SALES FORECAST PREDICTION SYSTEM

UCS 503 Software Engineering Project Report

END-Semester Evaluation

Submitted by:

(102103373) ANUPRIYA LATHEY

(102103377) NITLEEN KAUR

(102103394) PIA GUPTA

BE Third Year, COE14

BE Third Year, COE

Group No: 5

Submitted to:

Ms. ANAMIKA SHARMA

Lab Instructor

Computer Science and Engineering Department

TIET, Patiala

December 2023

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1. PROJECT SELECTION PHASE

1.1 Software Bid

Software Bid/ Project Teams

UCS 503- Software Engineering Lab

Group ID: 3CO14 Dated: 08 /08 /2023

Team ID (will be assigned by Instructor): 5

Please enter the names of your Preferred Team Members:

You are required to form **a three to four-person** teams

Choose your team members wisely. You will not be allowed to change teams.

Table 1: Project Experience

Name	**Roll No**	**Project Experience**	**Programming Language used**	**Signature**
Pia Gupta	102103394	Handwritten text recognition (AI), Taxi Management System(DBMS)	Python, PL/SQL	
Nitleen Kaur	102103377	Speech to text Recognition (AI) ,Taxi Management System(DBMS)	Python, PL/SQL	
Anupriya Lathey	102103373	Speech to text Recognition (AI) ,Taxi Management System(DBMS)	Python, PL/SQL	

Programming Language / Environment Experience

List the languages you are most comfortable developing in, **as a team**, in your order ofpreference. Many of the projects involve Java or C/C++ programming.

1. Python
2. CPP
3. C

Choices of Projects:

Please select **4 projects** your team would like to work on, by order of preference: [Write at-least one paragraph for each choice (motivation, reason for choice, feasibility analysis, etc.)

Table 2: Software Bid

First Choice	DISCORD STOCK BOT We will create a Stock Bot with an intent to reduce a trader's dependency on manual efforts and help them analyze the market with automated updates and brief commands. This can be used by beginner's in stock market too. We will use queries to show stock details of a company for previous day, latest stock details of a company, history stock details of a company. The stock data will be fetched from Yahoo Finance API. The stock market is a volatile one and one needs to stay updated about the stock rates to step up one's trading capabilities.
Second Choice	LOAN STATUS PREDICTION The aim of this project is to forecast the likelihood of loan approval for new applicants by analysing historical data on borrowers and their loan applications. This can assist banks and other lenders set appropriate terms and conditions for accepted loans as well as helping them make better

	decisions about whether to approve or reject loan applications. This project automates the loan prediction process, thus reducing time for rejection or approval of loans by banks.
Third Choice	WINE QUALITY PREDICTION Wine certification includes physiochemical tests like determination of density, pH, alcohol quantity, fixed and volatile acidity etc. It is important to determine which features are the most indicative of a good quality wine. Such a model can be used not only by the certification bodies but also by the wine producers to improve quality based on the physicochemical properties and by the consumers to predict the quality of wines.
Fourth Choice	SALES FORECAST PREDICTION This model will help to determine present-day or future sales using data like past sales, seasonality, festivities, economic conditions, etc. So, this model will be able to predict sales on a certain day after being provided with a certain set of inputs. It's an easy way for companies to predict their sales depending on various factors and therefore increase their sales by adopting such methods.

Additional Remarks/ Inputs

Please tell us about any other factors that we should take into consideration (e.g., if you really would like to work on a project for some particularly convincing reason).

A stock bot is an easy to use tool which enables beginner level traders or even students to use the information about stocks of various companies in the form of messages in selected discord channels and direct message.

1.2 Project Overview

Sales Forecast Prediction using Machine Learning is a pivotal project that addresses the pressing need for businesses to make accurate sales predictions. The essence of this project is to leverage historical sales data, combined with cutting-edge machine learning techniques, to enable companies to forecast future sales trends with precision. In doing so, this project seeks to empower decision-makers with invaluable insights, thereby facilitating more informed and strategic choices in areas such as inventory management, marketing strategies, and financial planning.

The project's primary goal is to develop a robust and reliable system that harnesses the power of data to provide forecasts for sales performance across various products, time frames, and geographic locations. By analyzing patterns, trends, and historical data, this system will become a strategic tool for businesses in optimizing their operations, improving customer service, and achieving sustainable growth.

2. ANALYSIS PHASE

2.1 Use Cases

2.1.1 Use Case Diagram

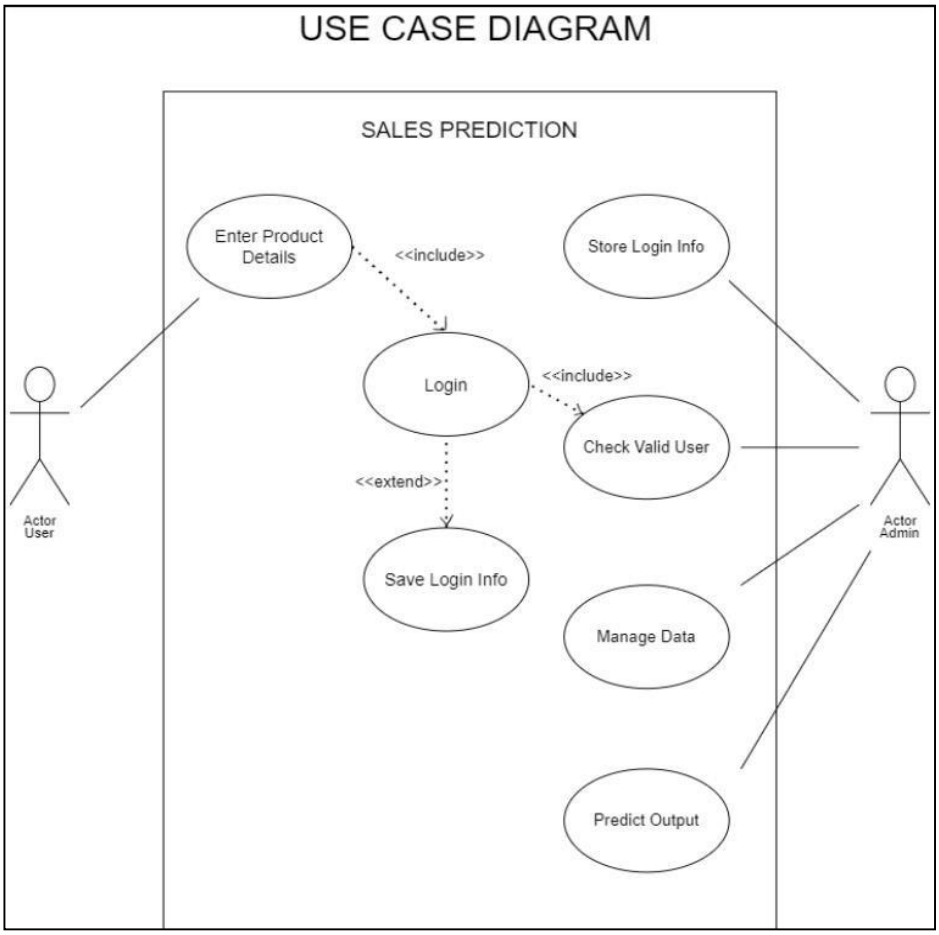


Fig 1: Use Case Diagram

2.1.2 Use Case Templates

Table 3: Template 1

1. Use Case Title	Enter Product Details
2. Abbreviated Title	Enter Product Details
3. Use Case ID	1
4. Actors	User
5. Description	User must enter product specifications like Item Identifier, Item Weight, Item Fat Content, Item Visibility, Item Type, Item MRP, Outlet Identifier, etc to predict its sales.
5.1. Pre-Conditions	Every product must have predefined attributes like Item Identifier, Item Weight, Item Fat Content, Item Visibility, Item Type, Item MRP, Outlet Identifier, etc to predict its sales.
5.2. Task Sequence	a) Product form will be displayed on the home page. b) User must enter corresponding details.
5.3. Post Conditions	Foremost step in prediction.
6. Modification History	September 20, 2023
7. Author	Nitleen Kaur, Anupriya Lathey, Pia Gupta

Table 4: Template 2

1. Use Case Title	Login
2. Abbreviated Title	Login
3. Use Case ID	2
4. Actors	User
5. Description	User must enter personal information like name, employee id, etc. Enables Admin to find out which user is valid to access the model.
5.1. Pre-Conditions	Set attributes which user must enter.
5.2. Task Sequence	a) User Info form will be displayed on the page. b) User must enter corresponding details.
5.3. Post Conditions	If successful, user is logged in for the next step.
6. Modification History	September 20, 2023
7. Author	Nitleen Kaur, Anupriya Lathey, Pia Gupta

Table 5: Template 3

1. Use Case Title	Save Login Information
2. Abbreviated Title	Save Login Info
3. Use Case ID	3
4. Actors	User
5. Description	User can choose whether or not to store his login info for future login.
5.1. Pre-Conditions	User must have entered some information prior to this.
5.2. Task Sequence	a) User must select the option whether or not he wants his information saved for future. b) Click login button
5.3. Post Conditions	User information is saved for future.
6. Modification History	September 20, 2023
7. Author	Nitleen Kaur, Anupriya Lathey, Pia Gupta

Table 6: Template 4

1. Use Case Title	Store Login Information
2. Abbreviated Title	Store Login Info
3. Use Case ID	4
4. Actors	Admin
5. Description	Login info entered by user is stored as a record of who loggedin.
5.1. Pre-Conditions	User must have entered some data using Login and clicked the Login button.
5.2. Task Sequence	Admin will update the user login history.
5.3. Post Conditions	Data of user who accessed system is stored.
6. Modification History	September 20, 2023
7. Author	Nitleen Kaur, Anupriya Lathey, Pia Gupta

Table 7: Template 5

1. Use Case Title	Check Valid User
2. Abbreviated Title	Check Valid User
3. Use Case ID	5
4. Actors	Admin
5. Description	Admin must check if user is allowed access or not depending upon his employee ID.
5.1. Pre-Conditions	A set sequence of Employee IDs for users who are to be allowed access.
5.2. Task Sequence	Followed by entering of Login details. Admin must display message if user invalid.
5.3. Post Conditions	If valid, user accepted for next step.
6. Modification History	September 20, 2023
7. Author	Nitleen Kaur, Anupriya Lathey, Pia Gupta

Table 8: Template 6

1. Use Case Title	Manage Data
2. Abbreviated Title	Manage Data
3. Use Case ID	6
4. Actors	Admin
5. Description	Admin must manage and store database on which the model is built and if there are any changes to be made on it.
5.1. Pre-Conditions	Pre-defined data set.
5.2. Task Sequence	A dataset must be pre-processed and uploaded.
5.3. Post Conditions	Model is learned to be implemented.
6. Modification History	September 20, 2023
7. Author	Nitleen Kaur, Anupriya Lathey, Pia Gupta

Table 9: Template 7

1. Use Case Title	Predict Output
2. Abbreviated Title	Predict Output
3. Use Case ID	7
4. Actors	Admin
5. Description	Output for which the model is built is calculated.
5.1. Pre-Conditions	All processes must be executed successfully.
5.2. Task Sequence	a) Admin must calculate the result. b) The result must be displayed on the screen, visible to theuser.
5.3. Post Conditions	User can apply this model for sales predictions.
6. Modification History	September 20, 2023
7. Author	Nitleen Kaur, Anupriya Lathey, Pia Gupta

