

D.K.T.E.Society's Textile and Engineering Institute,Ichalkaranji.

(An Autonomous Institute, Affiliated to Shivaji University, Kolhapur)

Department of Computer Science & Engineering

2021-2022



Project Synopsis On

Gadget Recommendation System

Under The Guidance Of

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CERTIFICATE

This is to certify that,

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Have successfully completed the SRS and Design documentation of the mega project entitled,

Gadget Recommendation System

In fulfillment for Final Year B.Tech CSE academics. This is the record of their work carried out during the academic year 2021-2022

Date:

Place: Ichalkaranji

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1. Introduction

Recommendation systems are software agents that elicit the interests and preferences of individual consumers and make recommendations accordingly. These are basically the systems that recommend things like music, videos, books, shopping items, and even people. They have the potential to support and improve the quality of the decisions consumers make while searching for and selecting things online. They have become overly popular in recent times with their presence and increase in their use on almost every platform. The most popular live recommender systems can be seen on platforms like Amazon, Facebook, Youtube. Their need has been largely increased because of the very size of the population to which these platforms cater to. They basically improve user experience. A user, for example, would not like to go through the hassle of finding something in the very big inventory of, say, Amazon and would highly appreciate if an item is being recommended to him based on some criteria like his rating of previously bought things or his most favourite category etc.

Recommendation systems can be built in many ways:

- Personalized: Here the user's profile and his/her context is only considered.
- Collaborative: Here all users data is considered and recommendations are constructed.
- Content-based: Here similar items of those positively rated by users are recommended.
- Knowledge-based: Here both user context and product attributes are considered.
- Hybrid: Here different compositions of all the above methods are used.

Why a gadget recommendation system ?

Today smartphones have become a basic need of individuals, as a communication device across the globe. The advances in smartphone technology and the competitive fight among the smartphone manufacturers created the situation that almost every day a new model of a smartphone is being introduced into the market. The endless increase in the options space presented a tricky challenge in front of the consumers of smartphones. The major factors that influence consumers in selecting a smartphone to use include: innovative features, image, price, personal recommendation, durability, portable aspects, influence of media, post-sales service and so on. Though smartphones have a number of features in common, manufacturers still try to bring uniqueness to their products by adding some more new features to the existing features. This made smartphone development a challenge and manufacturers welcomed the challenge with a great set of innovative designs. The growing number of brands and models created fierce market competition. Therefore it is inevitable to run with innovations updates and at the same time it is mostly desirable to know the trending thoughts of potential customers. So here the recommendation system suggests the best possible outcome for the customers based on the recommendation algorithm.

1.1 Goals and Objectives

In this, the goal is

- Data collection, Using data scraper collecting the specifications of various devices from different e-commerce sites. The data will be in either numeric or string format. Data will be processed in further procedure.
- The inputs are the user requirements, It will be collected using a web form. The data will be input using checkboxes, drop down lists, value selector. The data will be in only numeric format.
- The output will be product information like product name, its pros and cons, specifications, product image, best buy affiliate link.

The objectives of this paper are:

- Collection of data about concerned products from different e-commerce sites like GSMarena, Flipkart or Amazon using Web Scraper (It will be implemented using python3. BeautifulSoup or Scrapy python library will be used. The collected data will be stored in a csv file).
- Forming databases using Google firebase, where User Authentication is done by Firebase Authentication module and Product Specifications is done by Firestore NoSQL database.
- Front End will be implemented using HTML5, CSS3, JS and React JS will be used to create interactive UI components.
- Back End will be implemented using python3 - Django framework. Cosine similarity will be used for recommender systems.

1.2 Scope

As an initial version, the project is starting with only Smartphone Recommendations. The reason behind this is if we get this smartphone recommendation working then the web scraper and recommendation algorithm can also work for other types of gadgets it just have to be implemented for new input forms for different users.

The problem statement is quite straightforward: recommend gadgets to users from a large availability of gadgets. There are many online recommender systems each following have its own methodology in recommending gadgets. The GSMarena, for example, follows a methodology where it takes into consideration the user activity, the similarity, scores based on specification. Here we are taking a very basic approach of calculating similarities of requirements based on users' requirements.

2. Usage Scenario

2.1 User Profiles

- User
- Admin

2.2 Use Cases

- User
 - Register in the system
 - Login into the system
 - Fill the input form
 - Access the recommendation
 - Log out of the system
- Admin
 - Add/remove user
 - Gather user data
 - Calculate similarity scores
 - Show the recommendation

2.3 Use Case Diagram

Fig 2.1 shows the Use Case diagram where the two actors are user and admin. It shows the graphical representation of their possible interactions with the system.

