Stock Market Price Prediction

Mini Project/Internship Assessment (BCS 554)

COURSE: B.Tech.

SEMESTER:V

by

Abhiyanshu Anand
(2200911530008)

Department of Computer Science and Engineering
JSS ACADEMY OF TECHNICAL EDUCATION
C-20/1, SECTOR-62, NOIDA
December, 2024

VISION AND MISSION

VISION OF THE INSTITUTE

JSS Academy of Technical Education Noida aims to become an Institution of excellence in imparting quality Outcome Based Education that empowers the young generation with Knowledge, Skills, Research, Aptitude and Ethical values to solve Contemporary Challenging Problems.

MISSION OF THE INSTITUTE

1. Develop a platform for achieving globally acceptable level of intellectual acumen and technological competence.
2. Create an inspiring ambience that raises the motivation level for conducting quality research.
3. Provide an environment for acquiring ethical values and positive attitude.

VISION OF THE DEPARTMENT

“To spark the imagination of the Computer Science Engineers with values,skills and creativity to solve the real-world problems.”

MISSION OF THE DEPARTMENT

1. To inculcate creative thinking and problem-solving skills through effective teaching, learning and research.
2. To empower professionals with core competency in the field of Computer Science and Engineering.
3. To foster independent and lifelong learning with ethical and social responsibilities.

PROGRAM OUTCOMES(POs)

Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify,formulate,review research literature,and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts,and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and teamwork: Function effectively as an individual,and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation,make effective presentations,and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work,as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for,and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM EDUCATIONAL OUTCOMES (PEOs)

PEO1: To apply computational skills necessary to analyze, formulate and solve engineering problems.

PEO2: To establish a entrepreneurs,and work in interdisciplinary research and development organizations as an individual or in a team.

PEO3: To inculcate ethical values and leadership qualities in students to have a successful career.

PEO4: To develop analytical thinking that helps them to comprehend and solve real-world problems and inherit the attitude of lifelong learning for pursuing higher education.

PROGRAM SPECIFIC OUTCOMES(PSOs)

PSO1: Acquiring in depth knowledge of theoretical foundations and issues in Computer Science to induce learning abilities for developing computational skills.

PSO2: Ability to analyse, design, develop, test and manage complex software system and applications using advanced tools and techniques.

Course Outcomes(COs)

C340.1: Developing a technical artifact requiring new technical skills and effectively utilizing a new software tool to complete a task

C340.2: Writing requirements documentation, selecting appropriate technologies, identifying and creating appropriate test cases for systems.

C340.3: Demonstrating understanding of professional customs & practices and working with professional standards.

C340.4: Improving problem-solving, critical thinking skills and report writing.

C340.5: Learning professional skills like exercising leadership, behaving professionally, behaving ethically, listening effectively, participating as a member of a team, developing appropriate workplace attitudes.

CO-PO-PSO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C340.1	3	3	3	3	2	3	3	3	3	3	2	3	3	3
C340.2	3	3	3	3	3	3	3	3	3	2	3	3	3	3
C340.3	2	2	3	3	3	2	3	3	3	1	2	3	3	3
C340.4	2	2	2	2	2	2	2	2	2	3	2	3	2	2
C340.5	2	2	2	2	2	2	2	2	2	3	2	3	2	2
C340	**2.40**	**2.40**	**2.60**	**2.60**	**2.40**	**2.40**	**2.60**	**2.60**	**2.60**	**2.40**	**2.20**	**3.00**	**2.60**	**2.60**

DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

Name : Abhiyanshu Anand

Roll. No. : 2200911530008

(Candidate Signature)

CERTIFICATE

This is to certify that Mini Project/Internship Assessment Report entitled “Stock Market Price Prediction” which is submitted by Abhiyanshu Anand in partial fulfillment of the requirement for the award of degree B. Tech. in Department of Computer Science and Engineering of Dr. APJ Abdul Kalam Technical University, Uttar Pradesh, Lucknow is a record of the candidate’s own work carried out by him/her under my supervision. The matter embodied in this report is original and has not been submitted for the award of any other degree.

Signature

Name of Supervisor: Dr. Rachna
Designation: Assistant Professor, JSS Academy of Technical Education, Noida
Address: C-20/1, C Block, Phase 2, Industrial Area, Sector 62, Noida, Uttar Pradesh 201301

Date: 7/12/2024

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to all those who contributed to the successful completion of this report on the development of the “Stock Market Price Prediction” project. This endeavor would not have been possible without the unwavering support, guidance, and encouragement from various individuals and entities.

First and foremost, I extend my heartfelt thanks to JSSATE, NOIDA, where the training and project took place. The opportunity to work on the stock market prediction project was invaluable, and I am grateful for the support and resources provided throughout the duration.

I would like to extend my sincere gratitude to Assistant Professor and HOD in-charge Dr. Rachna for their invaluable guidance and instruction in LaTeX. Their expertise and dedication have equipped me with essential skills for crafting professional documents and have instilled in me a deeper understanding of the importance of clear and structured communication in academic and professional settings. The knowledge and confidence gained under their mentorship have significantly contributed to the quality and presentation of this project report. I am grateful for their unwavering commitment to our academic growth and success.

I would like to acknowledge the entire project team for their collaboration and collective efforts.

In conclusion, I acknowledge and appreciate the collective effort of everyone involved, directly or indirectly, in the realization of this Stock Market Prediction project and the subsequent report. Your contributions have left an indelible mark on this endeavor, and I am truly thankful for your support.