2.2 Activity Diagram and Swimlane Diagram

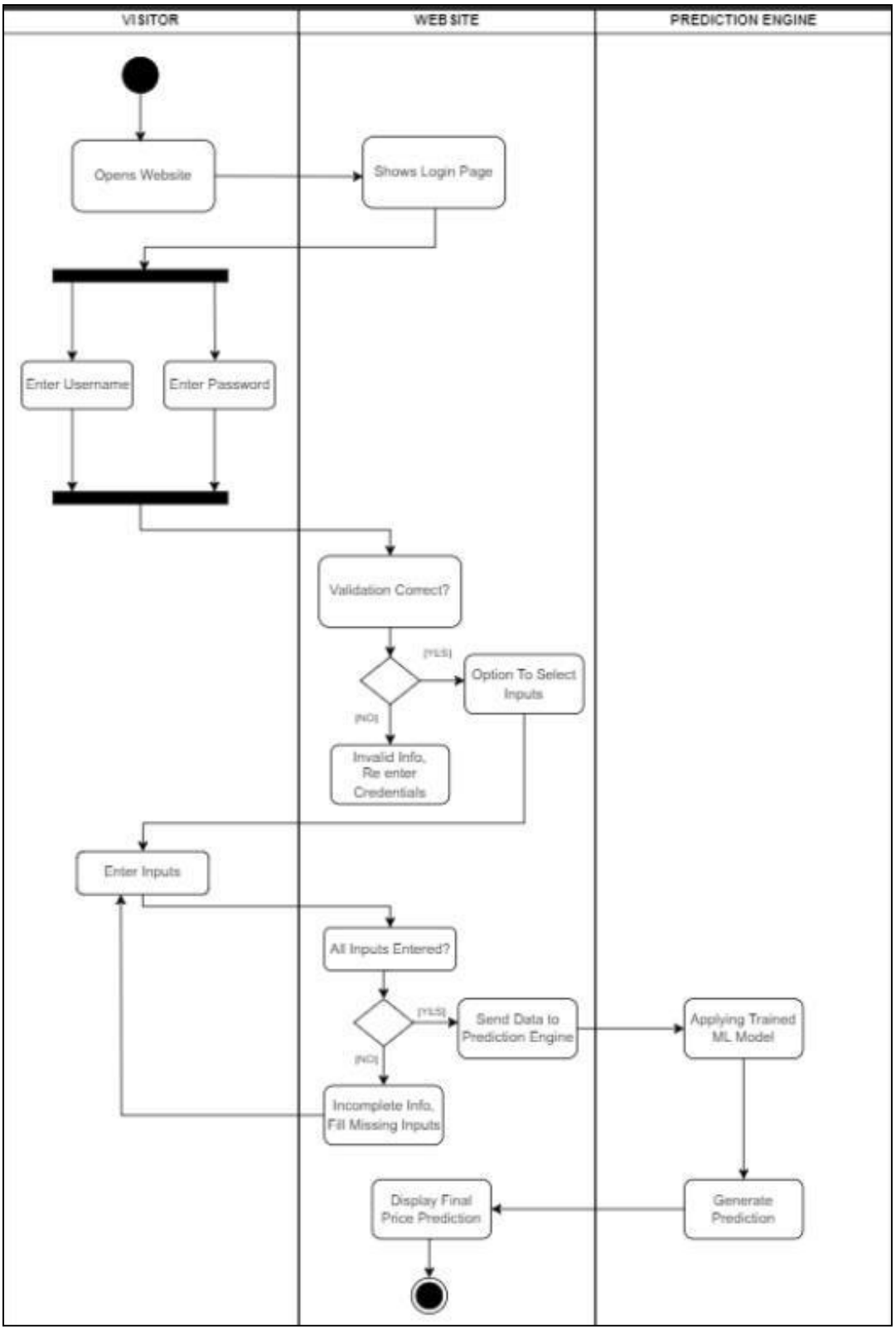


Fig 2: Swimlane Diagram

2.3 Data Flow Diagrams(DFDs)

2.3.1 DFD Level 0

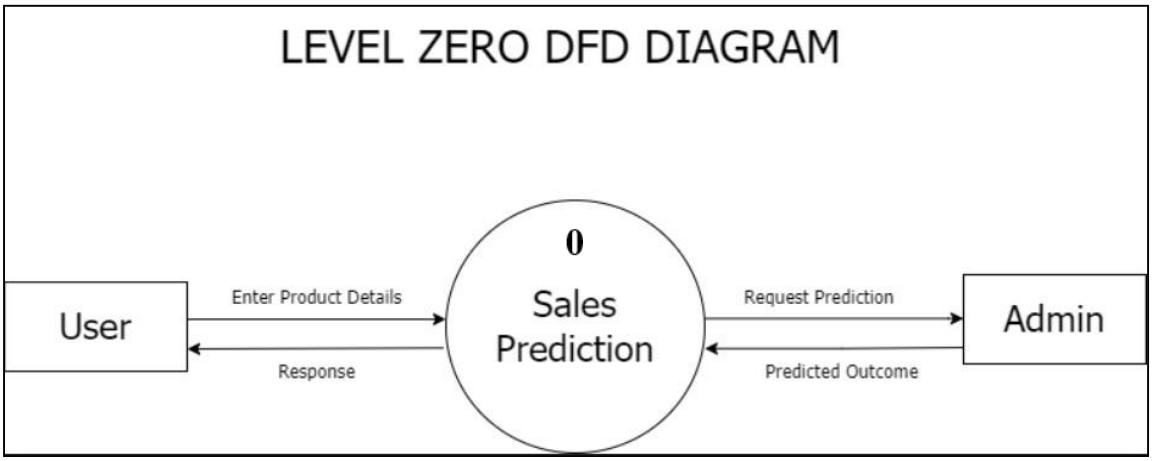


Fig 3: DFD Level 0

2.3.2 DFD Level 1

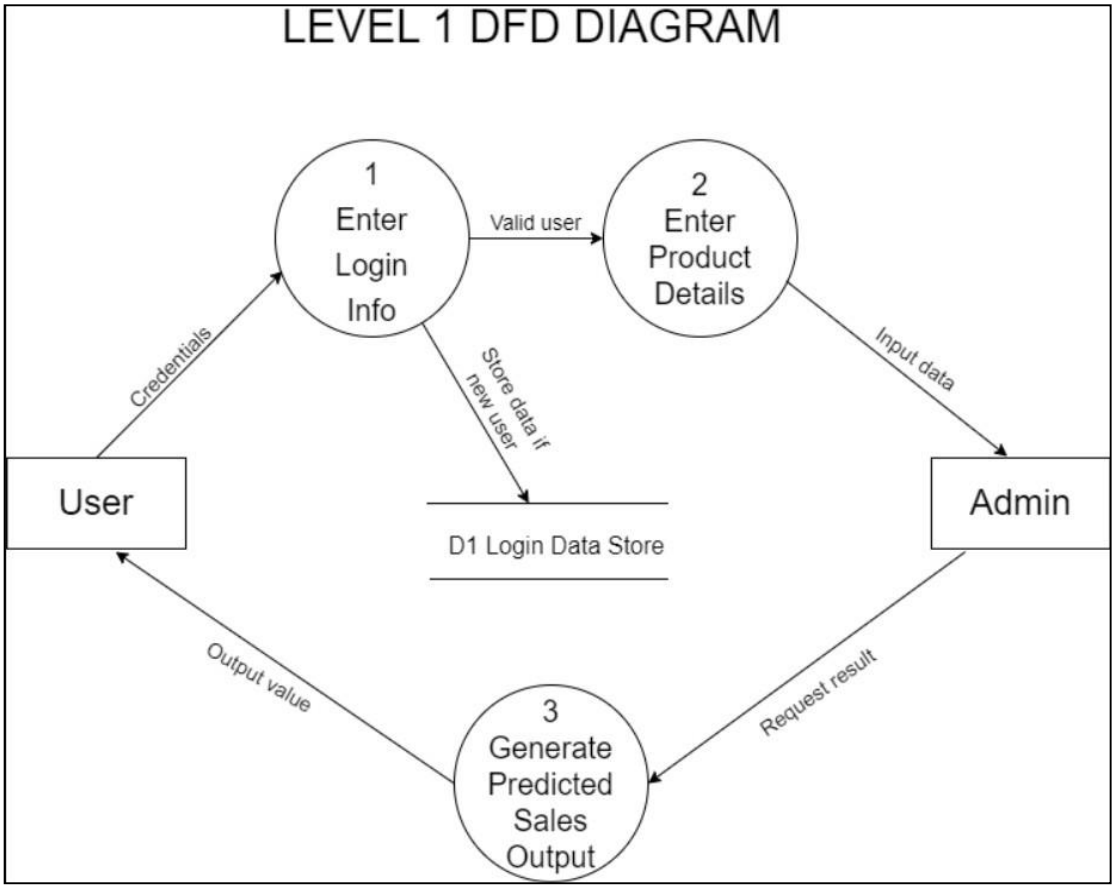


Fig 4: DFD Level 1

2.4 Software Requirement Specification in IEEE Format

2.4.1 Introduction

I. Purpose of this Document

The purpose of this SRS document is to provide a detailed overview of our software product, its parameters and goals. This document describes the project's target audience and its user interface, hardware and software requirements. It defines how our client, team and audience see the product and its functionality.

II. Scope of the Development Project

Sales Forecast Prediction using Machine Learning is a pivotal project that addresses the pressing need for businesses to make accurate sales predictions. The essence of this project is to leverage historical sales data, combined with cutting-edge machine learning techniques, to enable companies to forecast future sales trends with precision. In doing so, this project seeks to empower decision-makers with invaluable insights, thereby facilitating more informed and strategic choices in areas such as inventory management, marketing strategies, and financial planning. The project's primary goal is to develop a robust and reliable system that harnesses the power of data to provide forecasts for sales performance across various products, time frames, and geographic locations. By analyzingpatterns, trends, and historical data, this system will become a strategic tool for businesses in optimizing their operations, improving customer service, and achieving sustainable growth.

III. Definitions, abbreviations and acronyms

Definitions

Table 1 gives explanation of the most commonly used terms in this SRS document.

Table 1: Definitions for most commonly used terms

Table 10Definitions for most commonly used terms

S.No.	Term	Definition
1	Forecasting	a method of making informed predictions by using historical data as the main input for determining the course of future trends.
2	Hyperparameters	parameters whose values control the learning process and determine the values of model parameters that a learning algorithm ends up learning.
3	Scikit-learn, TensorFlow, or PyTorch	Python Frameworks
4	Apportioning	To divide and assign according to a plan
5	XG Boost regressor	Extreme Gradient Boosting (XGBoost) is an open-source library that provides an efficient and effective implementation of the gradient boosting algorithm.

Abbreviations

Table 2 gives the full form of most commonly used mnemonics in this SRSdocument.

Table 11: Full form for most commonly used mnemonics

S.No.	Mnemonic	Full Form
1	CSV	Comma Separated Values
2	MAE	Mean Absolute Error
3	RMSE	Root Mean Square Error
4	ML	Machine Learning
5	SRS	Software Requirement Specification
6	UML	Unified Modelling Language
7	GDPR	General Data Protection Regulation
8	DFD	Data Flow Diagram
9	XG Boost	Extreme Gradient Boost

IV. References

[1] Sales Forecasting guide. **Link**: https://www.anaplan.com/blog/sales-forecasting-guide/

[2] XG Boost regressor. **Link**: https://machinelearningmastery.com/xgboost-for-regression/

[3] Software Engineering , A Practitioner's Approach by Roger S. Pressman

[4] UML Diagrams. **Link**: https://www.lucidchart.com/blog/types-of-UML-diagrams

V. Gantt Chart WBS (Work Breakdown Structure):

S.No.	Task Name	Duration	Start	End
1	Planning & Feasibility Study	1 week	21.08.23	27.08.23
2	Requirement Analysis	4 weeks	28.08.23	24.09.23
3	Design	2 weeks	25.09.23	08.10.23
4	Development	5 weeks	09.10.23	14.11.23
4	Development	5 weeks	09.10.23	12.11.23
5	Testing	2 weeks	13.11.23	26.11.23
6	Documentation & Deployment	1 week	27.11.23	03.12.23

Fig 5: Gantt Chart

VI. Overview

The remaining sections of this document provide a general description, including characteristics of the users of this project, the product's hardware, and the functional and data requirements of the product. General description of the project is discussed in section 2 of this document. Section 2 gives the functional requirements, data requirements and constraints and assumptions made while designing the multi-utility system. It also gives the user viewpoint of product use. Section 3 gives the specific requirements of the product. Section 3.0 also discusses the external interface requirements and gives detailed description of functional requirements.

