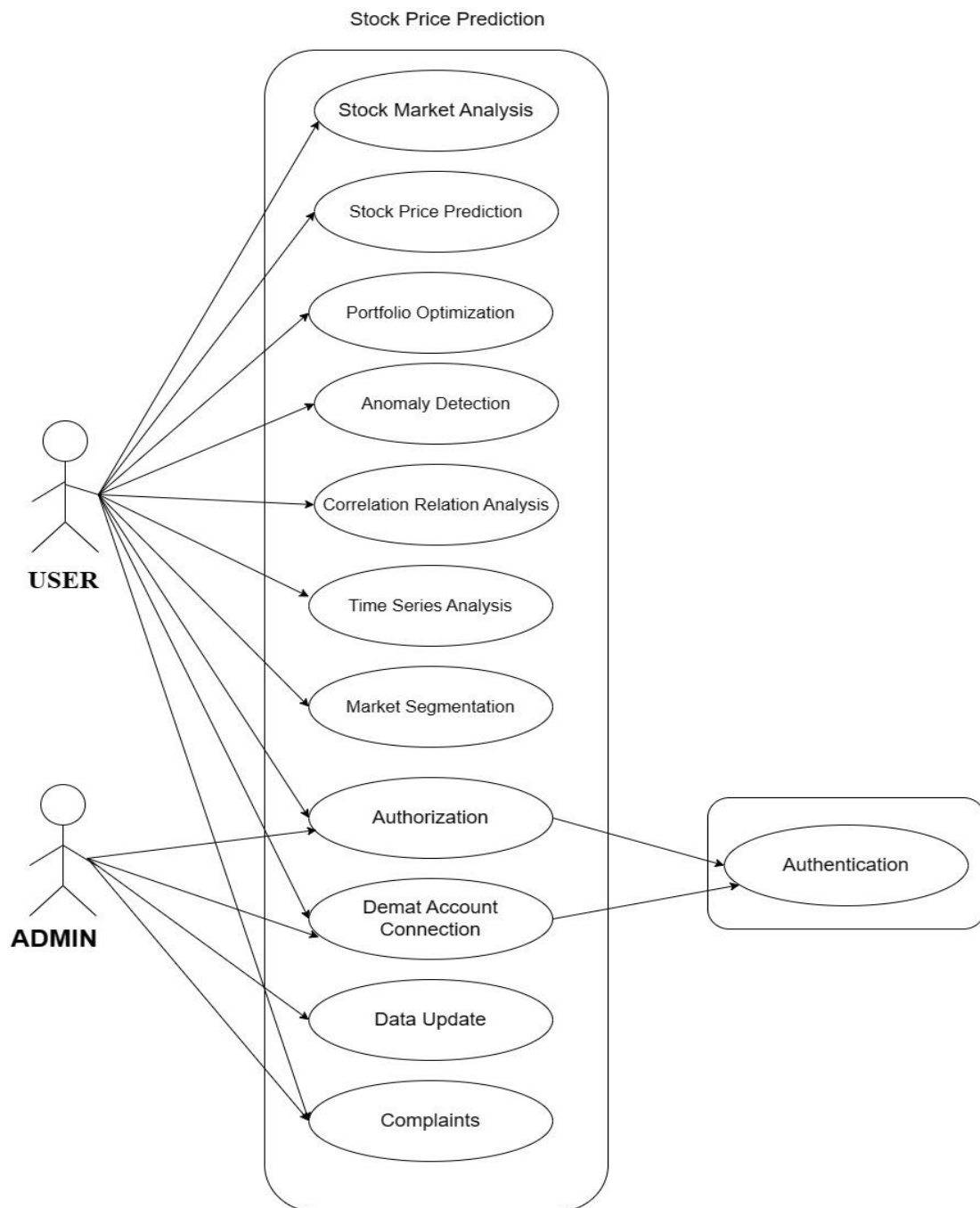
3.5.1 USE CASE DIAGRAM

Figure 3.1 Use case Diagram for Stock Market Prediction
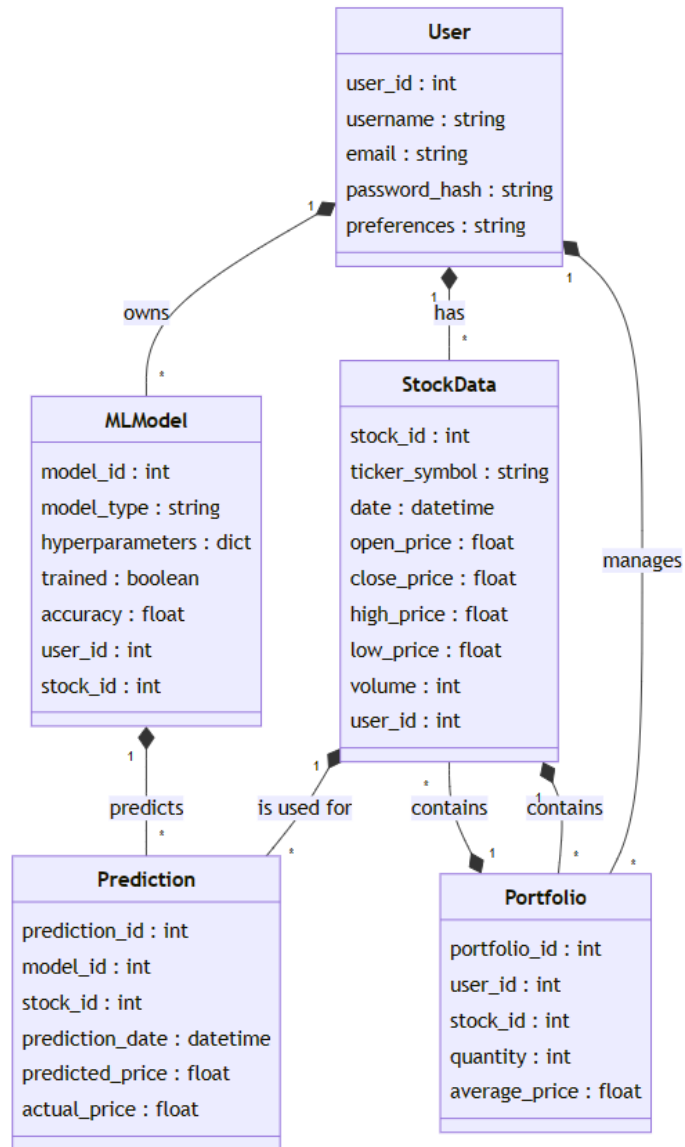
3.5.2 CLASS DIAGRAM

Figure 3.2 Class Diagram for Stock Price Prediction

CHAPTER 4

SYSTEM REQUIREMENTS

4.1 SOFTWARE REQUIREMENTS

Role	Software	Minimum Requirement
Development	**Platform (OS)**	Windows 8 and above
	Front End (Prog. Lang.)	HTML / CSS
	Backend (DB)	JavaScript / Python (Machine Learning)
	Development Tool (IDE)	Jupyter Notebook / Visual Studio Code
	Testing Tool	Selenium
Deployment	**Execution Environment**	Browser
	Browser	Chrome
	Server (Application / Database Server)	Yfinance and MongoDB
Design	**UML Design**	Draw.io