ABSTRACT

This report encapsulates the comprehensive exploration and development of a Stock Market Price Prediction System, utilizing a spectrum of cutting-edge technologies and methodologies. The project was undertaken as part of a training program at JSSATE, NOIDA, with a primary focus on incorporating Python, Flask, TensorFlow, and scikit-learn.

The report commences with an insightful introduction, elucidating the objectives, background, and the author's role in the Stock Market Price Prediction project. A meticulous discussion on the selection of tools and technologies ensues, delving into the rationale behind opting for Python, Flask, TensorFlow, and yfinance. An in-depth analysis, encompassing alternative technologies and a comparative study, offers a panoramic view of the technological landscape.

The Stock Market Price Prediction system is an online platform that dynamically forecasts stock prices for any valid stock ticker. It integrates machine learning with real-time data fetching to ensure accuracy and relevance. The system provides an intuitive user interface (UI) for user input and displays predictions effectively.

The core of the report unfolds in the "Work Done" section, showcasing diagrammatic representations of the project, including use case diagrams and data flow diagrams. Modules within the system are discussed, accompanied by insightful screenshots that provide a visual narrative of the actual work done during the training. Each screenshot is dissected to elucidate the features of the technology, its application in the project, integration with other modules, and the associated inputs and outputs.

The concluding section delineates the key findings and outlines the future scope of the Stock Market Price Prediction system. The report concludes by emphasizing the industrial and societal relevance and impact of the project. Additionally, it envisions the integration of the learned technologies and tools into the author's final year major project.

In essence, this report serves as a comprehensive documentation of the Stock Market Price Prediction system development journey, shedding light on the intricate interplay of technologies, methodologies, and the project's broader implications.

LIST OF FIGURES

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CHAPTER 1

INTRODUCTION

Title: Stock Market Price Prediction Project.

In today's dynamic financial landscape, the ability to predict stock market prices has become a powerful tool for decision-making, both for individual investors and financial institutions. This project aims to harness the power of **machine learning** and **real-time data analysis** to predict stock prices using an **LSTM (Long Short-Term Memory)** model.

This comprehensive report explores the development, implementation, and potential applications of the stock market price prediction system. By leveraging **real-time stock data** and a sophisticated machine learning algorithm, this project aspires to bring precision and insights into the world of stock market forecasting.

The system integrates a **Flask web application** for user interaction, enabling predictions for any given stock ticker symbol in real-time. This innovation eliminates the need for manual CSV file updates and allows for seamless data integration from Yahoo Finance.

The report details the technical aspects of the project, covering the implementation of the **machine learning model**, integration of real-time data, and deployment of a web-based user interface. It highlights the challenges encountered and the solutions devised, showcasing the adaptability of LSTM models for modern financial applications.

My Role in the Project

Within the project team, my role was instrumental in bringing the stock prediction system to life. Specifically, my contributions included:

- **Developing and Training the LSTM Model:** Designing and training the machine learning model for sequential data prediction.
- **Data Integration:** Implementing real-time data fetching from Yahoo Finance using the `yfinance` library to eliminate dependency on static datasets.
- **Web Application Development:** Creating a user-friendly web interface with Flask for seamless interaction and prediction.
- **Debugging and Testing:** Ensuring the accuracy and reliability of predictions by addressing issues during model development and deployment.

This multifaceted role allowed me to gain insights into the complexities of time-series data analysis and the challenges of real-time web application development.

Project Background and Goals

The financial sector is undergoing rapid digital transformation, and stock market forecasting plays a pivotal role in this evolution. Accurate predictions can drive informed decision-making and strategic investments.

Recognizing this need, the **Stock Market Price Prediction Project** aims to leverage machine learning to forecast stock prices dynamically.

Goals:

- To provide a reliable and user-friendly platform for predicting stock prices dynamically.
- To integrate **real-time stock data** for predictions without requiring manual updates.
- To enable users to make informed decisions by providing **next-day stock price forecasts** for any stock ticker.
- To establish the feasibility and applicability of LSTM models in financial forecasting.

In essence, this introduction sets the foundation for understanding the tools and technologies employed, the implementation process, and the broader implications of the project. Subsequent sections delve into the technical architecture, the challenges faced during development, and the potential for future enhancements in this domain.

CHAPTER 2

TOOLS & TECHNOLOGY USED

TOOLS:

1. Visual Studio Code (VS Code):

• **Explanation:** Visual Studio Code is a lightweight and versatile code editor developed by Microsoft. It supports various programming languages and frameworks, making it ideal for full-stack development. Its built-in Git support, extensions, and debugging tools make it a favorite among developers.

• **Key Features:**

- Integrated terminal and support for Git.
- IntelliSense for code completion.
- Support for Python, Flask, and machine learning libraries.

2. Jupyter Notebook:

• **Explanation:** Jupyter Notebook provides an interactive environment for writing and testing Python code. It is widely used for data analysis, visualization, and experimentation with machine learning models.

• **Key Features:**

- Supports live code execution and Markdown documentation.
- Enables visualizing data directly in the notebook.
- Ideal for iterative model development.

3. Git/GitHub:

• **Explanation:** Git is a distributed version control system used for tracking changes in the codebase, while GitHub is a web-based platform for collaboration and repository hosting.

• **Key Features:**

- Tracks changes and allows branching and merging.
- Enables seamless team collaboration.
- Provides a platform for sharing code repositories.

—

FRONTEND TECHNOLOGIES:

1. HTML (HyperText Markup Language):

• **Explanation:** HTML is the backbone of web development, used to structure content for web pages. It defines elements such as input fields, buttons, and result displays in the Flask application.

• **Key Features:**

- Universally supported by all browsers.
- Provides a structured way to display content.
- Easy to learn and widely adopted.

