Cleverus

Final Year Project – Mid Report

Session FA21-SP22

A 4th Year Student

A project submitted in partial fulfilment of the

COMSATS University Degree

of

BSc. (Hons.)BS in Computer Science / Software Engineering (CUI)



Department of Computer Science

COMSATS University Islamabad, Lahore Campus

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# 

# Evaluation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Project Group Members** (To be filled by students) | | | | (To be filled by supervisor) |
| Sr.# | Reg. # | Student Name | \*Signature | Obtained Marks  (Total Marks: 10) |
| (i) | Group Leader Reg. No. Here |  |  |  |
| (ii) |  |  |  |  |
| (iii) |  |  |  |  |

\*The candidates confirm that the work submitted is their own and appropriate credit has been given where reference has been made to work of others.

Supervisor Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Supervisor Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Remarks (if any): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Abstract**

Our project is a generic recommendation system, which will be varying and adopting in the environment with the passage of time. In this project, our aim is to provide an online recommendation system service, which people can use to make their experience a lot better on contrary to their experience with some other service like Google. To find a correct, low budget orientated and location friendly service is very important and required for users but it’s not a cake walk today as there are plenty of sources which are not among those which can be reliable.

As of now, lot of recommendation systems are not able to suggest users an appropriate place that map their needs. Information mismatch have a great negative impact on such recommendation system predictions. To make a customised recommended application for imparting beneficial and powerful on line services, we want mass reviews and updated data from online databases.

**Acknowledgement**

It is optional

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# Final Year Project (FYP) Report Outline

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**Chapter 1**

**Introduction**

# Introduction

## Introduction

In different fields, including e-commerce, social media applications, and video platforms, recommendation systems are one of the most important aspects. They help people to suggest what might be interesting, useful, and relatable for them.

Models are built to recommend the content which is appropriate according to user requirement or pattern by depending on different factors like user information, interest of user, targeted age, reviews and ratings. This helps to keep user engage with the application and it becomes easy to suggest something to users according to his/her needs by using provided data.

Starting with the basic idea, Recommendation system is sort of data filtering method, in which on the basis of certain parameters you show certain data to user from database. The parameters can be rating, prices/rates, accessing comfort, nearby one etc. In simple words, Recommendation systems provides only that information which will be user hoping against the content he has provided to system.

Now our goal is to create a recommendation system which will suggest its users about multiple things like hospitals, restaurants, hotels etc. depending on the different parameters like ratings, remarks/feedback and the list goes on. On the other hand, system must be able to be adaptive with new parameter’s value which can help the system to remain up to date with the future recommendations.

Now if we talk about the basic parameters, these are as following

* Rating
* Reviews
* Distance
* Price

## Objectives

* To make it easy and effective for users to get best recommendations nearest to their location and easily accessible.
* To develop such application that will automate the function of finding the appropriate recommendation according to user requirement, thus bring easiness, save time and efforts needed to find a best suitable suggestion.
* To overcome the drawbacks of traditional approaches for finding a thing by developing such recommendation system that will uses natural language processing and machine earning techniques to produce a recommendation list.
* To develop such intelligent recommendation system that performs accurately and efficiently and help users to know about the authentic, best, affordable, nearest doctor, restaurants, hotels etc. whom which they can trust or prefer.
* To create a model, that will vary time to time in order to acquire excellence in further recommendations.

## Problem statement

In the modern world, a number of applications are there that suggest what is most appropriate for the user. Recommendation systems are widely used to suggest the appropriate, relevant, according to mood and best content to the user. Tech giants like Facebook, YouTube, and Netflix used RS to show what is according to the pattern of users. On the other hand, applications like Yelp, Food Panda, etc. use the RS to show the results which are according to the reviews and ratings of other users that have previously experienced that place. Each of the platforms uses a different type of RS for different types of recommendations. But most of the applications are handling a single domain, like food, cars, entertainment, etc.