2.4.2 Overall Description

I. Product Perspective

Step 1: ***User Authentication***

The user, whether an administrator, sales manager, or executive, accesses the system and provides their login credentials. The system verifies the user's credentials by checking them against the user database. If the credentials are valid, access is granted; otherwise, access is denied.

Step 2: ***Dashboard Show***

After successful authentication, the user is presented with a dashboard screen.

Step 3: ***Data Import***

Sales managers can choose to import historical sales data for analysis and forecasting. If selected, the system provides a data import feature that allows sales managers to upload historical sales data files (e.g., CSV). Behind the scenes, the system processes the uploaded data, cleans it, and prepares it for analysis.

Step 4: ***Data Analysis and Forecasting***

Users can view sales forecasts and reports on the dashboard. The system uses machine learning algorithms to analyze the imported historical sales data. It then generates sales forecasts based on the analyzed data and user-defined parameters. The results are displayed on the dashboard in the form of charts, graphs, and textualinformation.

Step 5: ***Security and Audit Logs***

User Action: Security measures are enforced transparently during user interactions with

the system. The system enforces security behind the scenes by using authentication and authorization mechanisms.

II. Product Perspective

The product should be able to perform the following operations:

i. **Data Collection**: Gather comprehensive historical sales data, encompassing factors such as product details, sales quantities, customer demographics, and market conditions.

ii. **Model Selection**: Implement a range of machine learning models including linear regression, decision trees, random forests and neural networks. Conduct comprehensive model selection and comparison exercises, taking into account performance metrics and business objectives.

iii. **Model Training, Testing and Validation**: Train selected models on the training dataset, ensuring proper validation and hyperparameter tuning to optimize predictive accuracy. Implement cross-validation techniques to assess and improve the robustness of models. Evaluate model performance on the validation and testing datasets, employing relevant metrics such as Mean Absolute Error (MAE) and Root Mean Square Error (RMSE). Confirm the model's ability to generalize to unseen data.

iv. **Visualization and Reporting**: Create intuitive and interactive dashboards andreports for visualizing historical sales data, comparing actual vs. predicted sales, and identifying emerging trends. Enable users to export reports in multiple formats (e.g., PDF, Excel, graphs).

v. **User Management and Documentation**: Implement role-based access control anduser management functionalities to control and track user access to the forecasting system. Provide comprehensive documentation and training materials, ensuring that users and

administrators can effectively navigate and utilize the forecasting system.

III. User Characteristics

These user types are listed below as follows:

1. **Administrators:**

   Data Collection and Management: Administrators are responsible for gathering and managing the data required for training and testing the sales prediction model. They ensure data quality, handle missing values, and preprocess the data for analysis.

   Model Selection and Training: They choose the appropriate machine learning algorithms or techniques for the task, train the model using historical sales data, and fine-tune hyperparameters.

   Monitoring and Maintenance: Administrators continuously monitor the model's performance and retrain it periodically to adapt to changing trends.

2. **Sales Managers:**

   Model Evaluation: Sales managers interact with the system to evaluate the performance of the sales prediction model. They analyze metrics such as accuracy, precision, recall, and F1 score to assess how well the model is predicting sales.

   Visualizations: They use visualizations provided by the system tounderstand historical sales trends and predictions, helping them make informed decisions.

3. **Sales Representatives:**

   Sales Projections: Sales representatives can access the system to view projected sales for specific products or timeframes. This information aids in setting sales targets and prioritizing their efforts.

4. **Executives and Decision Makers:**

   Performance Reports: Executives use the system to access comprehensive reports on overall sales performance, broken down by products, regions, or other relevant segments.

   Long-Term Planning: The system's predictions can assist in long-termplanning, helping executives allocate resources, adjust marketing strategies, and make informed business decisions.

   Scenario Analysis: Decision makers can use the system to simulate different scenarios and assess how changes in various factors (e.g.,pricing, marketing spend) might impact future sales.

5. **IT Support:**

   Infrastructure and Deployment: IT support ensures that the ML-based salesprediction system is properly deployed and integrated with other systems. They manage server resources, scalability, and security.

   Troubleshooting: If users encounter technical issues while interacting with the system, IT support provides assistance in resolving these problems.

6. **Customers (limited interaction):**

   Online Shopping Platforms: If the ML system is integrated with online shopping platforms, customers might indirectly interact with it by receiving personalized recommendations based on their browsing and purchasing history.

IV. General Constraints, Assumptions and Dependencies

CONSTRAINTS:

i. **Data Quality:** The accuracy of sales forecasts is heavily dependent on the quality of historical sales data. Any inconsistencies, inaccuracies, or missing data can impact the effectiveness of the forecasting system.

ii. **Computational Resources:** The availability of computational resources, including processing power and memory, may constrain the complexity of machine learning models and the size of datasets that can be used.

iii. **Historical Data Availability:** The availability of historical sales data for certain products or regions may be limited, affecting the accuracy of forecasts for those specific areas.

iv. **Competitive Intelligence:** Limited access to competitor data and market intelligence can constrain the project's ability to factor in external competitive pressures into forecasts.

v. Model Complexity: The project may be constrained by the computational resources required to implement highly complex machine learning models, impactingthe choice of algorithms and techniques.

vi. **Data Availability for New Products:** Forecasting for new product launches can be challenging due to the lack of historical sales data, potentially limiting theaccuracy of forecasts for these items.

vii. **Seasonality and External Events:** The presence of seasonality or external events (e.g., holidays, economic fluctuations) can introduce constraints, as these factors may require specialized modelling techniques.

viii. **Data Imbalance:** Imbalanced datasets, where certain products or regions have significantly fewer sales data points than others, can constrain the model's ability to make accurate predictions for underrepresented categories.

ASSUMPTIONS:

i. **Historical Data Availability:** It is assumed that a sufficient amount of historical sales data is available for training and testing the machine learning models.

ii. **Data Relevance:** The assumption is made that historical sales data is relevant to future sales patterns and can be used as a basis for forecasting.

iii. **Stable Business Environment:** The project assumes that the business environment, including market conditions and product offerings, will remain relatively stable during the forecasting period.

iv. **User Training:** It is assumed that users will receive the necessary training to effectively use the forecasting system and interpret its results.

v. **Data Privacy Compliance:** The project assumes that data privacy regulations will be adhered to, and any necessary consents or permissions for data usage have been obtained.

vi. **Customer Behaviour Consistency:** The project assumes that customer purchasing behaviour remains relatively consistent over time, without significant shifts in preferences or buying habits.

vii. **Model Generalization:** It is assumed that the selected machine learning models will generalize well across different products, regions, or market segments, even when training data is limited for certain subsets.

DEPENDENCIES:

i. **Data Sources**: The project is dependent on the availability and reliability of data sources, including historical sales data and any external data used for contextual information.

ii. **Machine Learning Libraries:** Dependencies exist on machine learning libraries and frameworks, such as scikit-learn, TensorFlow, or PyTorch, for model development.

iii. **Feedback Loop:** The project may depend on establishing a feedback loop for continuous improvement, where insights from forecast results are used to refine the models and strategies.

iv. **IT Infrastructure:** Dependencies exist on the IT infrastructure, including server availability, database performance, and network stability, to support the forecasting system.

v. **Software Updates:** The project relies on specific software or libraries, hence dependencies exist on the maintenance and updates of those tools to ensure compatibility and security.

vi. **Data Cleaning and Validation Tools:** Dependencies on tools and processes for data cleaning, validation, and anomaly detection to maintain data quality.

vii. **Training Data Updates:** Dependencies on processes to periodically update trainingdata to account for changing sales patterns and emerging trends.

V. Apportioning of requirement

The Sales Forecasting Predicting System is to be implemented in the following threephases:

i. **Pilot Phase:** Focus on core functionalities, such as data import, model selection, and basic reporting. Ensure stability and performance. Implement basic user roles (e.g., administrators, sales managers) and their associated permissions for data access and configuration.

ii. **Institute wide deployment:** Following the successful completion of the pilot phase, we plan to deploy the same across more granular access controls, such as team-level permissions and executive-level access.

iii. **Expansion of data sources:** In future versions, consider expanding data sources to include external data feeds and third-party integrations based on user requirements.

2.4.3 Specific Requirements

I. External Interface Requirements

The following list presents the external interface requirements:

- The product requires very limited graphics usage. User inputs through the keypad, such as login credentials, data selection, and configuration settings.
- Displayed information and text-based responses on the screen; no graphics, sound, or animation are required.
- The system's user interface should be tailored to fit the specified screenresolution without graphical elements or animations.

II. Detailed Description of Functional Requirements

1. **Data Collection:** Gather comprehensive historical sales data, encompassing factors such as product details, sales quantities, customer demographics, and market conditions.

2. **Data Preprocessing:** Rigorously clean and preprocess the collected data, addressing issues such as missing values, outliers, and data inconsistencies. Implement advanced feature engineering techniques to derive meaningful predictors for model training.

3. **Data Splitting:** Divide the dataset into training, validation, and testing subsets to facilitate rigorous model evaluation and fine-tuning.

4. **Model Selection:** Implement a range of machine learning models, including but not limited to linear regression, decision trees, random forests, XGBoost and neural networks. Conduct comprehensive model selection and comparison exercises, taking into account performance metrics and business objectives.

5. **Model Training:** Train selected models on the training dataset, ensuring proper validation and hyperparameter tuning to optimize predictive accuracy. Implement cross-validation techniques to assess and improve the robustness of models.

6. **Model Testing and Validation:** Evaluate model performance on the validation and testing datasets, employing relevant metrics such as Mean Absolute Error (MAE), Root Mean Square Error (RMSE), and Mean Absolute Percentage Error (MAPE). Confirm the model's ability to generalize to unseen data.

7. **Forecast Generation:** Deploy the trained models to generate sales forecasts for future time periods, offering flexibility in customizing forecast horizons and granularity (daily, weekly, monthly).

8. **Visualization and Reporting:** Create intuitive and interactive dashboards andreports for visualizing historical sales data, comparing actual vs. predicted sales, and identifying emerging trends. Enable users to export reports in multiple formats (e.g., PDF, Excel).

9. **Alerting Mechanism:** Implement an automated alerting system to notify stakeholders when sales figures significantly deviate from forecasts, facilitating rapid response and adaptation.
10. **Integration:** Seamlessly integrate the forecasting system with existing Enterprise Resource Planning (ERP) or Customer Relationship Management (CRM) systems to ensure smooth data flow and decision support.

11. **User Management**: Implement role-based access control and user management functionalities to control and track user access to the forecasting system.

12. **Documentation and Training:** Provide comprehensive documentation and training materials, ensuring that users and administrators can effectively navigate and utilize the forecasting system.

III. Performance Requirements

1. **System Deployment:** The Sales Forecast Prediction System will be deployed on standard desktop and server hardware. It should be accessible from a web browser, ensuring compatibility with a wide range of devices and platforms.

2. **Concurrency:** The system should support concurrent user access. It must be able to handle multiple users simultaneously, regardless of the number of terminals, ensuring a responsive user experience.