2. CSS (Cascading Style Sheets):

• **Explanation:** CSS is used to style the web application, enabling the customization of fonts, colors, layouts, and overall aesthetics.

• **Key Features:**

- Consistent styling across the entire application.
- Allows responsive design for different devices.

- Separates content structure from visual representation.

3. JavaScript:

• **Explanation:** JavaScript adds interactivity to the web application, enabling features like input validation and dynamic updates to the user interface.

• **Key Features:**

- Supports client-side scripting for interactive elements.
- Enhances the user experience by enabling real-time updates.
- Compatible with all modern web browsers.

—

BACKEND TECHNOLOGIES:

1. Flask:

• **Explanation:** Flask is a lightweight Python web framework used for building the backend of the web application. It handles HTTP requests, processes user input, and delivers predictions generated by the machine learning model.

• **Key Features:**

- Simple and lightweight, ideal for small-scale projects.
- Provides tools for routing, templating, and request handling.
- Supports integration with Python-based machine learning libraries.

2. Python:

• **Explanation:** Python is the primary programming language used for developing the machine learning model, data processing, and backend logic of the project.

• **Key Features:**

- Extensive library support for machine learning and data analysis.

- High readability and simplicity, making it ideal for rapid development.
- Cross-platform compatibility.

—

MACHINE LEARNING LIBRARIES:

1. TensorFlow/Keras:

• **Explanation:** TensorFlow, along with its high-level API Keras, is used to build and train the LSTM (Long Short-Term Memory) model for stock price prediction.

• **Key Features:**

- Supports deep learning and neural network modeling.
- Highly efficient for handling time-series data.
- Includes tools for model evaluation and tuning.

2. scikit-learn:

• **Explanation:** scikit-learn is used for data preprocessing, such as normalization and feature scaling, which are essential for LSTM model performance.

• **Key Features:**

- Provides robust preprocessing tools (e.g., MinMaxScaler).
- Includes utilities for model validation and evaluation.

—

DATA FETCHING LIBRARIES:

1. yfinance:

• **Explanation:** yfinance is a Python library that fetches real-time stock market data from Yahoo

Finance. It eliminates the need for manual CSV updates.

• **Key Features:**

- Fetches historical and real-time stock prices.
- Provides data in an easy-to-use format (e.g., Pandas DataFrame).
- Handles stock symbols dynamically, enabling predictions for multiple companies.

—

DATABASES:

1. SQLite (optional):

• **Explanation:** SQLite is used for storing user input data, such as stock tickers and prediction logs, if needed.

• **Key Features:**

- Lightweight and serverless database.
- Easy integration with Flask for small-scale projects.
- Requires minimal setup and maintenance.

CHAPTER 3

HISTORY AND FEATURES OF THE TECHNOLOGY

History of the Technology Used

HTML5 (Hyper Text Markup Language):

- HTML was created by Sir Tim Berners-Lee in 1991 with a basic set of tags for structuring documents, including headings, paragraphs, links, and lists.
- HTML has evolved to become the backbone of the World Wide Web, providing a standardized way to create and structure content for the internet.
- HTML5, introduced in 2014, added new elements like `<video>`, `<audio>`, and `<canvas>` to enable rich media and interactive content directly in web pages.

CSS (Cascading Style Sheets):

- CSS was first introduced in December 1996 by the World Wide Web Consortium (W3C) to separate content from presentation in web design.
- It allowed developers to define styles for HTML elements, enabling more efficient and maintainable web development.
- Over time, CSS evolved to include features like animations, transitions, and responsive design, which are critical for modern web applications.

JavaScript:

- JavaScript was created by Brendan Eich in 1995 as a lightweight scripting language for web browsers.

- Initially used for adding interactivity to web pages, it has grown into a versatile language for client-side and server-side applications.
- Today, JavaScript is a core technology for web development, enabling dynamic content, interactivity, and asynchronous operations through frameworks and tools like Node.js and React.

Visual Studio Code (Integrated Development Environment):

- Visual Studio Code (VS Code) was developed by Microsoft and released in 2015.
- It quickly became one of the most popular and widely used code editors due to its lightweight nature and extensive functionality.
- Known for its robust extension support and built-in Git integration, VS Code is ideal for developing full-stack applications and machine learning projects.

Python:

- Python was created by Guido van Rossum in 1991 as a general-purpose programming language focused on simplicity and readability.
- Over the years, Python became one of the most widely used languages for data science, machine learning, and web development.
- Libraries like TensorFlow, Keras, and Flask have made Python indispensable for artificial intelligence and web-based applications.

Flask:

- Flask is a micro web framework for Python, created by Armin Ronacher in 2010.
- Built on Werkzeug and Jinja2, Flask provides a lightweight and flexible framework for building web applications.
- It is widely adopted for projects requiring rapid development and integration with machine learning models.

TensorFlow/Keras:

- TensorFlow, developed by Google Brain in 2015, is an open-source library for machine learning and deep learning applications.
- Keras, a high-level API built on TensorFlow, was introduced in 2015 to simplify the development of neural networks.
- Together, TensorFlow and Keras enable the development of complex models like LSTM (Long Short-Term Memory) for time-series data analysis.

scikit-learn:

- scikit-learn, released in 2007, is an open-source Python library for machine learning and data preprocessing.
- It provides tools for tasks such as data scaling, splitting, and model evaluation.
- Widely used for preprocessing steps like normalization (e.g., MinMaxScaler) to improve model performance.

yfinance:

- yfinance is an open-source Python library developed to simplify fetching real-time and historical stock market data from Yahoo Finance.
- It supports dynamic data retrieval for multiple stock tickers, enabling seamless integration with machine learning workflows.
- Introduced to eliminate the need for manual updates of stock data through CSV files.