Our project is to come up with a generic recommendation system that would be able to recommend any field of the second type explained i.e. Recommendation on the basis of feedback. The generic model would analyse textual data (reviews) and after that, we will generate the final rating on the basis of the combination of user ratings and rating generated by the model on the basis of reviews. Moreover, we will add Reinforcement Learning so that this process of ratings becomes dynamic i.e. as more reviews come, ratings will be changed according to reviews.

## Assumptions & constraints

**1.4.1 Assumptions**

The project is supposed to be a user-friendly web and mobile application, which can be able to provide the recommendation of places in your surrounding on the basis of the feedback. The services users will get are:

* Users will get recommendations on the basis of the experience of other users.
* Recommendations given to users will be dynamic, which will be changed over the period time.
* Users will be able to see the place's profile and read comments to get a better idea about the place.
* Users will be able to share his/her experience in terms of feedback.

**1.4.2 Constraints**

There are many plus points of the project in different ways, but there is some limitation of the project too, both technical and non-technical. As for the technical side, our recommendation system depends on the reviews and we don't have any control over the language used in reviews, which may lead to the problem of discarding of reviews. Another problem is that no system has a perfect database that covers all areas, so if someone wants to get a response about a location that is not already in our system that case we will become dependent on Google MAP API ratings, and the reason behind this is that it might take long enough time to respond if we fetch data, feed to model and then show ratings. As far as non-technical constraints are concerned, in the initial stage, we will only show recommendations and there will be no such system like appointment or booking of places. Our System won’t be able to provide product reviews from several businesses like shopping malls etc.

## Project objectives and scope

Since we are living in the 3rd word country and are among a developing one in Asia we don’t have recourses that can cover up the mass requirements. There are hundreds of thousands of cases weekly that are unable to get even first aid timely especially those who are lying in or near to rural areas. Pakistan’s population which belongs to this section is reported to be 63.09% in 2019 which is a shocking stat itself.

One of the many examples we can site here is of Muniba Mazari also known as the Iron Lady of Pakistan. She is a Pakistani activist, anchor artist, model, singer and motivational speaker. On 27 February 2008, Muniba and her husband were travelling from [Quetta](https://en.wikipedia.org/wiki/Quetta) to [Rahim Yar Khan](https://en.wikipedia.org/wiki/Rahim_Yar_Khan_District). Their car met with an accident, in which she sustained several major injuries, including broken bones in her arm, rib-cage, shoulder blade, collarbone and spine. Her [lungs](https://en.wikipedia.org/wiki/Lungs) and [liver](https://en.wikipedia.org/wiki/Liver) were also deeply cut. Moreover, her entire lower body was left paralyzed. She was taken to a nearby hospital, which was ill-equipped to deal with such a severe case. She was then taken to her native hospital but result didn’t change as there were no doctors or equipment’s to handle the patient either. She was then moved to a hospital in [Rahim Yar Khan](https://en.wikipedia.org/wiki/Rahim_Yar_Khan_District), and eventually, she was admitted to the [Agha Khan Hospital](https://en.wikipedia.org/wiki/Aga_Khan_University_Hospital,_Karachi), [Karachi](https://en.wikipedia.org/wiki/Karachi). Post-surgery, she was left bed-ridden for two years.

The idea to cite the above example is there are several cases of these context where the population is unable to find the emergency service just because of the unawareness and no helping hands that can lead them to desired output. Our aim is same, to provide that sort of application which will be able to guide with best possible source of help that user can imagine or desire at runtime.

Natural Language processing is a vast field that acts as an umbrella for many different fields. Getting Recommendations by using reviews are also one of the things which come under this. This application will cover most of the modules that we counter in normal life ranging from Hotels, Malls, Doctors etc. Furthermore, user can apply filters as per their use. In future, more modules can be added to this system as user requirements increase and so do filters We are going to develop such a system which will help in the following:

* Generate recommendations on the basis of feedback i.e. ratings and reviews.
* Make a dynamic system by introducing Reinforcement learning, so that ratings will be changed over the period of time according to new feedbacks

.

**Chapter 2**

**Requirement Analysis**

# Requirements Analysis

## Literature review / Existing system study

There is a lot of work in the field of Recommendation systems has been done. Recommendations systems are used to recommend different things while considering multiple parameters. Few of the works, apps, and researches have been discussed below.