3. **Data Handling:** The system will process both numerical and textual data related to sales and forecasting. It should efficiently handle varying data volumes, scaling to accommodate large datasets when necessary.

4. **Response Time:** Under normal operating conditions, at least 95% of user requests for

sales forecasts should be processed and responded to within 5 seconds. This ensures that users can quickly retrieve critical information to make informed decisions.

IV. Non-Functional Requirements:

1. **Accuracy:** The system must consistently achieve a high level of forecasting accuracy to minimize errors in predictions, underpinning its value to the business.

2. **Scalability:** The system should be designed to scale gracefully, accommodating large datasets and accommodating increasing data volume over time.

3. **Performance:** Forecast generation should be efficient, with minimal delays, to facilitate timely decision-making.
4. **Robustness:** The system should demonstrate resilience to data anomalies, changing market conditions, and unexpected sales patterns.

5. **Security:** Implement robust data security measures and user authentication protocols to safeguard sensitive sales information.

6. **Usability:** The user interface should be highly intuitive and user-friendly, requiring minimal training for users to operate effectively.

7. **Compatibility:** Ensure compatibility with various data formats and seamless integration with common business software and systems.

8. **Maintainability:** The system should be designed for easy maintenance, includingregular model retraining and updates to accommodate evolving business needs.

9. **Reliability:** The forecasting system should be highly reliable, with minimal downtime or disruptions to business operations.

10. **Regulatory Compliance:** Adhere to any relevant data protection and privacy regulations (e.g., GDPR) if applicable, ensuring the responsible use of customer and sales data.

11. **Auditability:** Maintain detailed logs and audit trails for user actions and system processes, enabling traceability and accountability.

12. **Cost-Efficiency:** Optimize resource usage to minimize operational costs, making the system sustainable and budget-friendly for the organization.

V. Quality Attributes

The Sales Forecast Prediction System is designed to cater to a diverse range of users, including sales managers, marketing professionals, and data analysts. The product is expected to exhibit robust performance across various hardware configurations and operating systems. It must be capable of handling a wide array of input scenarios, including unexpected data inputs or user interactions.

VI. Other Requirements

None

2.4.4 Change History

202309	Version 1.0 – Initial Release

Table 12: Change History

2.4.5 Document Approvers

SRS for Sales Forecast Prediction System is approved by:

_____

Name:

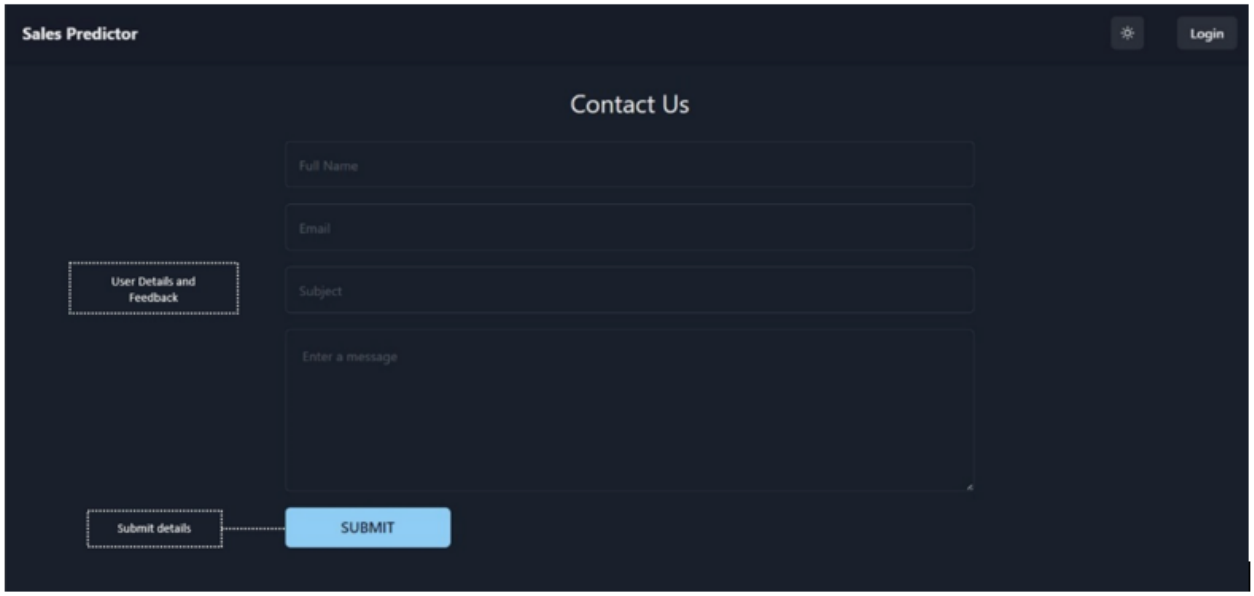
Designation:

Date:

2.5 User Stories and Story Card

Fig 6: User Card 1

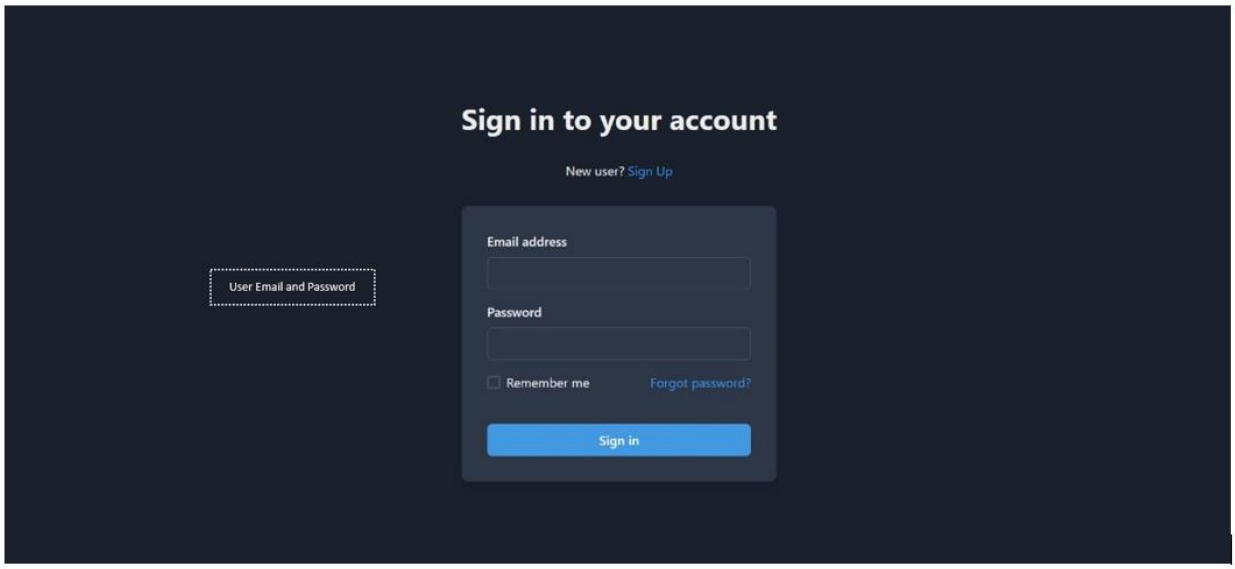
As a [user], **I want to** [send message], **so I can** [give feedback].



Full Name	Email	Subject	Message
Priya Sharma	priya@gmail.com	Appreciation	Excellent prediction accuracy

Fig 7: User Card 2

As a **[registered user],** I want to **[sign in],** so I can **[predict sales].**



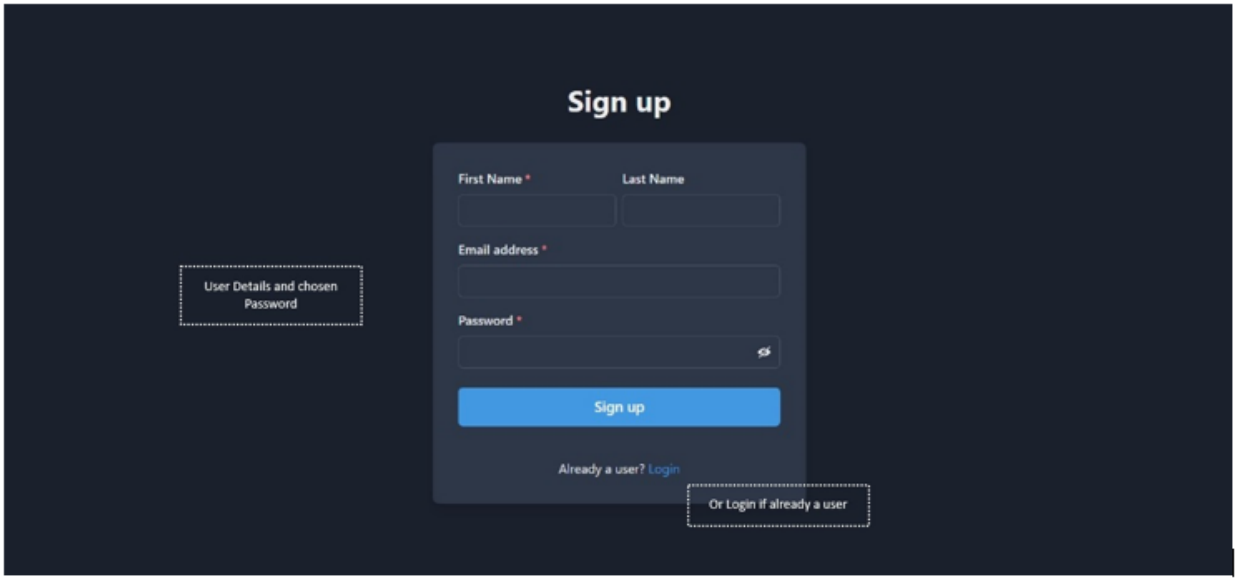
Email Address	Password
priya@gmail.com	123abc4

Confirmation

1. Success - valid user logged in and referred to sales prediction page.
2. Failure – display message:
   - "Fill all fields"
   - "Invalid login credentials"

Fig 8: User Card 3

As a **[new user]**, I want to **[sign up]**, so I can **[predict sales]**.



First Name	Last Name	Email Address	Password
Anu	Gupta	anu@gmail.com	etf22331

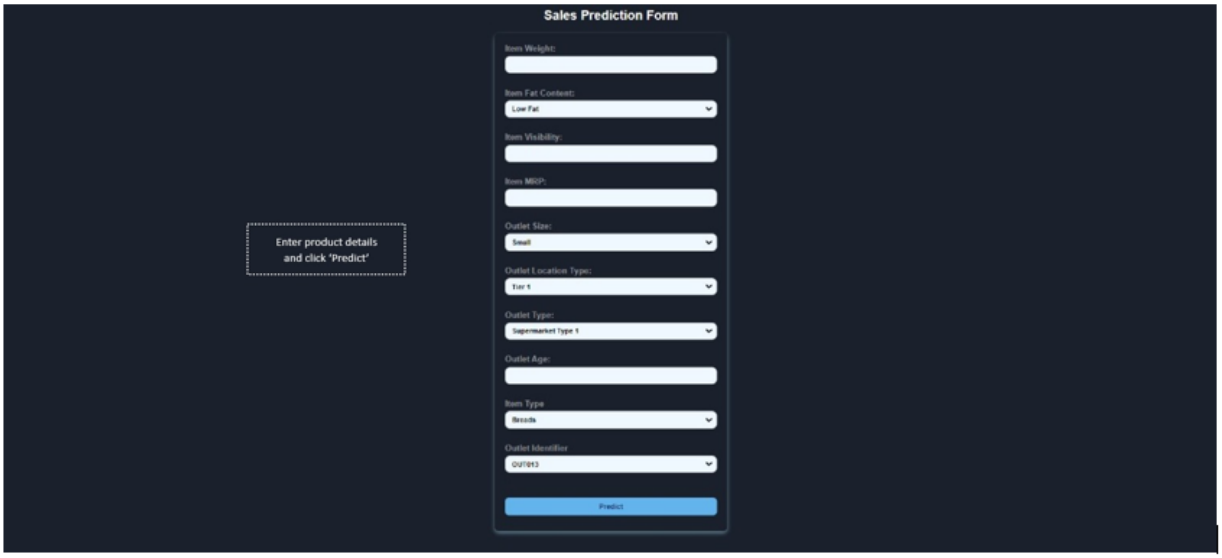
Confirmation

1. Success - new user signed up and referred to sales prediction page with details stored in database.

2. Failure – display message:
   - "Fill all fields"
   - "Password should be atleast 6 characters"
   - "Email already in use"

Fig 9: User Card 4

As a **[registered user]**, I want to **[enter details]**, so I can **[predict sales]**.