—

Features of the Technology Used

HTML5 (Hyper Text Markup Language):

- Provides structure to the website and supports semantic elements like `<header>`, `<footer>`, and `<article>`.
- Includes new input types for forms, such as `email`, `date`, and `range`, enhancing user experience.
- Enables responsive design through compatibility with CSS and JavaScript.
- Offers multimedia support through `<audio>` and `<video>` elements without plugins.

CSS (Cascading Style Sheets):

- Provides precise control over the layout, fonts, colors, and animations of a web page.
- Supports responsive design through media queries, allowing web pages to adapt to different devices.
- Enables transitions and animations, improving user engagement and visual appeal.

JavaScript:

- Enhances user interactivity with dynamic content updates, real-time form validation, and AJAX for server communication.
- Supports asynchronous programming through promises and async/await, crucial for handling API calls in the project.
- Provides versatility by enabling both client-side and server-side scripting.

Visual Studio Code (Integrated Development Environment):

- Extensibility through a marketplace offering extensions for Python, TensorFlow, Flask, and more.

- Intelligent code completion and syntax highlighting, reducing errors and improving productivity.
- Integrated terminal for running Python scripts, Flask applications, and Git commands within the editor.

Python:

- Supports libraries for data manipulation (Pandas, NumPy), machine learning (TensorFlow, scikit-learn), and web development (Flask).
- Easy-to-read syntax simplifies the development and integration of machine learning models.
- Provides extensive support for visualization tools like Matplotlib and Seaborn.

Flask:

- Simple and flexible routing for handling HTTP requests and responses.
- Jinja2 templating for dynamically generating HTML pages based on user input.
- Integration with machine learning models for real-time predictions in web applications.

TensorFlow/Keras:

- Provides tools for building and training deep learning models, such as LSTM for time-series prediction.
- High scalability for deploying models in production environments.
- Includes pre-built functions for backpropagation, loss calculation, and optimization.

scikit-learn:

- Enables preprocessing tasks like normalization and splitting data into training and testing sets.

- Provides metrics for model evaluation, such as mean squared error (MSE) and accuracy scores.

yfinance:

- Fetches historical stock data (e.g., Open, Close, High, Low) and real-time data for predictions.
- Allows fetching data dynamically based on user input (stock ticker symbols).
- Seamlessly integrates with Pandas for easy data manipulation and analysis.

CHAPTER 4

WORK DONE

• Diagrammatic Representation of the Project

1. Frontend

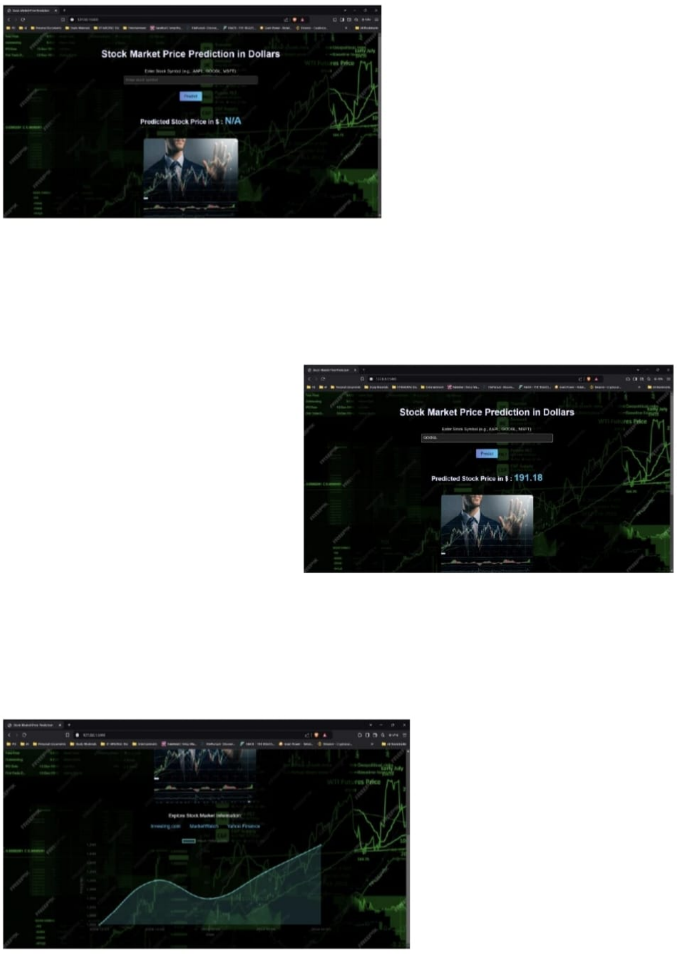
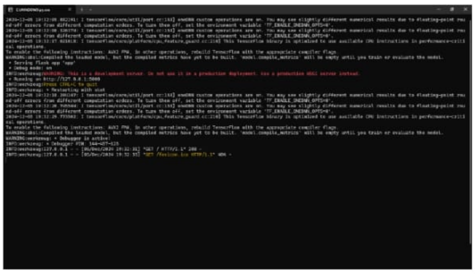
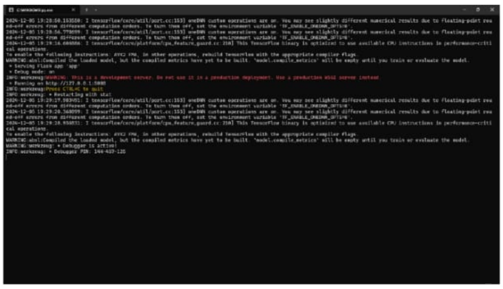