**Research-Based Related Work**

1. **Recommendation systems: Principles, methods and evaluation**

This is a research-based article, which explains the characteristics, methods, and potential of different types of recommendation systems that are used to show the data which is according to the interest of the user.

The authors explained multiple types and phases of RS and explained the working of each. One of the most important phases is the collection of information for different types of recommendations. Types are explained in detail, which are:

* Explicit Feedback
* Implicit feedback
* Hybrid feedback

Phases of systems are divided as follows which shows the relationship between each phase:



Once the phases of recommendations are done, the next explanation is of the filtering techniques that RS follows to give recommendations. The authors have described each filtering method, its pros & cons, sub-types, and examples of each filtering approach in the paper. The following pictures showing the filtering approaches for RS.



1. **Multi-Criteria Review-Based Recommender System–The State of the Art**

In this research paper, there are multiple parameters that have been discussed, on the basis of which RS can generate ratings or in other words can show better results. The authors explained the importance of reviews and the advantages of taking "reviews" into consideration. Moreover, problems have been discussed which are there when we will work with "reviews". Following shows the information which we can extract from reviews.



Another section of this research paper is Multi-Criteria RS which explains that how we can generate better recommendations by considering multiple factors. This is what we are trying to implement in our FYP i.e. consider ratings and reviews of the place and generate ratings based on both. Following depicts different steps of Multi-Criteria Review based RS.



1. **Recommender System Based on Consumer Product Reviews**

This research paper proposed one of the solutions to create a recommendation system based on reviews. This solution considers mining multiple information from the text, and on the basics of that information evaluate multiple factors of the item. Moreover, prioritization and ontology have also been created to recommend the best on the basis of reviews. In the paper, RS for cameras is developed. The following shows the general flow of the proposed solution.



**Application-Based Related Work**

1. Yelp

Yelp is one of the biggest platforms in the RS category. Yelp recommends multiple places related to different fields base on the reviews and ratings of previous users. For instance, if you select the restaurants and search for "steaks", depending on which city you are in, it will show you the highest-rated restaurants that serve steak. You can further filter the recommendations on the basis of different factors like nearby, price-efficient, etc. But Yelp's services are not available in our Region.

1. TripAdvisor

TripAdvisor is another app that recommends restaurants, hotels, vacation rentals in multiple countries and this depends on the ratings and reviews given by previous users. One can see the profile of the place which includes photos, reviews, and ratings about the place. You can also get customized recommendations depending on the price range and nearby to someplace. But recommendations are always from best high to low ratings which are calculated by considering the feedback of users.

1. Urban Spoon

Urban Spoon is another RS-based app that is like Yelp but only handles a single module i.e. finding places to eat. By using Urban Spoon, you can not only search places to eat but customize searches like the internet availability, category of food, etc. On Urban Spoon not only business owners and users provide reviews but also local food critics and chefs also give their reviews.

4) Pinterest

Pinterest has one of the most widely used recommender networks (Pixie), with over 10 billion suggestions served per day. They 've installed personalization engines that can serve the correct recommendation to the right customer at the right time, selecting from a pool of over 100 billion artefacts in real time—by combining the data they've accumulated over the time with human curation.

5) Netflix

When you use Netflix, their recommendations system tries to make it as easy as possible for you to find a show or movie to watch. They calculate the probability of you watching a specific title in our library based on a variety of factors, including:

* your experiences using their service (such as your viewing history and how your ratings),
* other participants with common preferences and values

These bits of information are used as inputs to Netflix algorithms.