Item Weight	Item Fat Content	Item Visibility	Item MRP	Outlet Size	Outlet Location Type	Outlet Type	Outlet Age	Item Type	Outlet Identifier
23	Low Fat	1	45	Small	Tier 1	Supermarket Type 1	28	Breads	OUT013

Confirmation

1. Success – Prediction obtained after product details entered.
2. Failure – display message:
   - "Enter all fields"

Fig 10: User Card 5

3. DESIGN PHASE

3.1 Class Diagram

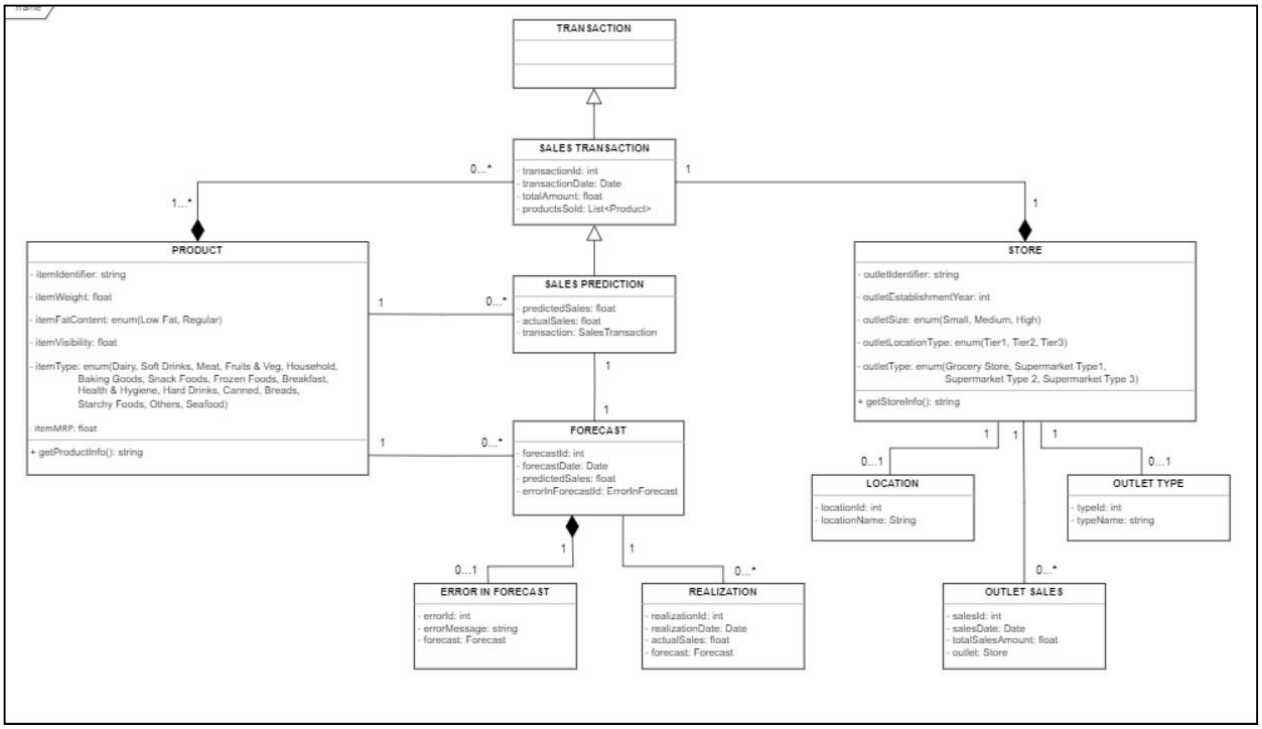


Fig 11: Class Diagram

3.2 Sequence Diagram

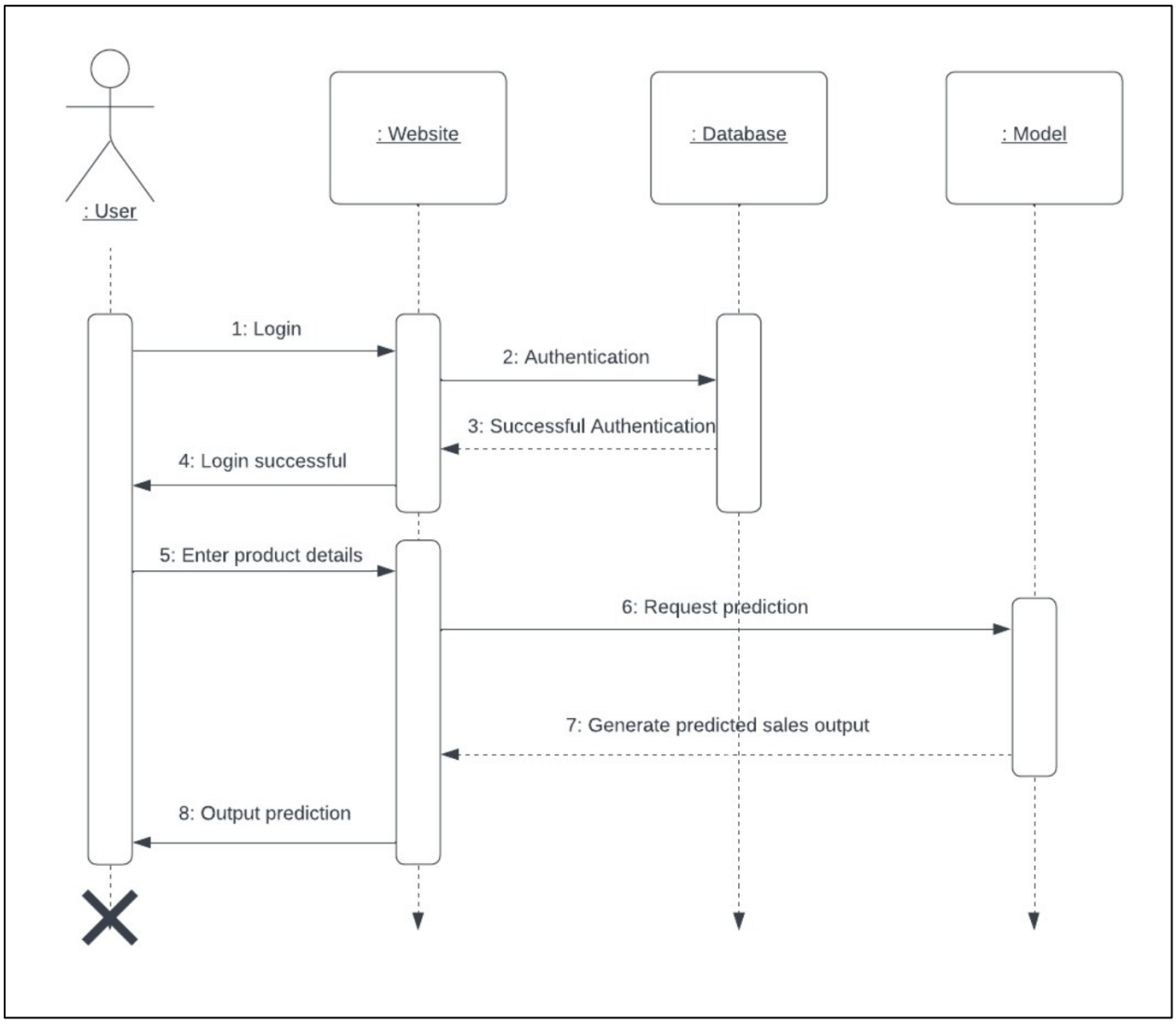


Fig 12: Sequence Diagram