Stock Market Price Prediction in Dollars
Enter Stock Symbol (e.g., AAPL, GOOGL, MSFT)
Predict
Predicted Stock Price in $: N/A
Stock Market Price Prediction in Dollars
Enter Stock Symbol (e.g., AAPL, GOOGL, MSFT)
GOOGL
Predict
Predicted Stock Price in $: 191.18
Explore Stock Market Information
Investing.com
MarketWatch
Yahoo Finance

Figure 4-1: Snapshots of the Website

2. Code Snippets of the Website



```
2024-12-05 19:32:08.882291: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point rou
nd-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-12-05 19:32:08.326370: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point rou
nd-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-12-05 19:32:17.021818: I tensorflow/core/platform/cpu_feature_guard.cc:210] This TensorFlow binary is optimized to use available CPU instructions in performance-criti
cal operations.
To enable the following instructions: AVX2 FMA, in other operations, rebuild TensorFlow with the appropriate compiler flags.
WARNING:absl:Compiled the loaded model, but the compiled metrics have yet to be built. `model.compile_metrics` will be empty until you train or evaluate the model.
 * Serving Flask app 'app'
 * Debug mode: on
INFO:werkzeug:WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
INFO:werkzeug:Press CTRL+C to quit
INFO:werkzeug: * Restarting with stat
2024-12-05 19:32:18.201147: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point rou
nd-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-12-05 19:32:20.785540: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point rou
nd-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-12-05 19:32:29.733502: I tensorflow/core/platform/cpu_feature_guard.cc:210] This TensorFlow binary is optimized to use available CPU instructions in performance-criti
cal operations.
To enable the following instructions: AVX2 FMA, in other operations, rebuild TensorFlow with the appropriate compiler flags.
WARNING:absl:Compiled the loaded model, but the compiled metrics have yet to be built. `model.compile_metrics` will be empty until you train or evaluate the model.
WARNING:werkzeug: * Debugger is active!
INFO:werkzeug: * Debugger PIN: 144-457-125
INFO:werkzeug:127.0.0.1 - - [05/Dec/2024 19:32:31] "GET / HTTP/1.1" 200 -
INFO:werkzeug:127.0.0.1 - - [05/Dec/2024 19:32:33] "GET /favicon.ico HTTP/1.1" 404 -
```



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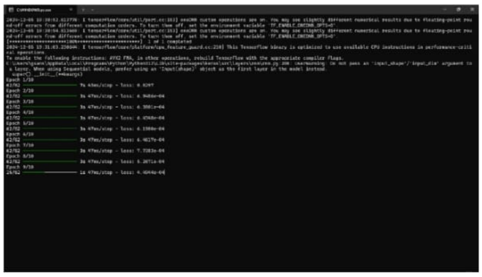
2024-12-05 19:28:50.153550: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point rou
nd-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-12-05 19:28:56.770699: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point rou
nd-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-12-05 19:29:16.600000: I tensorflow/core/platform/cpu_feature_guard.cc:210] This TensorFlow binary is optimized to use available CPU instructions in performance-criti
cal operations.
To enable the following instructions: AVX2 FMA, in other operations, rebuild TensorFlow with the appropriate compiler flags.
WARNING:absl:Compiled the loaded model, but the compiled metrics have yet to be built. `model.compile_metrics` will be empty until you train or evaluate the model.
 * Serving Flask app 'app'
 * Debug mode: on
INFO:werkzeug:WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
INFO:werkzeug:Press CTRL+C to quit
INFO:werkzeug: * Restarting with stat
2024-12-05 19:29:17.983451: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point rou
nd-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-12-05 19:29:20.368099: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point rou
nd-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-12-05 19:29:28.950831: I tensorflow/core/platform/cpu_feature_guard.cc:210] This TensorFlow binary is optimized to use available CPU instructions in performance-criti
cal operations.
To enable the following instructions: AVX2 FMA, in other operations, rebuild TensorFlow with the appropriate compiler flags.
WARNING:absl:Compiled the loaded model, but the compiled metrics have yet to be built. `model.compile_metrics` will be empty until you train or evaluate the model.
WARNING:werkzeug: * Debugger is active!
INFO:werkzeug: * Debugger PIN: 144-457-125
```