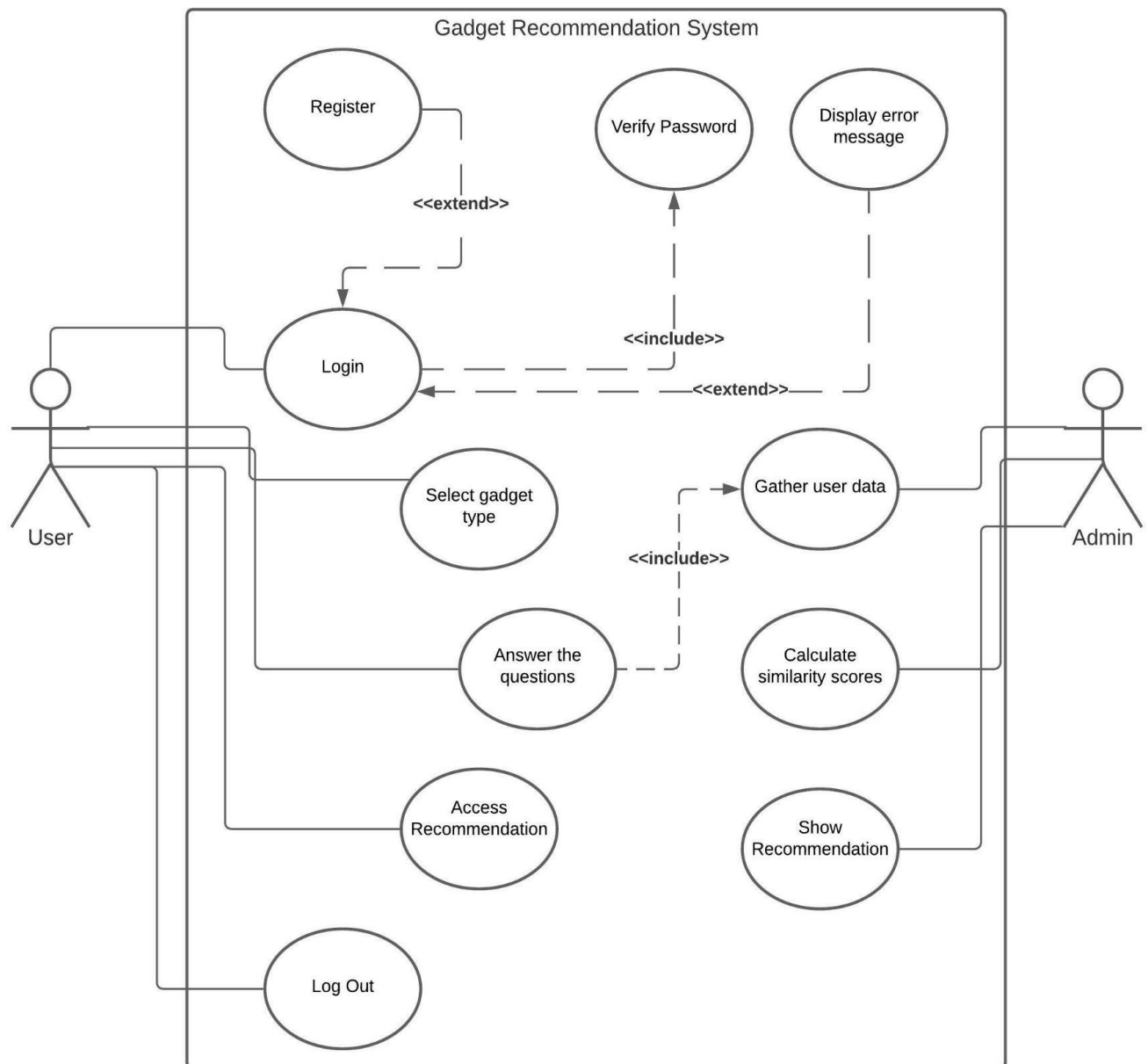


Fig 2.1 Use Case Diagram

2.4 Use Case Description

Actors	Use Case	Description
User	Register	Must register into the system
	Log in	Logging in using the registered credentials
	Select gadget type	Choose among the various gadget types in the system
	Answer the questions	Fill in the form according to the requirements
	Access Recommendation	System will display the recommendation
	Log out	Log out of the system
Admin	Gather user data	Data that user fills into the form
	Calculate similarity scores	Apply the algorithm on the user data
	Show recommendation	Recommend from the calculated similarity scores

2.5 Activity Diagram

Fig 2.2 is the activity diagram for the gadget recommendation system which depicts graphical representation of stepwise activities and actions in the system.