3.3 Collaboration Diagram

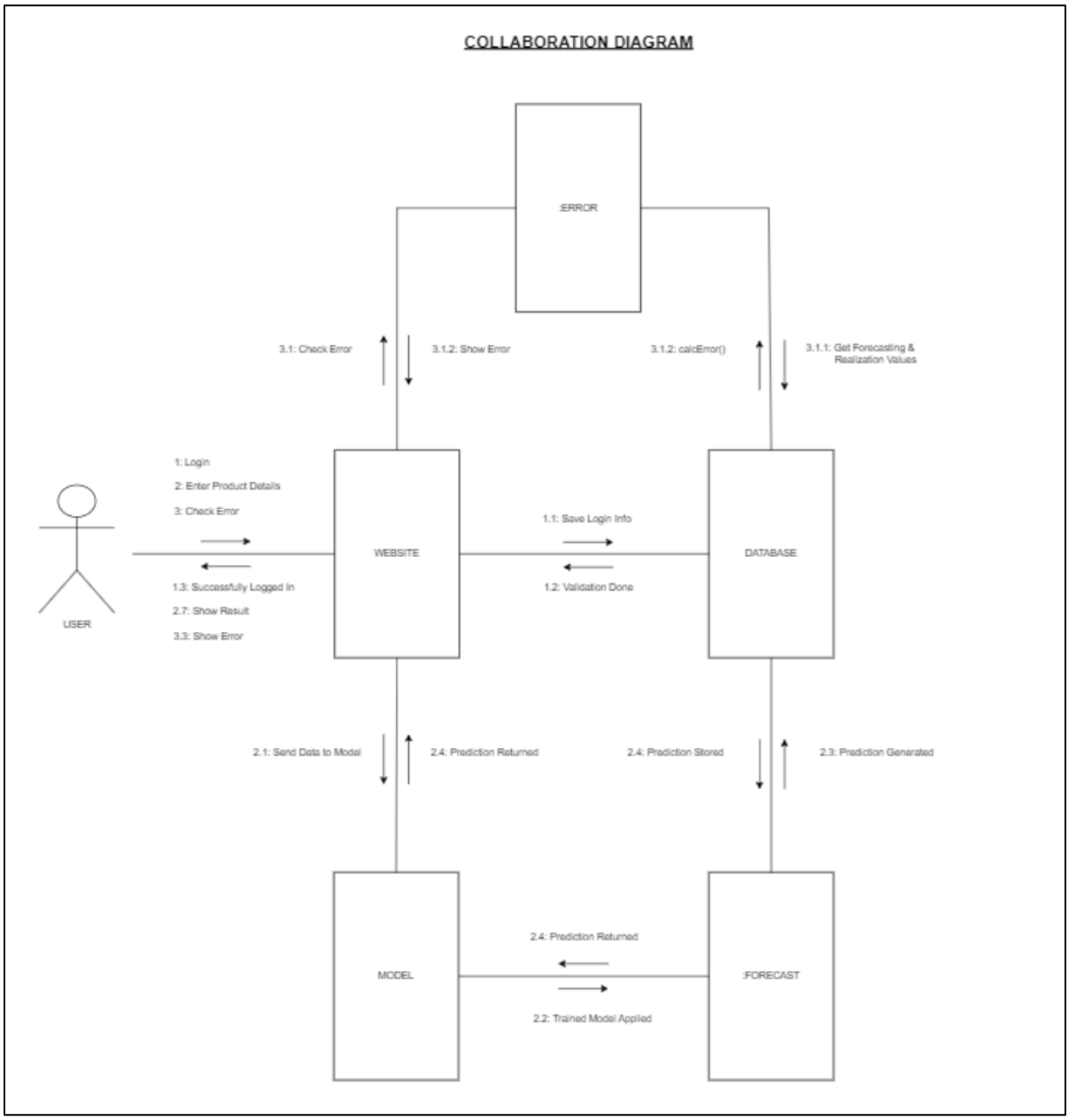


Fig 13: Collaboration Diagram

3.4 State Chart Diagrams

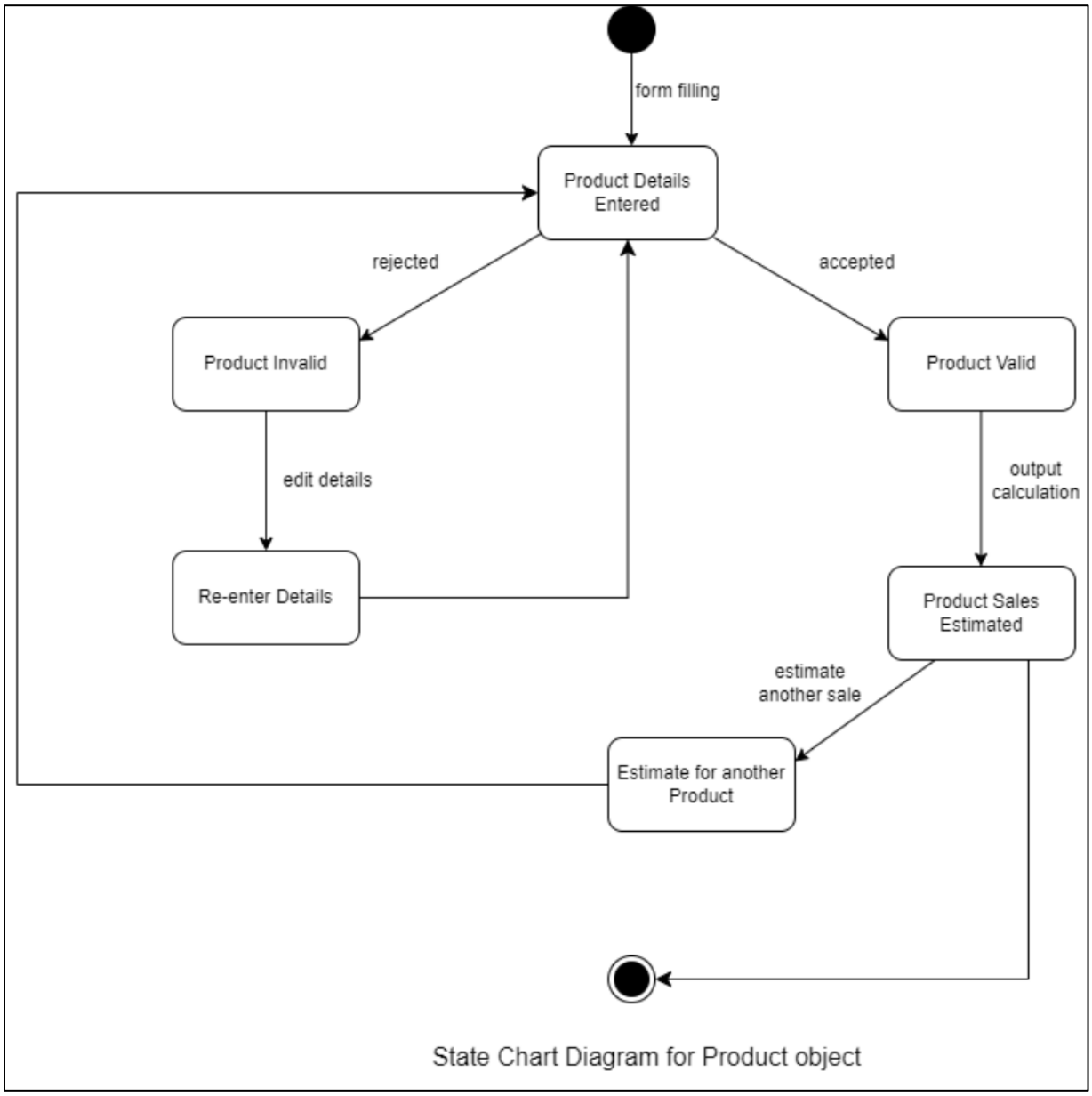


Fig 14: State Chart Diagram

3.5 Object Diagram

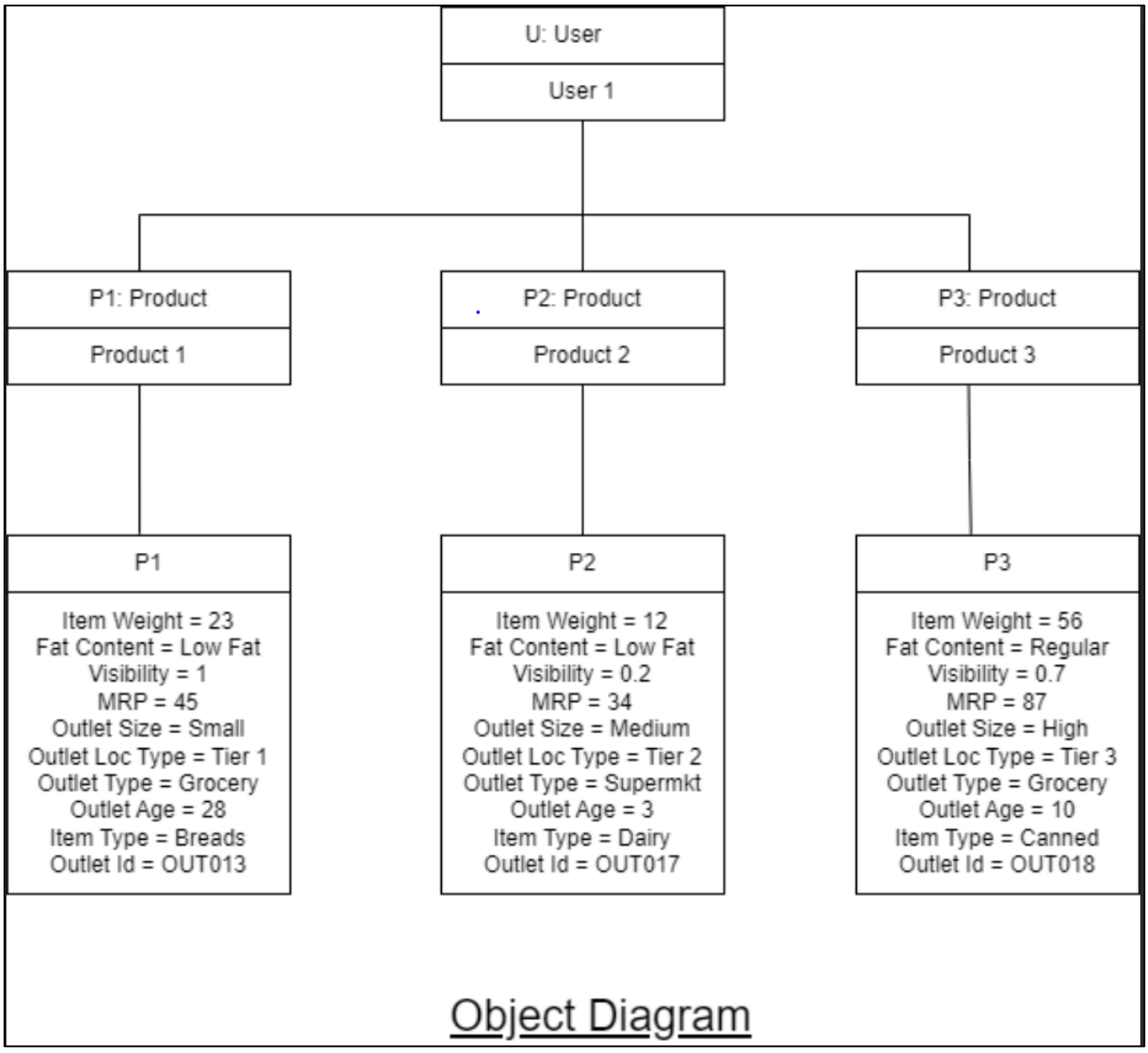


Fig 15: Object Diagram

4. IMPLEMENTATION

4.1 Component Diagram

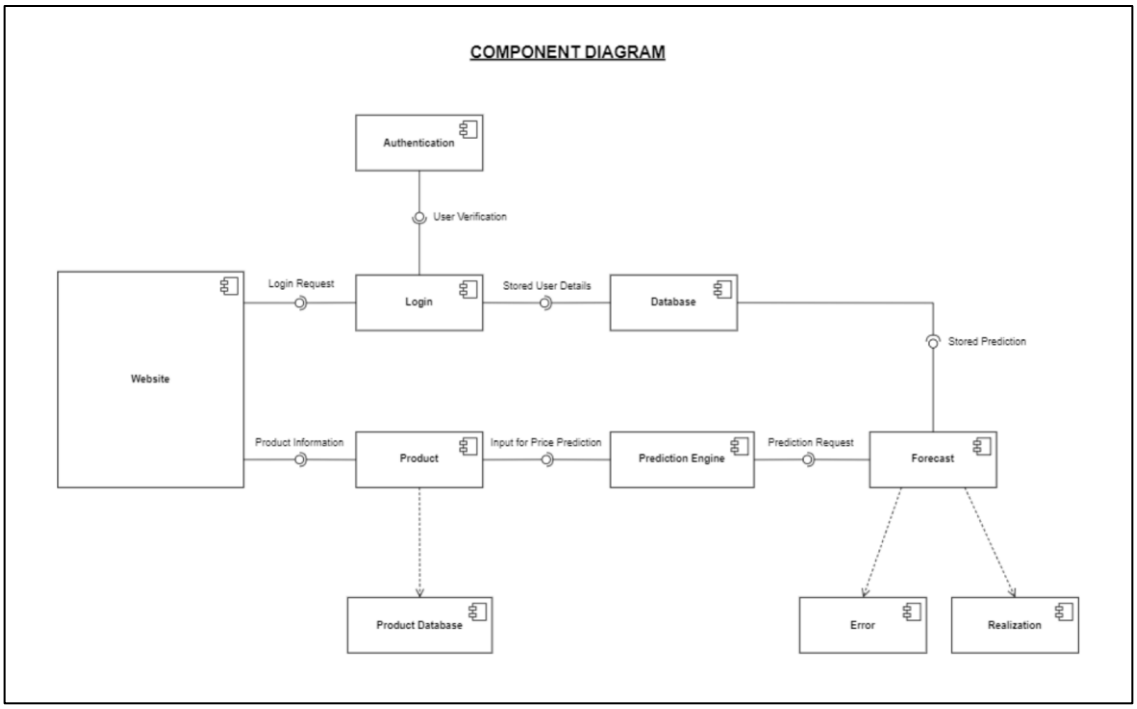


Fig 16: Component Diagram

4.2 Deployment Diagram

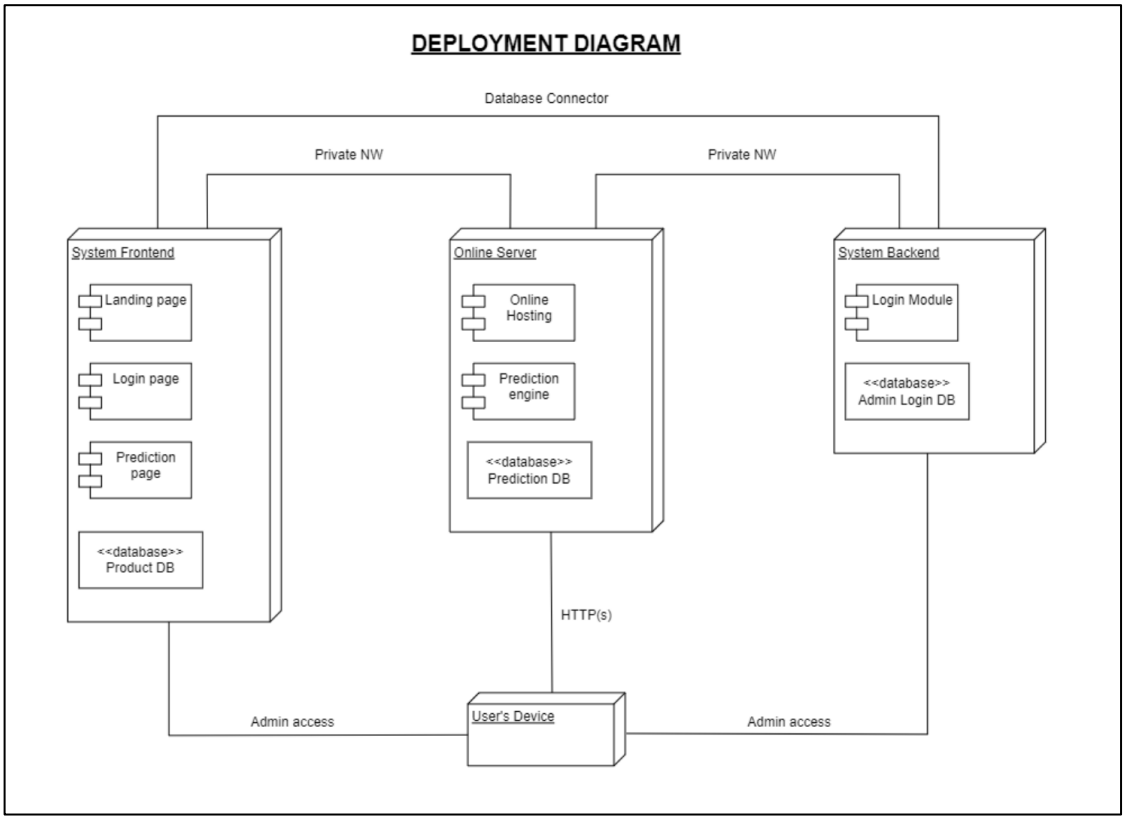


Fig 17: Deployment Diagram

4.3 Screenshots

Fig 18: Screenshot 1