```
2024-12-05 19:30:52.413776: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point rou
nd-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
2024-12-05 19:30:54.413460: I tensorflow/core/util/port.cc:153] oneDNN custom operations are on. You may see slightly different numerical results due to floating-point rou
nd-off errors from different computation orders. To turn them off, set the environment variable `TF_ENABLE_ONEDNN_OPTS=0`.
[*********************100%***********************]  1 of 1 completed
2024-12-05 19:31:03.226044: I tensorflow/core/platform/cpu_feature_guard.cc:210] This TensorFlow binary is optimized to use available CPU instructions in performance-criti
cal operations.
To enable the following instructions: AVX2 FMA, in other operations, rebuild TensorFlow with the appropriate compiler flags.
C:\Users\gsans\AppData\Local\Programs\Python\Python312\Lib\site-packages\keras\src\layers\rnn\rnn.py:200: UserWarning: Do not pass an `input_shape`/`input_dim` argument to
 a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.
  super().__init__(**kwargs)
Epoch 1/10
62/62 ━━━━━━━━━━━━━━━━━━━━ 7s 65ms/step - loss: 0.0297
Epoch 2/10
62/62 ━━━━━━━━━━━━━━━━━━━━ 3s 47ms/step - loss: 6.9486e-04
Epoch 3/10
62/62 ━━━━━━━━━━━━━━━━━━━━ 3s 47ms/step - loss: 6.3801e-04
Epoch 4/10
62/62 ━━━━━━━━━━━━━━━━━━━━ 3s 47ms/step - loss: 6.4368e-04
Epoch 5/10
62/62 ━━━━━━━━━━━━━━━━━━━━ 3s 47ms/step - loss: 6.1986e-04
Epoch 6/10
62/62 ━━━━━━━━━━━━━━━━━━━━ 3s 47ms/step - loss: 6.4617e-04
Epoch 7/10
62/62 ━━━━━━━━━━━━━━━━━━━━ 3s 47ms/step - loss: 7.7283e-04
Epoch 8/10
62/62 ━━━━━━━━━━━━━━━━━━━━ 3s 47ms/step - loss: 5.2071e-04
Epoch 9/10
26/62 ━━━━━━━━━━━━━━━━━━━━ 1s 47ms/step - loss: 4.4044e-04
```

Figure 4-2: Code Snippet 1 of the Website

3. Use Case Diagram

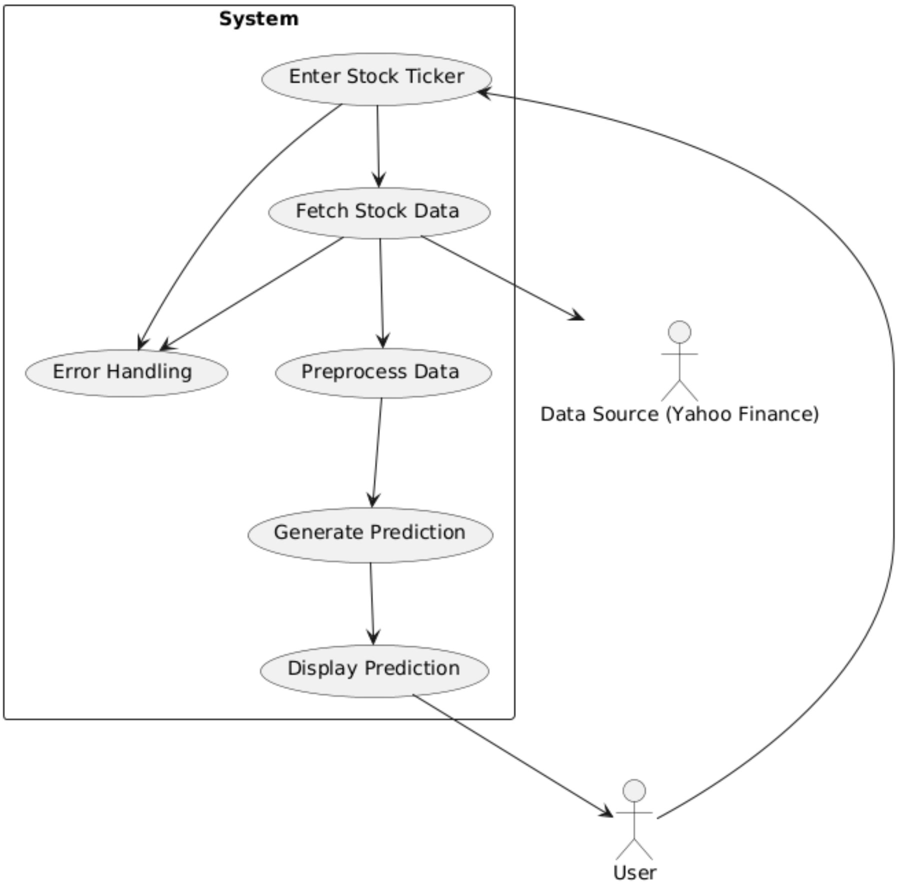


Figure 4-3: Use Case Diagram

4. Data Flow Diagram

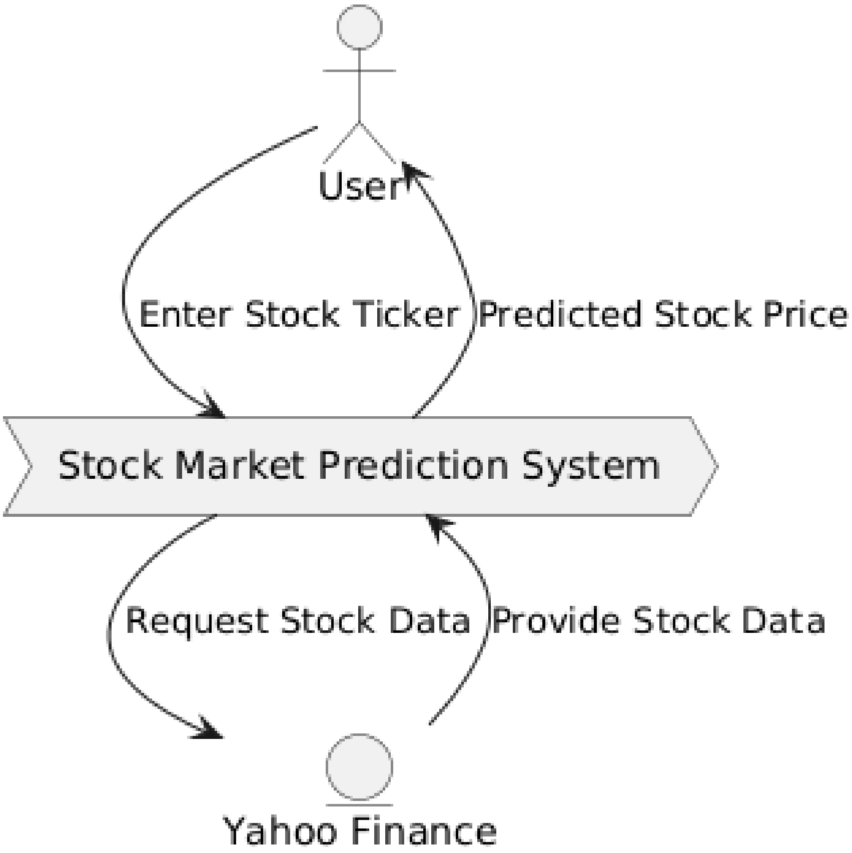


Figure 4-4: Zero Level Data Flow Diagram

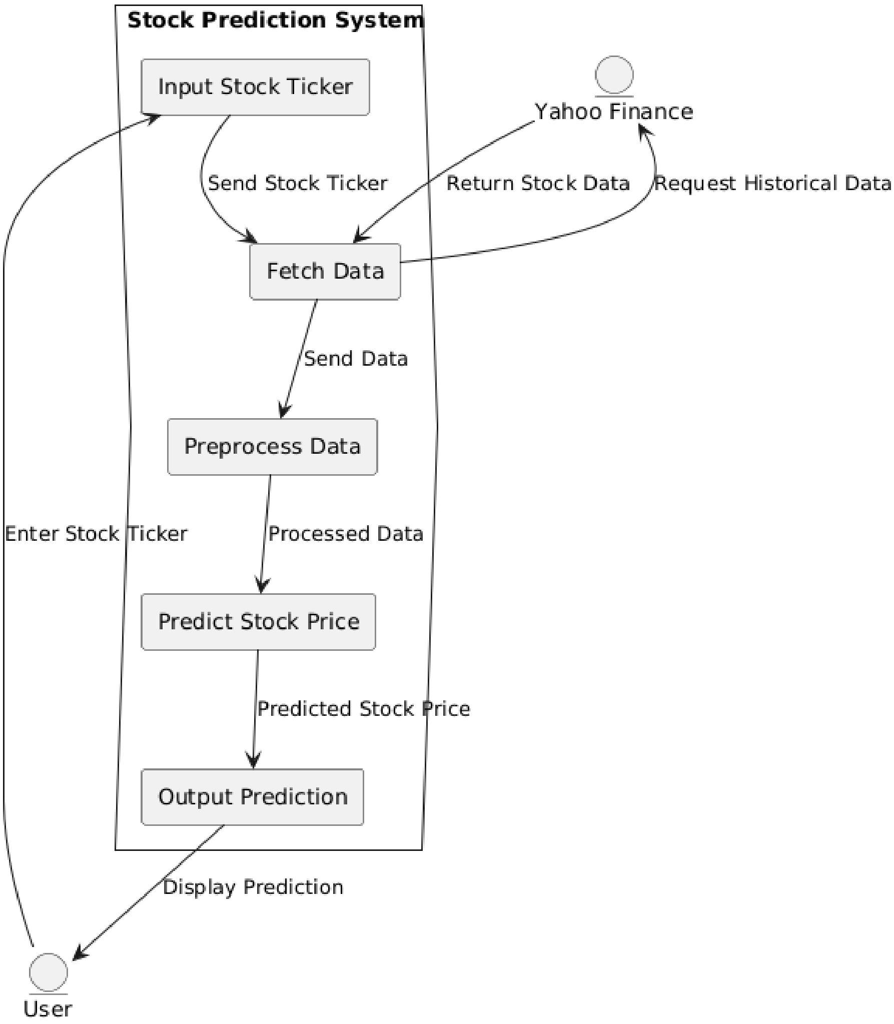


Figure 4-5: First Level Data Flow Diagram

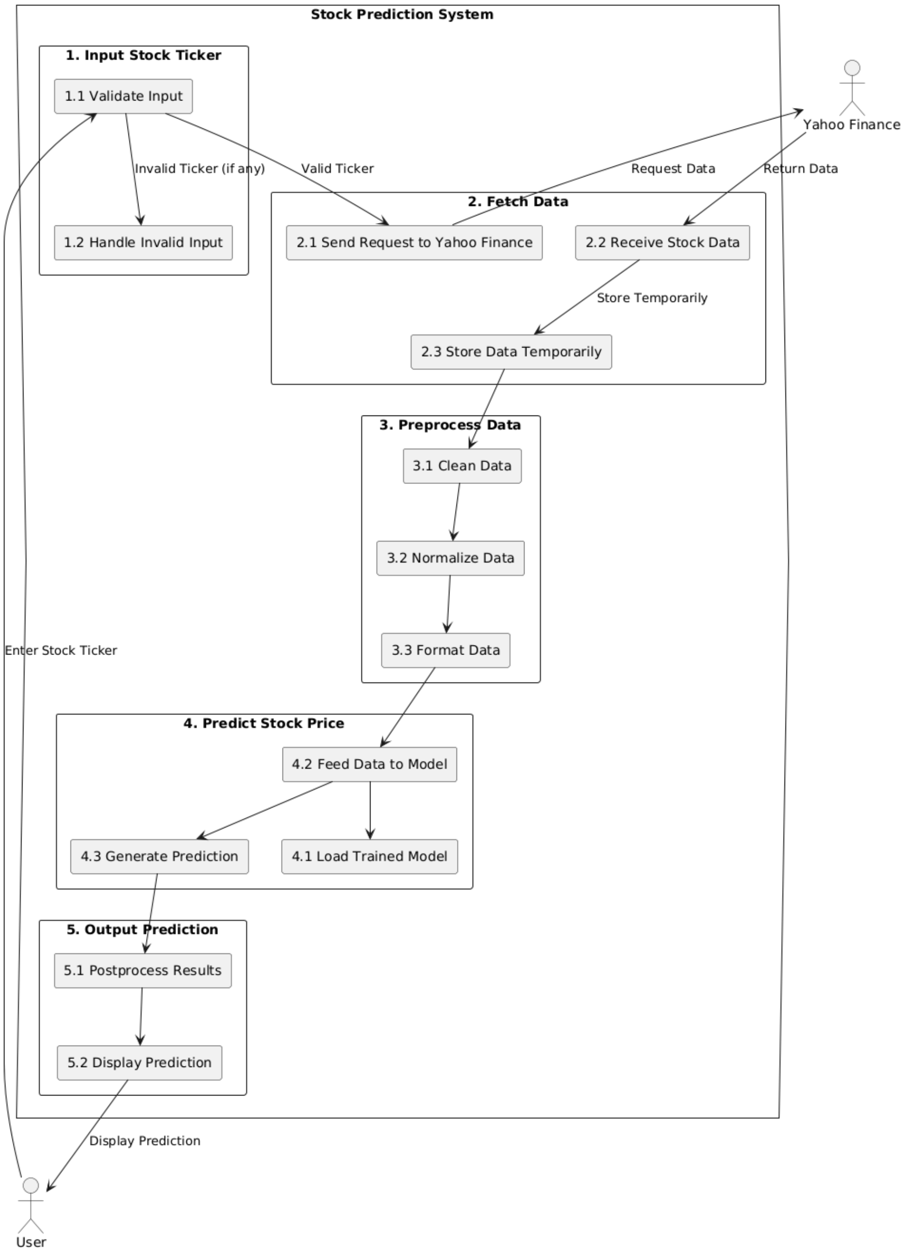


Figure 4-6: Second Level Data Flow Diagram

CHAPTER 5

CONCLUSIONS AND FUTURE SCOPE

• Concluding the Stock Market Prediction Project

The development of the Stock Market Price Prediction system, utilizing a powerful stack of technologies including Python, Flask, TensorFlow, and scikit-learn, has been a significant learning experience. This project combined machine learning, real-time data integration, and web application development to deliver a dynamic and user-friendly platform for stock price forecasting.