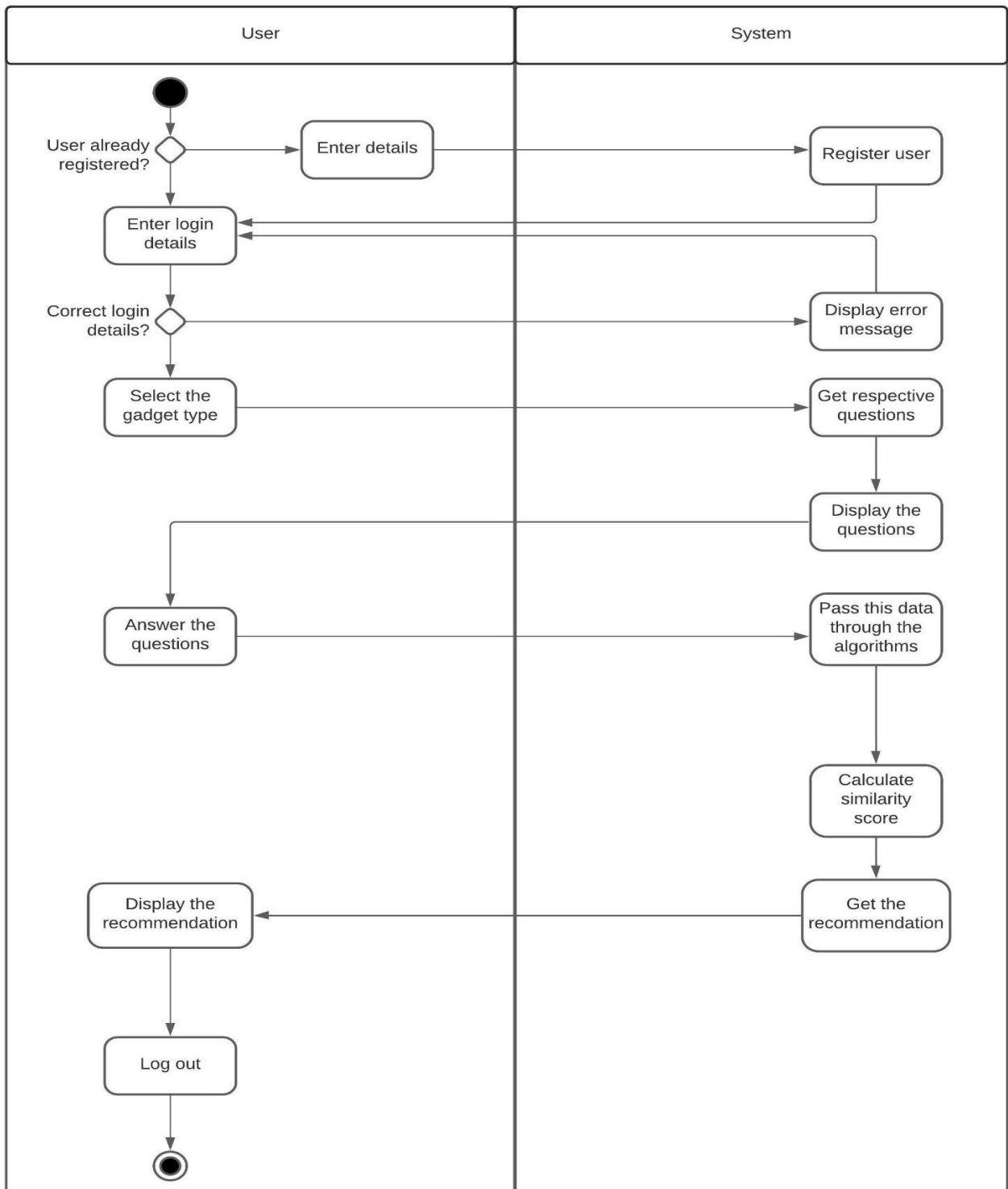


Fig 2.2 Activity Diagram

3. Data Model and Description

3.1 Database

Sr. No	Field Name	Range of Valid values for Field	Remarks
1	username	Up to 30 characters in length.	This is the name of the user.
2	user_Id	Any valid 5 digit number	This will be able to get all the details associated with the user.
3	password	10 alphanumeric characters	Users will use it for login.
4	g_name	Up to 20 characters in length.	This is the name of the gadget.
5	gadget_Type	Any valid 2 digit number	Identify the category of the gadget. (e.g. smartphone,laptop,earphone)
6	Gadget Id	Any valid 10 digit number	This will get all the information about gadgets.
7	price	Any valid 6 digit number	Selling price of the gadget.
8	specifications	Different values for different gadgets	Includes gadgets features (e.g.RAM,processor, storage,etc)
9	pros	List containing best features	It will showcase the pro features of gadgets.
10	cons	List containing not so best features	It will show the negative features.
11	Similarity score	Value in the range (-1,1)	It is the value used to get the recommendations.

3.2 Relationships

- **Recommendation System - User**

Fig 3.1 shows that many users can login and search for the gadgets. Thus the relationship between the system and the users is also a **one-to-many** relationship. Many users can interact with the system simultaneously.

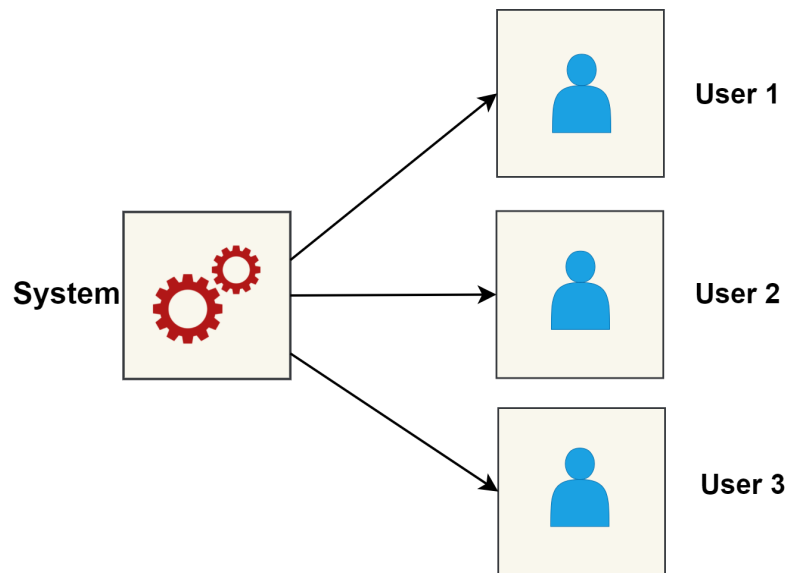


Fig 3.1 System-User Relationship

- **User - Gadget**

Fig 3.2 shows that many users can search for many gadgets on the platform provided by the system. The relationship between the two objects can be implemented as a **many-to-many** relationship. Users can view one or more gadgets as well as their specifications for comparison.