## Stakeholders list (Actors)

| **Stakeholder** | **Area/Skill set** | **Type of Stakeholder** | **Expectations** | **Influence** | **Impact** |
| --- | --- | --- | --- | --- | --- |
| Software Engineer | Software | Internal | applies software engineering principles to the development, maintenance, testing, and evaluation of applications | High | High |
| Database Developer | Database | Internal | database components of the application must be created or maintained. | Low | Low |
| Developer | Development | Internal | builds and creates applications, writes, debugs, and executes application source code | High | High |
| Natural Language Processing NLP) Engineer | Programming, Statistical Analysis, Text Representation | Internal | transforms natural language data representation into features that classification algorithms may understand. | Low | High |
| Machine Learning Engineer | Programming, Statistics, Data Modeling and Evaluation | Internal | creates algorithms and builds model that enables application to take action automatically | High | High |
| Application Tester | Analytical, Critical, Logical | Internal | creates algorithms and models that allow an application to take action on its own. | Low | High |
| SQA Engineer | Quality Assurance | Internal | in order to ensure consistency, track, evaluate, and test the application during production. | High | Low |
| End User | Customer | External | After the software has been completely produced, use it and provide input. | Low | High |

## Requirements elicitation

### Functional requirements

In Software Engineering, functional requirements define the scope and working of system components in a way that is feasible for both client and the team developing it. It differs software to software.

#### FR – 01 User Sign Up:

|  |  |
| --- | --- |
| FR 01 – 01 | User enters his/her Full name |
| FR 01 – 02 | User enters his/her username |
| FR 01 – 03 | User enters password (must contain alpha-numeric and special characters and should be at least six characters long) |
| FR 01 – 04 | User confirms his/her password |
| FR 01 – 05 | User accepts Terms and conditions checkbox |
| FR 01 – 06 | User clicks on the signup button |
| FR 01 – 07 | Error is displayed in-case of any failed step |
| FR 01 – 08 | User can also signup with their Google account |

#### FR – 02 User Log in:

|  |  |
| --- | --- |
| FR 02 – 01 | User enters his/her Full name |
| FR 02 – 02 | User confirms his/her password |
| FR 02 – 03 | User accepts Terms and conditions checkbox |
| FR 02 – 04 | User clicks on the log in button |
| FR 02 – 05 | Error is displayed in-case of any failed step |
| FR 02 – 06 | User can also sign in with their Google account |

#### FR – 03 Forget Password:

|  |  |
| --- | --- |
| FR 03 – 01 | User enters his/her Email |
| FR 03 – 02 | User gives the verification code he’d received through email |
| FR 03 – 03 | User enters new password |
| FR 03 – 04 | User confirms the new password |
| FR 03 – 05 | User clicks the reset password button |
| FR 03 – 06 | Error is displayed in-case of any failed step |

#### FR – 04 User Log Out:

|  |  |
| --- | --- |
| FR 04 – 01 | User clicks on sign out button |
| FR 04 – 02 | He/ She is redirected to login page |

#### FR – 05 User Profile:

|  |  |
| --- | --- |
| FR 05 – 01 | User goes to profile page |
| FR 05 – 02 | He/ She can update his personal information |
| FR 05 – 03 | User can delete his/her profile permanently (warning will be generated and extra verification step will be given) |
| FR 05 – 04 | In-case of account deletion , all of his data from database will be deleted and will be redirected to log in page afterword’s. |

#### FR – 06 Searching / Get Recommendations:

|  |  |
| --- | --- |
| FR 06 – 01 | User gives the requirements. |
| FR 06 – 02 | User applies the filter |
| FR 06 – 03 | User clicks the search button |

#### FR – 07 View Places Profiles:

|  |  |
| --- | --- |
| FR 07 – 01 | User enters place he/she wants to see profile of |
| FR 07 -02 | User clicks the view profile button |
| FR 07 – 03 | Place Profile will be displayed like location, rating and top comments etc. |
| FR 07 – 04 | User can gives his feedback by clicking on the give feedback button |
| FR 07 – 05 | User will give a place its rating ,comment and the required information |
| FR 07 – 06 | User feedback will be added . |
| FR 07 – 07 | Error is displayed in-case of any failed step |

### Non-functional requirements

On the other hand, non-functional requirements describe how system should behave. In short context, it represents the quality or attributes of the system. These requirements cover up all the left-overs from the functional requirements.