As the project concludes, it is essential to reflect on the achievements and consider how the acquired knowledge can be leveraged for future applications. The culmination of this project demonstrates the potential of LSTM-based models in handling time-series data, as well as the importance of integrating real-time APIs like yfinance for seamless stock data updates.

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• Utilization in the Final Year Major Project

The technologies and tools employed in this project lay a solid foundation for broader applications, making them ideal candidates for incorporation into future projects. The robust backend built using Python and Flask, combined with the LSTM model, provides a scalable architecture for more complex financial prediction systems. Leveraging these technologies ensures a streamlined and efficient development process for future academic or industrial projects.

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• Industrial Relevance

The technologies employed in this project hold substantial industrial relevance, particularly in the finance and investment sectors: **Accurate Financial Forecasting:**

Stock price prediction systems are invaluable for investors, traders, and financial institutions. By leveraging machine learning, such systems can offer actionable insights into market trends.

Dynamic Data Handling:

Integrating real-time data fetching libraries like yfinance ensures that the system remains up-to-date, reflecting current market conditions.

Investment Decision Support:

This system can assist users in making informed investment decisions by predicting future price movements based on historical data.

Application Scalability:

The project demonstrates scalability, enabling its expansion to include additional features such as multi-stock predictions, portfolio analysis, and financial risk assessment.

Educational Value:

This project serves as a strong demonstration of machine learning in finance, showcasing how time-series data can be effectively analyzed and utilized for predictions.

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• Societal Relevance and Impact

The Stock Market Price Prediction system carries societal relevance by empowering individuals and institutions with predictive insights for better financial decision-making. It democratizes access to advanced financial tools, enabling small-scale investors to benefit from data-driven predictions.