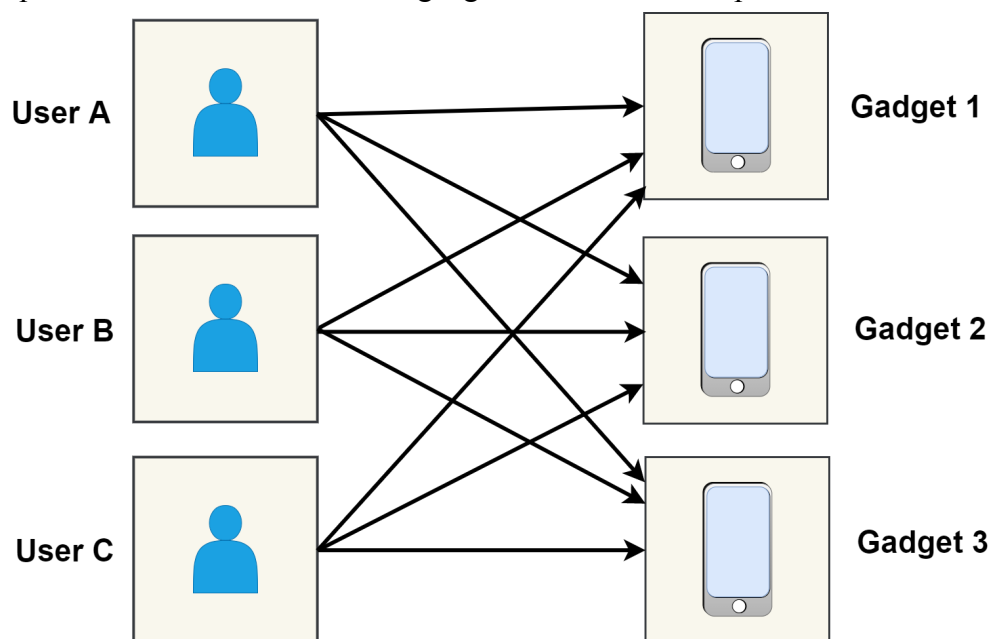
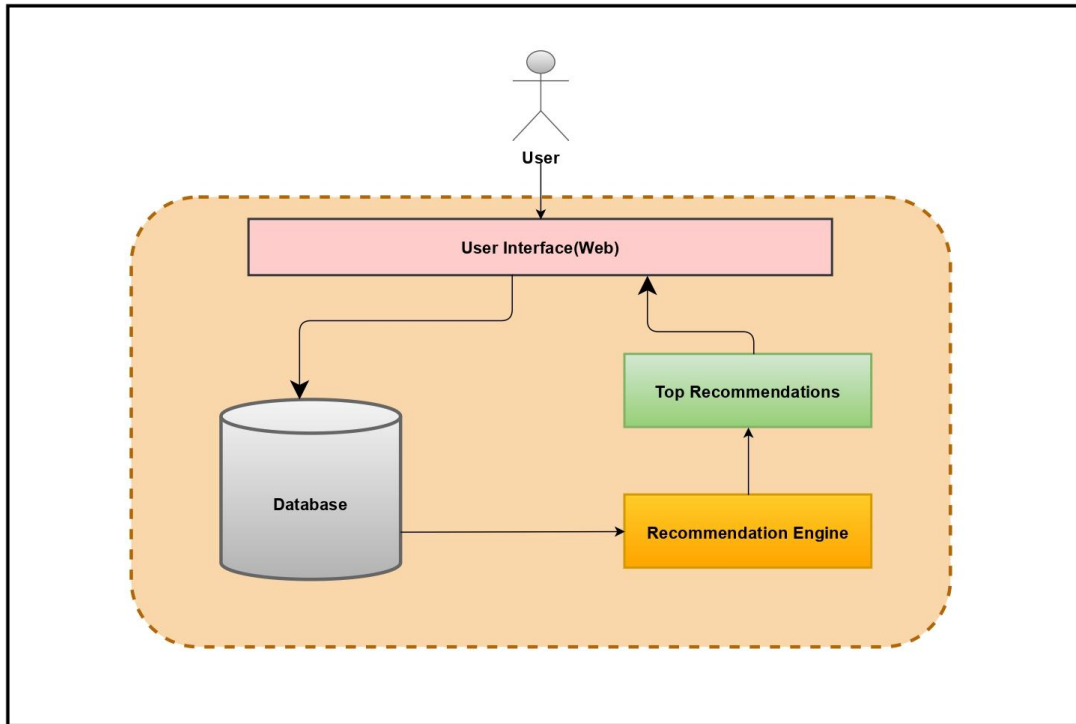