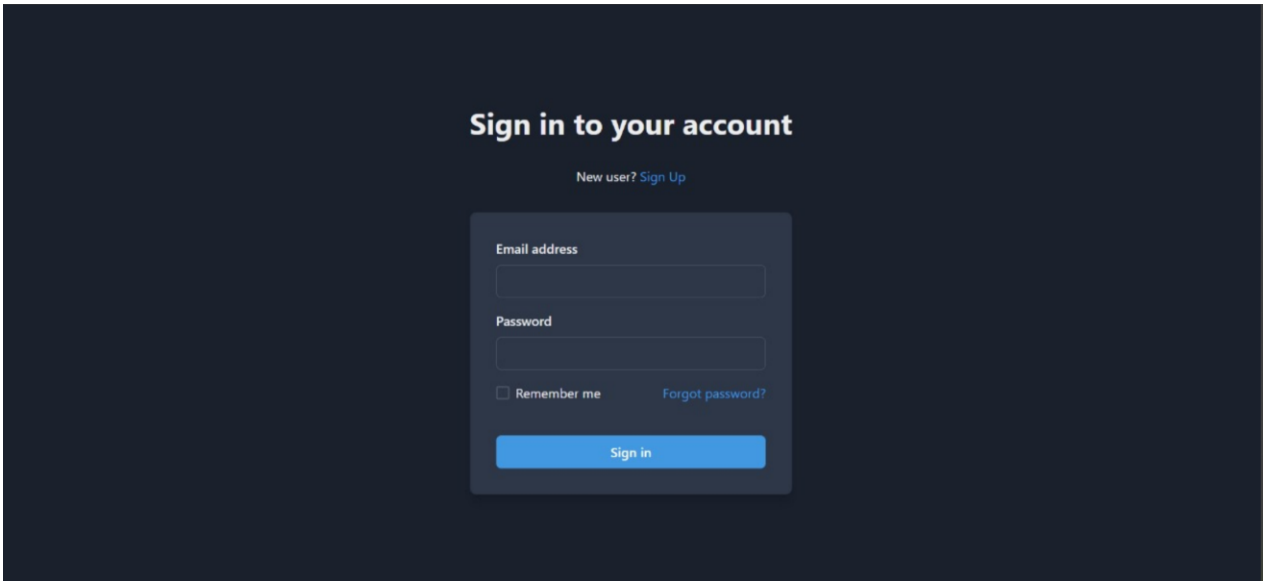


Fig 19: Screenshot 2

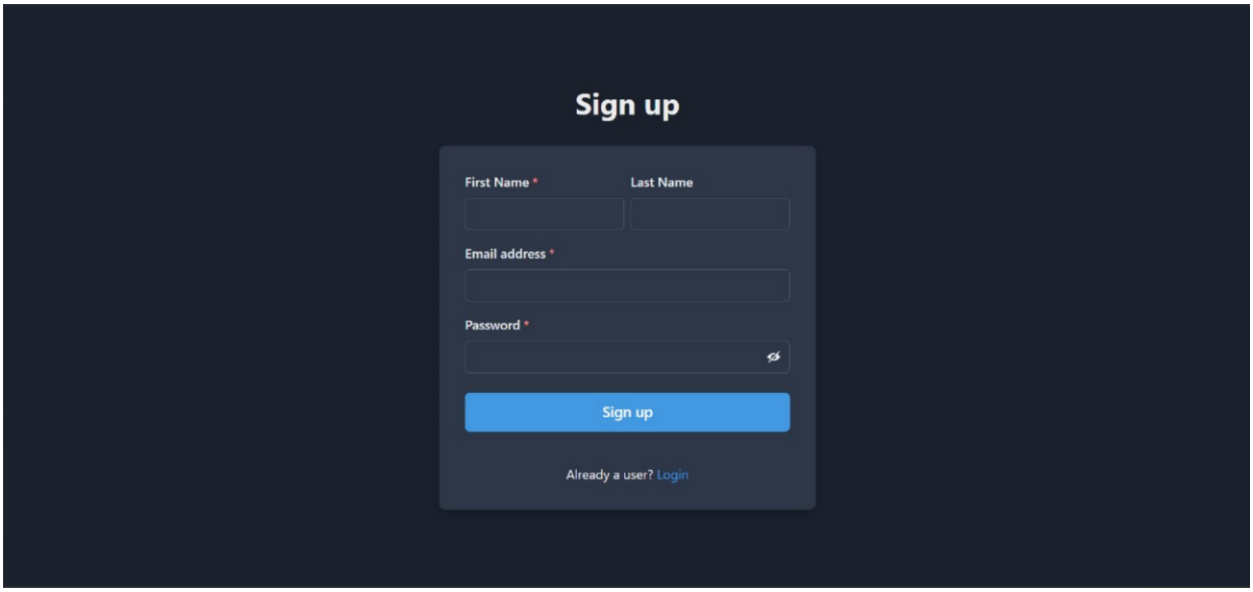


Fig 20: Screenshot 3

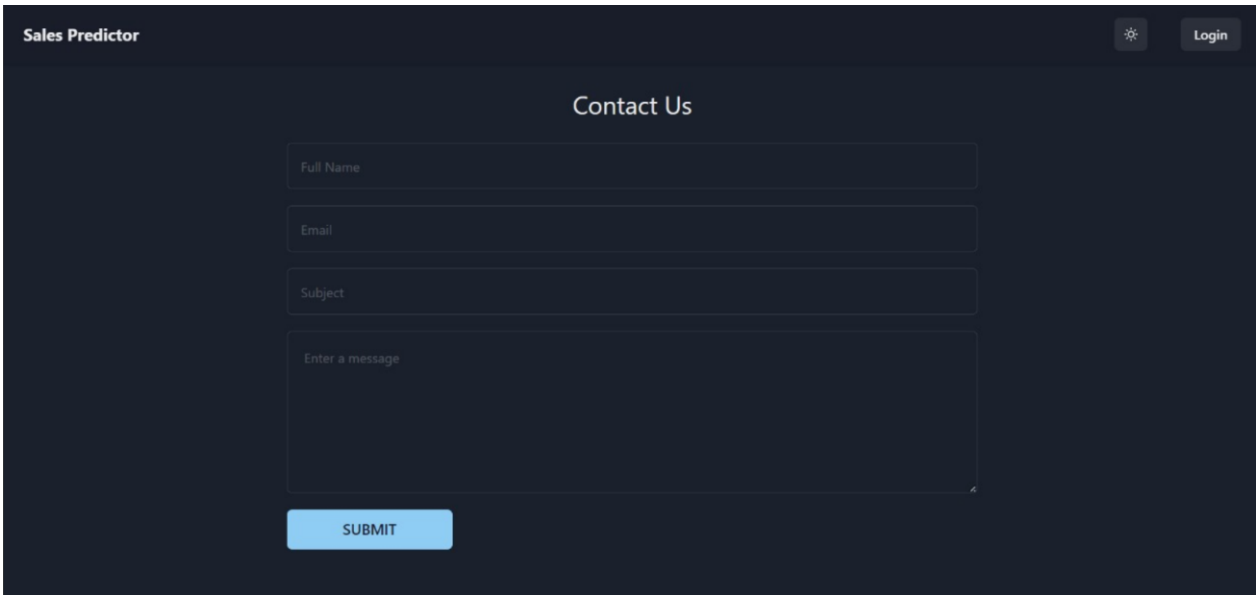


Fig 21: Screenshot 5

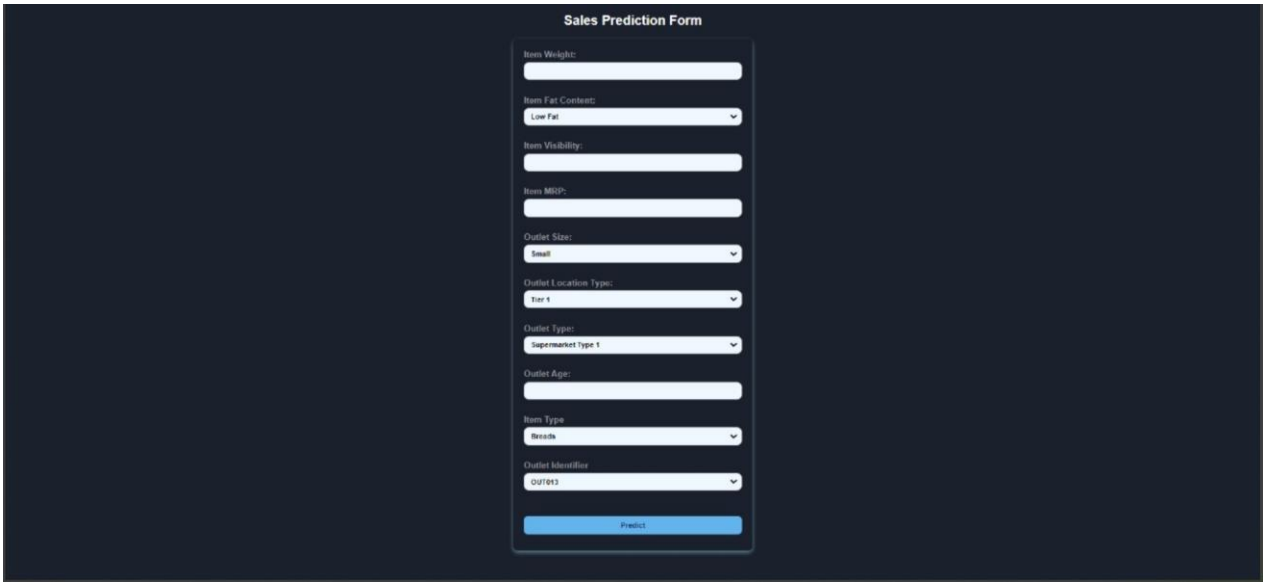


Fig 22: Screenshot 6

5. TESTING

5.1 Test Reports

Test Case Template

Test Case #: 1
Test Case Name: Basic utilities
System: Sales Prediction System
Subsystem: Utility
Designed by: Nitleen Kaur
Design Date: 15-11-2023
Executed by: Anshika Anand
Execution Date:30-11-2023
Short Description: Test the landing page specifications.