	DFD, ER, Flows	Mermaid Live Editor

Table 4.1 Software requirements

4.2 HARDWARE REQUIREMENTS

Role	Software	Minimum Requirement
Development	**Processor**	11th Gen Intel(R) Core(TM) i5-11320H @ 3.20GHz 3.19 GHz
	Primary Memory	8 Gb
	Secondary Memory	512 Gb
	Internet Connection	60 Mbps
	Other Hardware	Mobile Phone
Deployment	**Client Machine/Mobile**	Mobile Phone
	Primary Memory	2/4 Gb
	Secondary Memory	16/32/64 Gb

Table 4.2 Hardware Requirements

CHAPTER 5

EXPECTED OUTCOME

- Stock Prediction Web App: Empower informed investment decisions with Machine Learning models for forecasting.
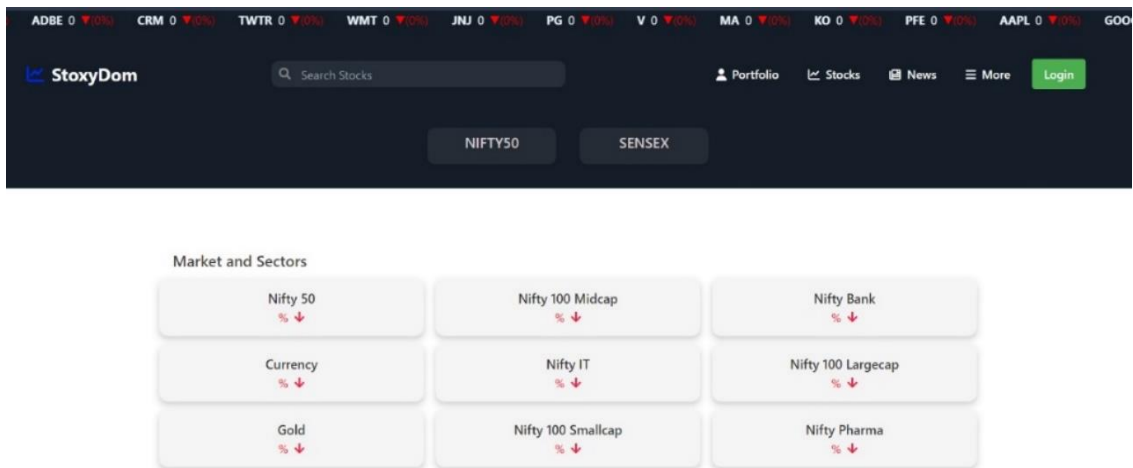

Figure 5.1 Frontpage of the web application

- The Moving average of 100 days.