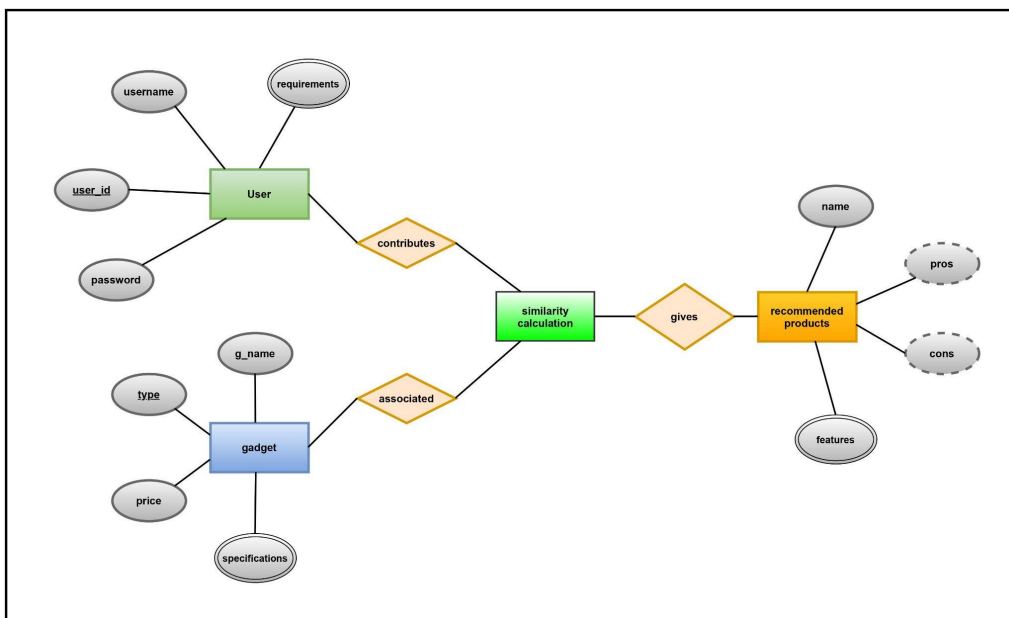
Fig 3.2 User-Gadget Relationship

3.3 Complete Data model

1. System Overview



2. Detailed Overview



4. Functional Model And Description

4.1 Class Diagram

Fig 4.1 shows the class diagram diagram of Gadget Recommendation System. It describes the structure of the system by showing the system's classes, their attributes, operations, and relationships among objects.

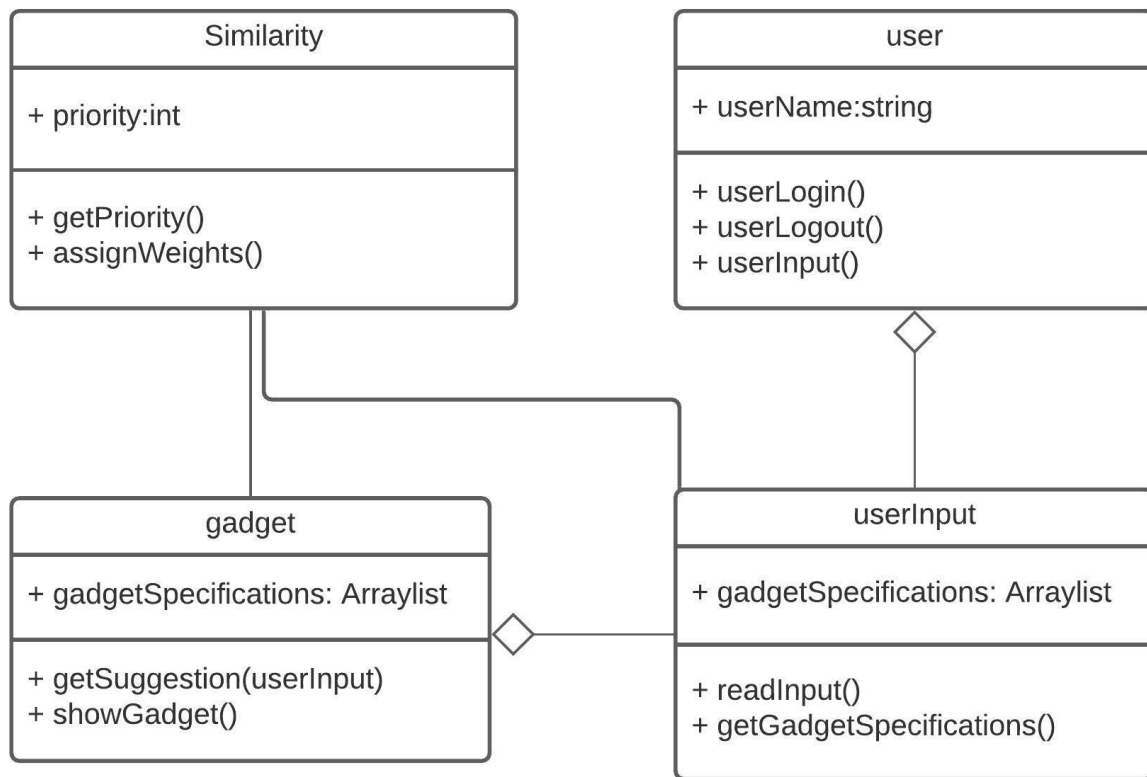


Fig 4.1 Class Diagram

4.2 Software Interfaces

The software interface that is required by the gadget recommendation system is any browser software like Google Chrome, Microsoft Edge, Mozilla Firefox etc.