#### NFR – 01 Transportability / Compatibility:

|  |  |
| --- | --- |
| NFR 01 – 01 | Systems android and web app should be compatible with all the desktops and native devices respectively. |
| NFR 01 – 02 | System shouldn’t undergo any major changes when sifting to any other Operating System |
| NFR 01 - 03 | Both apps should be consistent and generalize throughout |

#### NFR – 02 Performance:

|  |  |
| --- | --- |
| NFR 02 – 01 | Performance of the system must be good |
| NFR 02 – 02 | System’s quick response will outline its performance irresponsive of the mass interacting with him. |

#### NFR – 03 Secure:

|  |  |
| --- | --- |
| NFR 03 – 01 | The system must be secure so do the database which has primary role in system functioning properly |
| NFR 03 – 02 | System Database should be on a secure cloud platform. |
| NFR 03 - 03 | System should ensure both data integrity and user privacy |
| NFR 03 - 04 | The system should maintain correct as well as consistent information which will help to generate good recommendations. |

#### NFR – 04 Reliability:

|  |  |
| --- | --- |
| NFR 04 – 01 | System should only respond to correct and valid feedbacks and ignore the fake ones. |
| NFR 04 – 02 | System can also block the fake user permanently |

#### NFR – 05 Usability / User Friendly:

|  |  |
| --- | --- |
| NFR 05 – 01 | System must present a formal documentation  / tutorial in the form of pop-ups for newbies. |
| NFR 05 – 02 | The system should only focused on what is primary / important for the user and don’t focus on what would put the user in any type of mess or confusion |
| NFR 05 - 03 | Web Application should be information orientated while native app should be task orientated. |

#### NFR – 06 Maintainability:

|  |  |
| --- | --- |
| NFR 06 – 01 | The system should be maintained properly. Whenever there is a problem, it must be fixed as soon as possible. |
| NFR 06 – 02 | Moreover, the system must be timely updated according to the needs of the user |

### Requirements traceability matric

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test Case ID** | **FR\_ID** | **Description of Requirement** | **Objective** | **Priority** |
| 01 | FR-01 | The system will provide users with 2 types of accounts i.e. Admin and User. | Register a new user. | High |
| 01 | FR-02 | The system will facilitate the user with a login system. | Logging user account. | High |
| 02 | FR-06 | The system will facilitate user with the recommendation of different places based upon different parameters | Make Recommendation of Places | High |
| 03  03 | FR-07  FR-07 | The system will shows a complete Place profile to the user which he has just searched with options like place reviews, rating or location etc. | Display Place Profile to the user  Display Place Profile to the user | High  High |
| 04 | FR-07 | User can add his respective review of that place | User Feedback about Place | High |

## Use case descriptions

The use case description for the login process is shown in Table 1.

### Use case-02: Sign Up

Table 1: Use case description-01: Login

|  |  |
| --- | --- |
| **ID:** | 1 |
| **Name of Use Case:** | Login |
| **Actors:** | Admin, User, Database |
| **Description:** | The admin/user can log in to the application. |
| **Pre-Condition:** | Admin/User should’ve their account registered beforehand. |
| **Post-Condition:** | Admin/User has been signed into the application, successfully. |
| **Events:** | 1. Admin/user opens the app. 2. Admin/user clicks on the login / sign in button. 3. Admin/user fills the required fields (username and password) 4. After the authentication has been done, user will be redirected to dashboard |
| **Alternatives Flow:** | In case of forget password, user will be provided with the reset link by the app. |
| **Exceptions:** | None |

### Use case-02: Sign Up

The use case description for the sign up process is shown in Table 2.

Table 2: Use case description-02: Sign Up

|  |  |
| --- | --- |
| **ID:** | 2 |
| **Name of Use Case:** | Sign Up |
| **Actors:** | User, Database |
| **Description:** | User can create their respective account for application. |
| **Pre-Condition:** | No account of that credentials already exist. |
| **Post-Condition:** | User account has been created and they are logged in |
| **Events:** | 1. User opens the app. 2. User clicks on the sign up button. 3. User fills the required fields of the form 4. After the sign up procedure has been done, user will be redirected to dashboard |
| **Alternatives Flow:** | User already has an account. |
| **Exceptions:** | None |

### Use case-03: Logout

The description of the use case of the logout process is shown in Table 3.