Figure 5.2 Graph of 100 days moving average.
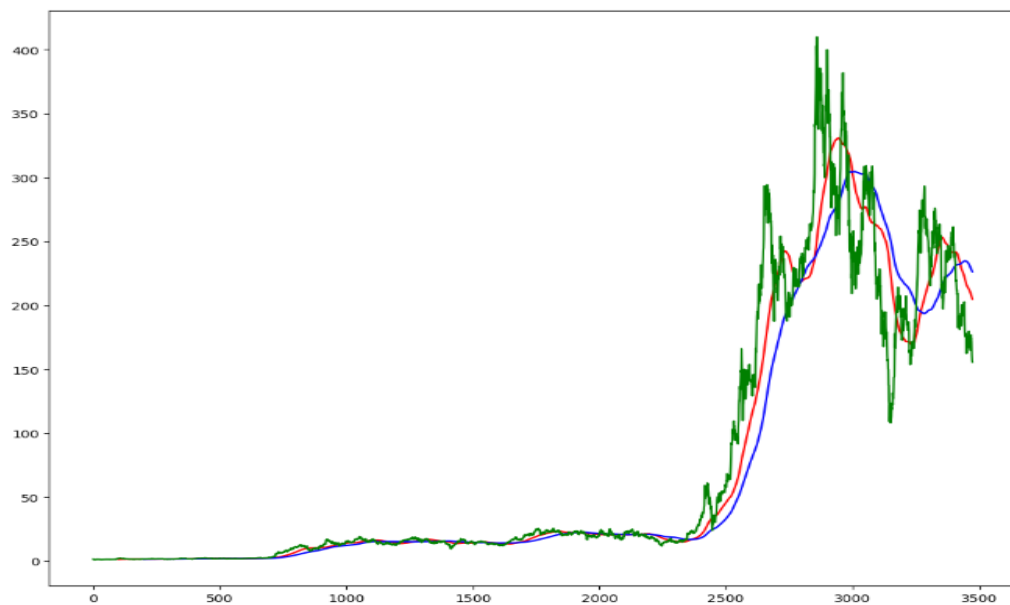
- The Moving average of 200 days.

Figure 5.3 Graph of 200 days moving average.

- The following graphical prediction was made by the trained machine learning model.

Figure 5.4 Prediction graph showing original vs predicted price.

- The summary of the trained model is given below:

```
[49]: model.summary()
      Model: "sequential_2"
      _____
       Layer (type)                Output Shape              Param #
      =================================================================
       lstm_9 (LSTM)               (None, 100, 60)           14880

       dropout_9 (Dropout)         (None, 100, 60)           0

       lstm_10 (LSTM)              (None, 100, 80)           45120

       dropout_10 (Dropout)        (None, 100, 80)           0

       lstm_11 (LSTM)              (None, 100, 100)          72400

       dropout_11 (Dropout)        (None, 100, 100)          0

       lstm_12 (LSTM)              (None, 120)               106080

       dropout_12 (Dropout)        (None, 120)               0

       dense_2 (Dense)             (None, 1)                 121

      =================================================================
      Total params: 238601 (932.04 KB)
      Trainable params: 238601 (932.04 KB)
      Non-trainable params: 0 (0.00 Byte)
      _____
```

Figure 5.5 Summary of the machine learning model.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 : CONCLUSION: -

In conclusion, the web application for stock price prediction using machine learning effectively leverages data from Yahoo Finance to provide users with valuable insights into stock trends. By combining various analysis techniques such as portfolio optimization, anomaly detection, and correlation analysis, the application enhances decision-making for investors. The use of Python and machine learning models like LSTM ensures accurate and efficient predictions. This application offers a comprehensive tool for both novice and experienced investors to optimize their portfolios and make informed financial decisions.

6.2 FUTURE WORK: -

- Enhanced Models: Explore and integrate advanced machine learning models and deep learning architectures to improve the accuracy and robustness of stock price predictions.

- User Personalization: Develop features that allow for personalized recommendations and insights based on individual user preferences, historical data, and risk tolerance.

- Real-Time Data Integration: Expand the application to support real-time data feeds from multiple sources, enhancing its ability to provide up-to-date analysis and predictions for informed investment decisions.

CHAPTER 7

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