5. Behavioral Model Description

5.1 Events

- User Login- The system allows the user to create an account if the user is a new user and stores his/her information in the database. If the user already has an account then the system checks the information provided by the user for logging in for authentication and the user logs in his/her account.
- User Logout- The system will log the user out of his/her account.
- Submit Input- System will store the user input to the database.

5.2 States

- Registration/Login - User will register or login in the system
- User Input- System will take the input from the user in the form of a form.
- Recommend Gadget- Recommend a gadget by taking into account the input submitted by the user.
- Show the result- Display the gadget to the user along with its pros and cons.

5.3 State Chart Diagram

Fig 5.1 shows the State Chart Diagram which describes the behavior of the Gadget Recommendation System and the flow of control from one state to another.

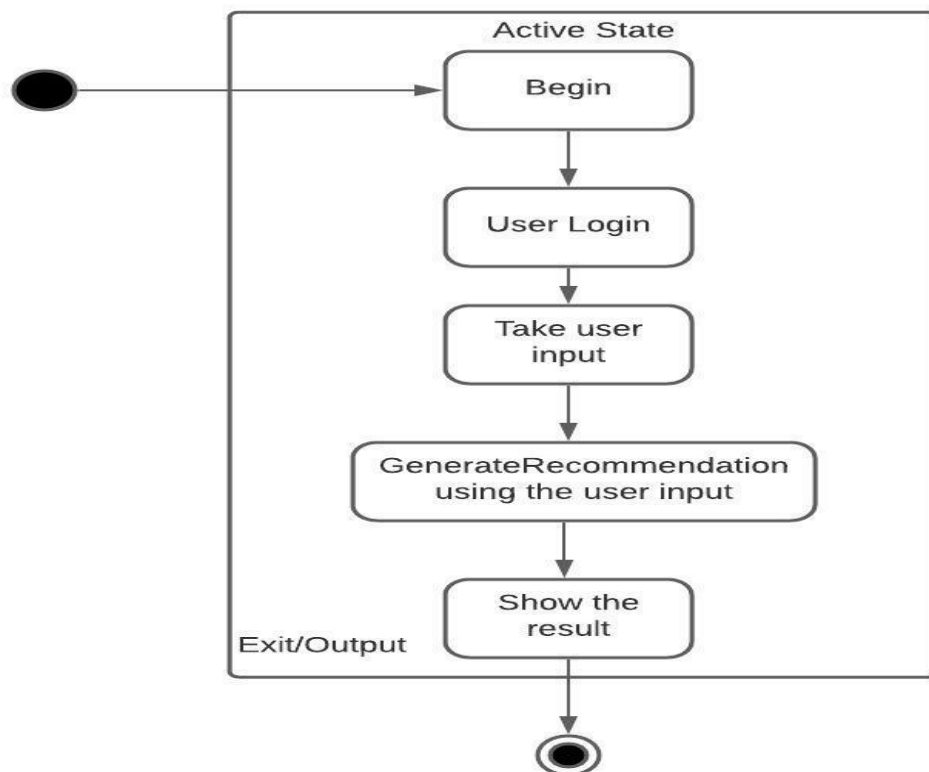


Fig 5.1 State Chart Diagram

6. Restrictions Limitations and Constraints

As an initial version, the project is starting with only Smartphone Recommendations. The reason behind this is if we get this smartphone recommendation working then the web scraper and recommendation algorithm can also work for other types of gadgets. New input forms will be designed for different gadgets.

To train the model a large dataset must be used in order to have better results and that dataset must be updated from time to time because many new gadgets are launching every month. In order to provide the latest and best recommendations, data scraping should be done frequently.

Gadget's design, battery life, and camera ratings may vary from person to person because they are relative. This project focuses on the bigger picture where all the gadgets are compared with each and every gadget from that category. The views presented about design, battery life, and camera are with respect to the standard user.

7.Detailed Design

Fig 7.1 shows DFD level 0 . It is a basic overview of the whole system.