Table 3: Use case description-03: Logout

|  |  |
| --- | --- |
| **ID:** | 3 |
| **Name of Use Case:** | Logout |
| **Actors:** | Admin, User |
| **Description:** | The user/admin can logout from the application. |
| **Pre-Condition:** | The user/admin should be signed in his/her account. |
| **Post-Condition:** | User/admin has been successfully logged out from the application. |
| **Events:** | 1. The user presses the logout button. 2. The user logs out and the login page appears. |
| **Alternatives Flow:** | The user has already logged out. |
| **Exceptions:** | None |

### Use case-04: Model Re-Training

The use case description for retraining the model is shown in Table 4.

Table 4: Use case description-04: Re-Training the model

|  |  |
| --- | --- |
| **ID:** | 4 |
| **Name of Use Case:** | Re-training the model |
| **Actors:** | Database, Trained Model |
| **Description:** | Application shall get feedbacks given by user and the model from the database and then retrain it. |
| **Pre-Condition:** | Database must exist with the trained model and feedbacks. |
| **Post-Condition:** | Model has been retrained. |
| **Events:** | 1. Feedbacks have been feed to trained model. 2. Timeout has been occurred for retraining of the model 3. Database will feed in the updated dataset with latest reviews and comments to model 4. Application has been updated accordingly after the retraining |
| **Alternatives Flow:** | Timeout has not been occurred for retraining phase |
| **Exceptions:** | None |

### Use case-05: User Portal

The use case description for the User Portal is shown in Table 5.

Table 5: Use case description-05: User Portal

|  |  |
| --- | --- |
| **ID:** | 5 |
| **Name of Use Case:** | User Portal |
| **Actors:** | User, Database, Google Map API, Trained Model |
| **Description:** | User can manage his profile , view profiles of the places , add places to his/her favorites section, give feedback in the form of reviews and comments, get recommendations |
| **Pre-Condition:** | User has been logged in. |
| **Post-Condition:** | User has carried out its desire goal |
| **Events:** | 1. User opens the app. 2. User logs in 3. User chooses either of the task he wants to perform 4. User performs the task by following the valid set of operations |
| **Alternatives Flow:** | In case of forget password, user will be provided with the reset link by the app. |
| **Exceptions:** | User Portal has been deleted due to some reason by admin or by himself accidently. |

### Use case-06: Admin Portal

The use case description for the Admin Portal is shown in Table 6.

Table 6: Use case description-6: Admin Portal

|  |  |
| --- | --- |
| **ID:** | 6 |
| **Name of Use Case:** | Admin Portal |
| **Actors:** | Admin, Database |
| **Description:** | Admin can view the users, their details and can check recommendations and other functions of app. Moreover, can manage app users either by deleting or updating. |
| **Pre-Condition:** | Admin has logged in or admin is a valid admin |
| **Post-Condition:** | Admin has carried out its desire goal |
| **Events:** | 1. Admin opens the app. 2. Admin logs in 3. Admin chooses either of the task he wants to perform 4. Admin performs the task by following the valid set of operations |
| **Alternatives Flow:** | None |
| **Exceptions:** | Admin is not a valid admin |

### 

### Use case-07: Recommendations

The use case description for the Admin Portal is shown in Table 7.

Table 7: Use case description-7: Recommendations

|  |  |
| --- | --- |
| **ID:** | 7 |
| **Name of Use Case:** | Recommendations |
| **Actors:** | User, Database, Trained Model, Google MAP API |
| **Description:** | Application shall get location given by user and will show recommendation according to need. |
| **Pre-Condition:** | Location must be valid. |
| **Post-Condition:** | Recommendations have been shown to user. |
| **Events:** | 1. User enters location and choose the recommendations which he/she needs. 2. From database data will be retrieved against the location. 3. Retrieved recommendations will be shown to user according to system ratings of the places available at that location. |
| **Alternatives Flow:** | Entered location’s data is not available in database. In that case following flow will be considered.   1. User enters location and choose the recommendations which he/she needs. 2. If data is not in database, it will be retrieved from Google MAP API. 3. Retrieved recommendations will be shown to user according to Google ratings of the places available at that location. 4. After that data of that location will be feed to trained model and data will be maintained of that location, according to Model’s generated ratings. |
| **Exceptions:** | None |