Furthermore, the integration of secure and transparent processes ensures data privacy and aligns with societal expectations for ethical handling of sensitive information. By fostering financial literacy and promoting informed decision-making, this project contributes to a more equitable financial ecosystem.

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• FUTURE SCOPE

The Stock Market Price Prediction system has the potential for significant enhancements and future applications. Several aspects to consider for expanding its scope include:

1. Integration of Emerging Technologies:

Exploring advanced technologies such as **natural language processing (NLP)** for news sentiment analysis or **reinforcement learning** for dynamic trading strategies. These additions can provide a holistic understanding of market trends and improve prediction accuracy.

2. Real-Time Analytics and Visualization:

Incorporating interactive dashboards to display real-time analytics, historical trends, and prediction confidence levels. This would enhance user engagement and provide actionable insights.

3. Multi-Asset Support:

Expanding the system to predict prices for other financial instruments, such as cryptocurrencies, commodities, or indices, broadening its appeal to diverse user groups.

4. Enhanced User Engagement:

Implementing a feature-rich web interface, including notifications for prediction updates, portfolio management tools, and interactive tutorials to help users interpret predictions effectively.

5. Mobile Optimization:

Developing a mobile-friendly version of the system or a dedicated mobile app to provide seamless access for users on the go.

6. Voice Search Integration:

Optimizing the platform for voice-based interaction, enabling users to request predictions or stock analysis via voice commands.

7. Collaboration with Financial Institutions:

The system can be adapted for use by financial institutions as a decision-support tool, integrating with their existing infrastructure for advanced analytics and forecasting.

8. AI-Driven Personalization:

Implementing AI-based personalization features to tailor predictions and insights based on user preferences, investment goals, and risk appetite.

In summary, the Stock Market Price Prediction system represents a robust starting point for advanced financial forecasting tools. By leveraging the latest in machine learning and real-time data integration, the system has immense potential for growth and industrial application.

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