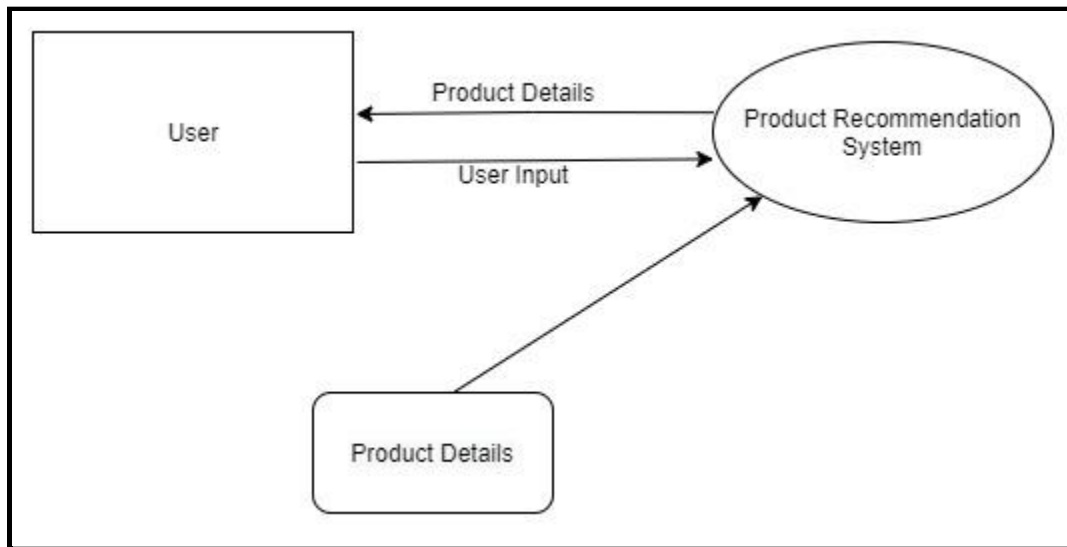


Fig 7.1 DFD level 0

Fig 7.2 shows DFD level 1 and it mentions sub processes that together form the complete system.

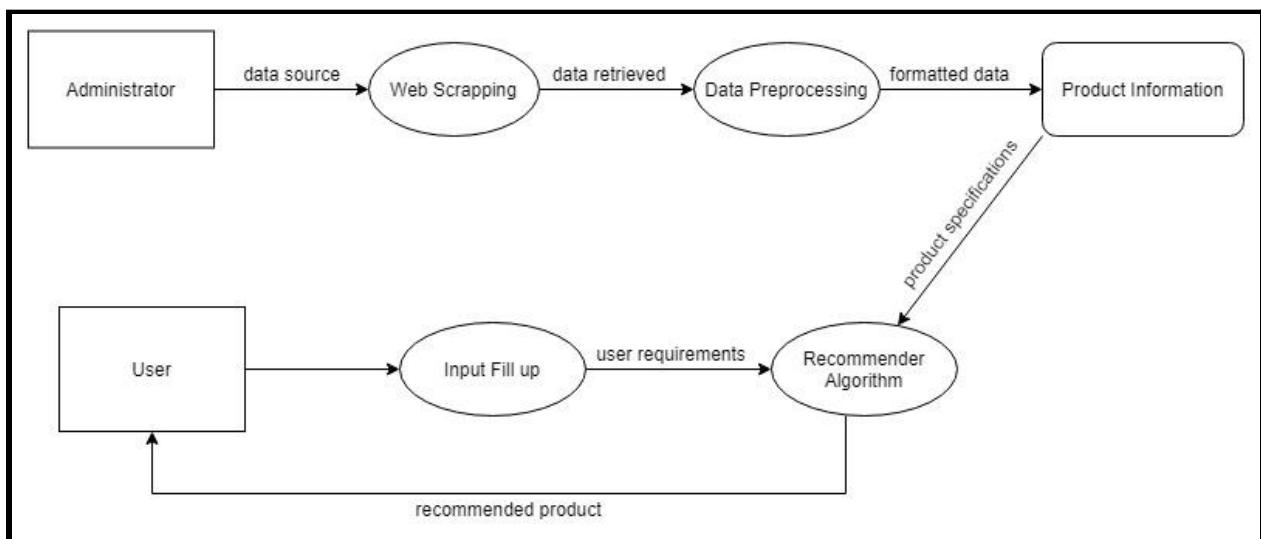


Fig 7.2 DFD level 1

7.1 Components

- User Management
 - User Registration
 - User Login
- Input Forms
- Web Scraper
- Gadgets specification's dataset
- Machine learning algorithm for gadget recommendation
- Product recommendation view

7.2 Pseudocode

- User Registration
 - a. Input email ID, password, and other user's information.
 - b. Check if the input data is following the database constraints.
 - c. If yes, then store that data in the database and redirect to the user login page.
 - d. If no, then print an error and return to step 'a'.
- User Login
 - a. Input email ID, password.
 - b. Validate entered email ID and password with the data from the database.
 - c. If the input matches then redirect to the home page.
 - d. If the data authentication is failed then print the error and return to step 'a'.
- Input Forms
 - a. Input the data from the user.
 - b. Check if all the required fields from the form are filled and pass the constraints.
 - c. If yes, then send that data to the machine learning algorithm.
 - d. If no, then print an error and return to step 'a'.
- Web Scraper
 - a. Input the website's URL
 - b. Fetch the HTML elements from the given webpage.
 - c. Identify the required elements using element ID.
 - d. Start an element pointer from the first element.
 - e. Check if the data from that HTML element passes the constraint.
 - f. If yes, then save that data to a CSV file.
 - g. If not, then print the error and move to the next element.
 - h. Increment the element pointer.