Pre-conditions:
1. User enters the landing page of the website.
2. System page displays buttons like 'Predict', 'Login', 'Mode'.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Click the 'Predict' button	The system redirects to the sign in page.	Pass	
2	Click the sun icon at the top-right corner	The toggle button switches mode from dark to light and vice versa.	Pass	
3	Click the 'Login' button	The system redirects to the sign in page.	Pass	

Post-conditions:
1. User is landed to Sign-in page.
2. Theme is switched.

Fig 23: Test Template 1

Test Case Template

Test Case #: 2
Test Case Name: Feedback section
System: Sales Prediction System
Subsystem: Feedback
Designed by: Anupriya Lathey
Design Date: 20-11-2023
Executed by: Anshika Anand
Execution Date: 30-11-2023
Short Description: Test the feedback section.

Pre-conditions:
1. User scrolls down to 'Contact Us' section.
2. System displays feedback form.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Scroll down to Contact Us section	Form to be filled is displayed	Pass	
2	Enter user details in each field and click 'Submit' button	Pop message displays on screen.	Pass	

Post-conditions:
1. User receives confirmation message.

Fig 24: Test Template 2

Test Case Template

Test Case #: 3
Test Case Name: User sign-in
System: Sales Prediction System
Subsystem: Sign-in
Designed by: Pia Gupta
Design Date: 20-11-2023
Executed by: Sunali
Execution Date:30-11-23
Short Description: Test the sign-in page.

Pre-conditions:
1. User clicks on 'Login' button.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	User leaves a field blank	Error message 'fill all fields' gets displayed	Pass	
2	User email does not include '@' or '.com'	Error message 'invalid email' gets displayed	Pass	Also explain the issue that is causing the mail to be invalid
3	Email address or password do not match database	Error message 'invalid login credentials' gets displayed	Pass	
4	User enters valid details which match the database	Redirected to prediction page	Pass	

Post-conditions:
1. If new user, lands on Sign-up page.
2. Details fetched from database and registered user lands on prediction page.

Fig 25: Test Template 3

Test Case Template

Test Case #: 4
Test Case Name: New user sign-up
System: Sales Prediction System
Subsystem: Sign-up
Designed by: Anupriya Lathey
Design Date: 20-11-2023
Executed by: Sanyam Gupta
Execution Date: 30-11-2023
Short Description: Test the Sign-up page.

Pre-conditions:
1. Current user is first time user.
2. User has clicked on 'Sign up' button.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	User leaves a field blank	Error message 'fill all fields' gets displayed	Pass	
2	User email does not include '@' or '.com'	Error message 'invalid email' gets displayed	Pass	
3	Password selected is less than 6 characters	Error message 'password should be atleast 6 characters' gets displayed	Pass	For more authentication of password it can include special characters compulsion too.
4	User enters already registered email address	Error message 'email already in use' gets displayed	Pass	
5	Toggle Eye icon is clicked	User can see entered password	Pass	
6	User enters valid details	Redirected to prediction page	Pass	

Post-conditions:
1. Details stored in database.
2. User is redirected to Prediction page.

Fig 26: Test Template 4

Test Case Template

Test Case #: 5
Test Case Name: Predict Sales
System: Sales Prediction System
Subsystem: Product Sales
Designed by: Pia Gupta
Design Date: 20-11-2023
Executed by: Sunali
Execution Date:30-11-23
Short Description: Test the Prediction system.

Pre-conditions:
1. User details are present in database.

Step	Action	Expected System Response	Pass/ Fail	Comment
1	Choose required vales of Item Fat Content, Outlet Size, Outlet Location Type, Outlet Type, Item Type, Outlet Identifier from respective dropdown menus	Selected options get chosen as prediction parameters	Pass	
2	Enter values of Item Weight, Item Visibility, Item MRP, Outlet Age in respective fields	Entered values get chosen as prediction parameters	Pass	
3	User leaves a field empty	Error message 'enter all fields' gets displayed	Pass	
4	User clicks on 'Predict' button	Sales value predicted according to model applied in the backend	Pass	

Post-conditions:
1. Sales values predicted if details entered are valid.

Fig 27: Test Template 5

GROUP 2 TEST TEMPLATES

Test case #: 1
System:Blood Bank Management
Designed By: Sunali
Executed By: Nitleen Kaur
Short Description:login functionality.

Test Case Name: Login Page
Subsystem: Authentication
Design Date: 27-11-2023
Execution date: 30-11-2023

Pre Conditions
The user has a valid account with the Blood Bank System.
The system displays the login page.

STEP	ACTION	EXPECTED SYSTEM RESPONSE	PASS/FAIL	COMMENT
1.	Enter valid email and password	The system authenticates the user's credentials, grants access if they are valid, and displays the main dashboard.	Pass	
2.	Enter invalid email.	The system displays an error message indicating that the email or password is incorrect. Access is denied	Pass	
3.	Enter valid email and incorrect password	The system displays an error message indicating that the email or password is incorrect. Access is denied	Pass	
4	Enter invalid email and invalid password	The system displays an error message indicating that the email or password is incorrect. Access is denied	Pass	
5	Check post-condition		Pass	

Post-conditions:
1. The user is successfully logged in, and access to the main dashboard is granted.
modify it in this format

Fig 28: Test Template 1

Test case #: 2	**Test Case Name: Blood Request**
System: Blood Bank Management	**Subsystem: Blood Request**
Designed By: Anshika Anand	**Design Date: 27/11/2023**
Executed By: Anupriya Lathey	**Execution date:** 30/11/2023
Short Description: Verify that the user can successfully request blood.	

Pre Conditions
User is logged into the application

STEP	ACTION	EXPECTED SYSTEM RESPONSE	PASS/FAIL	COMMENT
1.	Navigate to the blood request section	The page for requesting the blood and entering the details will open.	PASS	
2.	Filling the required fields with the provided Input.	It will accept the details and save the process.	PASS	specify minimum/maximum quantity for in/out
3.	Submit the request.	It will store your details and your request for the blood type you need. It can be viewed by authorized personnel.	PASS	Check for spam/duplicate records
4	Enter the invalid input in the respective fields .	"INVALID CREDENTIALS" will pop up on the screen.	PASS	
5	Attempt to submit the request.	As no new blood request is made the system remains unchanged.	PASS	

Post-conditions:
1. Your blood request is stored along with your details and your request for the blood type you need. It can be viewed by the authorized person.

Fig 29: Test Template 2

Test case #: 3 **Test Case Name: Removal of Donor by Admin**
System: Blood Bank Management **Subsystem: Removal of Donor**
Designed By: Anshika Anand **Design Date: 27/11/2023**
Executed By: Pia Gupta **Execution date: 30/11/23**
Short-Description: Verify that a user can successfully be removed by the admin.

Pre-Conditions:
Admin is logged in to the application.

STEP	ACTION	EXPECTED SYSTEM RESPONSE	PASS/FAIL	COMMENT
1.	Navigate to the Donor List.	The page for donor list along with their details like name, email, DOB will open.	PASS	
2.	Select User for Removal.	The user will be selected for removal via name, email, DOB	PASS	
3.	Confirm donor removal.	Before proceeding it will confirm whether to remove the donor or not.	PASS	
4	Watch the system processing time.	The system should not take more than few seconds to remove the donor.	PASS	
5	Verify user removal.	While checking the donor list the selected user should not be present there.	PASS	

Post-conditions:

1. The user is successfully removed from the system.
2. Any permissions, roles, associations related to the removed user are revoked or appropriately adjusted.
3. The system state is stable, and no unexpected errors or issues are observed.

Fig 30: Test Template 3

Test case #: 4
System:Blood Bank Management
Designed By: Sanyam Gupta
Executed By: Anupriya Lathey
Short Description:Register as new user

Test Case Name: Register New User
Subsystem: Registeration
Design Date: 27-11-2023
Execution date: 30-11-2023

Pre Conditions

- The user has access to a device with an internet connection.
- The user has a valid email ID and phone number.

STEP	ACTION	EXPECTED SYSTEM RESPONSE	PASS/FAIL	COMMENT
1.	For Donor Registeration: Enter name, email ID, phone number, address, and optionally website.	It will accept the details and save the process and if email doesnot have @ the system pops a message.	Pass	
2.	For Organization Registration:Enter organisation name, email ID, phone number, address, and website.	It will accept the details and save the process and if email doesnot have @ the system pops a message	Pass	
3.	For Hospital Registration: Enter Hospital name, email ID, phone number, address, and website.	It will accept the details and save the process and if email doesnot have @ the system pops a message	Pass	
4	For Admin Registration: Enter name, email ID, phone number, address, and website.	It will accept the details and save the process and if email doesnot have @ the system pops a message	Pass	
5.	Click the submit button to register as new user.	Successful submission message, stating new users has been register..	Pass	
5	Check post-condition		Pass	

Post-conditions:
1. User data is securely stored in the database.
2.Proper validation of email addresses and phone numbers to ensure accuracy.
3.Access rights and permissions are appropriately assigned based on the type of registration (donor, organization, hospital, admin).
4.Users can log in with their registered credentials after successful registration.

Fig 31: Test Template 4

Test case #:5
System: Blood Bank Management
Designed By: Sanaym Gupta
Executed By: Nitleen Kaur
Short Description: View the Blood Analytics

Test Case Name: Blood Analytics
Subsystem: Analytics
Design Date:27-11-2023
Execution date:30-11-23

Pre Conditions
1. Registered users (organizations, hospitals) have logged into the analytics system.
2. User access permissions are appropriately configured based on roles.
3.Properly configured and functional analytics dashboard with relevant visualization tools.

STEP	ACTION	EXPECTED SYSTEM RESPONSE	PASS/FAIL	COMMENT
1.	Log into the analytics system using registered credentials.	Successful login and access to the dashboard.	Pass	
2.	Access the blood group analytics section.	Successful navigation to the analytics page dedicated to blood group information.	Pass	
3.	View details of specific blood group types (A, B, AB, O).	Display the inflow (donations), outflow (requests/utilization), and total available quantity for each blood group through graphs or numerical representations.	Pass	
4	When ever inventory is updated ,the analytics also get updated.	The system shows an update in visual form.	Pass	
5	Check post-condition		Pass	

Post-conditions:
1. Analytics are accessible exclusively by authorized organizations and hospitals.
2. Real-time or near-real-time data updates on blood group analytics based on incoming donations, requests, and inventory changes.
3. Accurate representation of inflow, outflow, and total available quantity of different blood group types.

Fig 32: Test Template 5