- i. If the element pointer reaches the end then return the CSV file to the admin and exit the web scraper.
- Gadgets specification's dataset
 - a. Open the Product Specifications CSV file generated using a web scraper.
 - b. Perform data cleaning and data processing on each column.
 - c. Save the changes to the CSV file and close the file.
- Machine learning algorithm for gadget recommendation
 - a. Get user input from the input form.
 - b. Select the products from the CSV file in the given price range.
 - c. Compare user input with all the product specifications column-wise from step 'b' and store the difference in a1,a2,a3,... columns.
 - d. Multiply a1,a2,a3,... column values with their respective priorities (weights) and store it again to a1,a2,a3,... columns.
 - e. Take row-wise summation of a1,a2,a3,... values and store it in column B.
 - f. Sort the CSV file in descending order with respect to values from column B.
 - g. Share the first 2 rows addressed to the recommendation view component.
- Product recommendation view
 - a. Get the pointer from the machine learning algorithm.
 - b. Using that pointer fetch details from Gadgets specification's dataset.
 - c. Print those details using the predefined layout.

8. Validation Criteria

8.1 Test plan

Sr. No	Test case Title	Description	Expected Outcome
1.	Successful User Registration	The Registration to the system is successful because all the Mandatory fields and proper data is filled by the user.	Registration should be successful
2.	Unsuccessful user Registration due to Mandatory fields not filled.	Registration to the system with unfilled mandatory fields.	Registration should fail with an error ' <i>missing required field</i> '.
3.	Unsuccessful user Registration due to Invalid data	Registration to the system with Invalid data. For ex., <ul style="list-style-type: none">• Email address is not valid.• Mobile number is not 10 digit	Registration should fail with an error 'Invalid Data'
4.	Successful User Verification	The login to the system should be tried with the login assigned by the admin and the correct password	Login should be successful and the user should enter in to the system
5.	Unsuccessful User Verification due to wrong password	Login to the system with a wrong password	Login should fail with an error 'Invalid Password'
6.	Successful gadget Recommendation.	After entering into the system the user gives all the answers properly.	Recommendation should be successful and users can access the recommendation.

7.	Unsuccessful Recommendation due to wrong device name or other data	After entering into the system if the user gives the wrong device name(device names that are not available) or gives wrong data.	Recommendation should fail with an error 'Wrong device name'
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8.2 Expected final software response

The output will be product information as follows:

- Product name
- Its pros and cons
- Specifications
- Product image
- Best buy affiliate links

9. Preliminary Schedule and Budget

9.1 Preliminary Schedule -

TASK NAME	DURATION	START DATE	END DATE
Domain Selection	7 days	01-07-2021	07-07-2021
Domain Finalization	7 days	08-07-2021	14-07-2021
Selection of Problem Statement	14 days	15-07-2021	28-07-2021
Finalization of Problem Statement	7 days	29-07-2021	04-08-2021
Study on Research Paper	14 days	05-08-2021	18-08-2021
Documentation of Synopsis	14 days	19-08-2021	01-09-2021
Requirement Analysis	7 days	02-09-2021	08-09-2021
System Requirement	7 days	09-09-2021	15-09-2021
Module Identification	7 days	16-09-2021	21-09-2021
System Architecture	7 days	23-09-2021	30-09-2021
Implementation 25%	14 days	01-12-2021	14-12-2021
Testing 25%	7 days	15-12-2021	21-12-2021
Implementation 50%	14 days	22-12-2021	04-01-2022
Testing 50%	7 days	05-01-2022	11-01-2022
Implementation 75%	14 days	12-01-2022	25-01-2022
Testing 75%	7 days	26-01-2022	01-02-2022
Implementation 100%	14 days	02-02-2022	15-02-2022
Testing 100%	7 days	16-02-2022	22-02-2022
Report Making	14 days	23-02-2022	09-03-2022

9.2 Budget

The following is the pricing as per the Google Firebase Blaze plan:

- **Hosting:**

Storage	INR 1.95/GB
Data Transfer	INR 11.25/GB

At the initial stage hosting will use less than 5GB storage.

- **Real Time Databases:**

GB Stored	INR 375/GB
GB Downloaded	INR 75/GB

At the initial stage databases will use less than 2GB storage

We are using a scalable product so as to reduce the investment.

- **Domain Charges:** INR 800/year

At the initial stage the total costing will be around **INR 2000/year**

10.REFERENCES

1. [Greg Linden, Brent Smith, and Jeremy York,"Amazon.com Recommendations Item-to-Item Collaborative Filtering",IEEE,7, 76 - 80,22 January 2003](#)
2. [Shakila Shaikh; Sheetal Rathi; Prachi Janrao,"Recommendation system in E-commerce websites: A Graph Based Approached", 2017 IEEE 7th International Advance Computing Conference \(IACC\), 5-7 Jan. 2017](#)
3. [Pradeep Kumar Singh,Pijush Kanti Dutta Pramanik,Avick Kumar Dey,Prasenjit Choudhury,"Recommender Systems: An Overview, Research Trends, and Future Directions",International Journal of Business and Systems Research,15\(1\),14–52,January 2021](#)