## Use case design

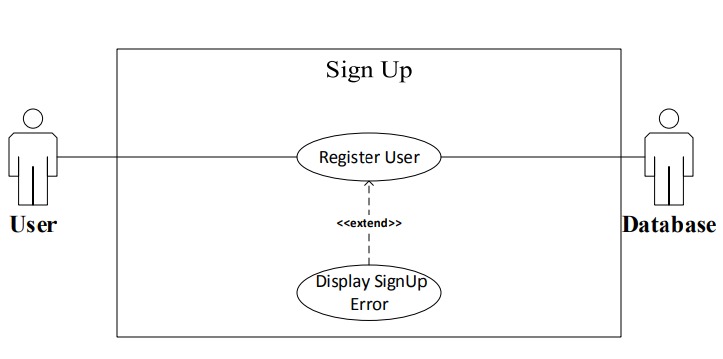
### Use case-01: User and Admin Login

The use case for the login process for the user and admin is shown in Figure 1



### Use case-02: User Sign Up

The use case for the signup process for the user is shown in Figure 2.



### Use case-03: User and Admin Logout

The use case for the logout process for the user and admin is shown in Figure 3.



### Use case-04: Model Retraining

The use case for the model training is shown in Figure 4.



### 2.8.5 Use case-05: User Portal

The use case for the user portal shown in Figure 5.



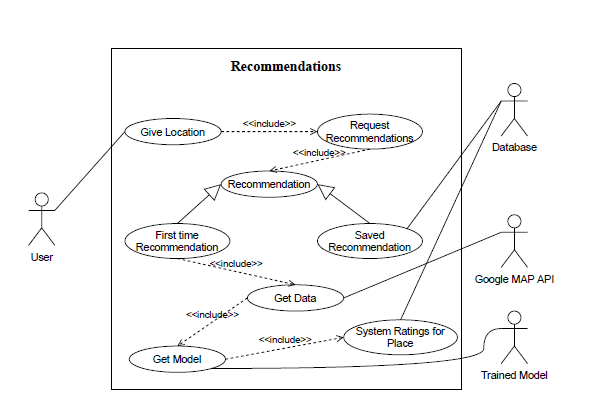
### 2.8.6 Use case-06: Admin Portal

The use case for the admin portal is shown in Figure 6.



### 2.8.7 Use case-07: System Recommendations

The use case for generate rating for new place



### 2.8.8 Use case-08: Recommendation System (Complete System)

### The use case in 8 depicts the overview of the complete recommendation system by combining all modules of the system in one diagram for a better understanding of the viewer.



## Software development life cycle model (justification on why this particular model is considered)

**Chapter 3**

**System Design**

# System Design

## Work breakdown structure (WBS)



## Activity diagram

### Login

The flow of activities of login show in Figure



1. Activity Diagram 1: Login

### Register User

The flow of activities of Register user show in Figure



1. Activity Diagram 2: Register user

### System Recommendations

The activity diagram of the flow of activities of user search result is shown in Figure



### Model Re-Training

The activity diagram of the flow of activities of Re-train the model shown in figure



## Sequence diagram

### Login Sequence



### System Recommendations



### Model Re-training



## Software architecture



## Class diagram



## 3.6 Database diagram



## 3.7 Network diagram (Gantt chart)



## 3.8 Collaboration diagram



**Chapter 4**

**System Testing**

# System Testing

## 1.1 Test Cases

|  |  |
| --- | --- |
| Test case Name | TC-01 |
| Application Name | Cleverus |
| Use Case | Login |
| Input Summary | User will enter its credentials and click the login button. |
| Output Summary | SUCCESS:  User has been logged in successfully.  FAILURE:  The access has been denied and an error message will be displayed i.e. “Either username or password is incorrect.” |
| Pre-Conditions | User must enter correct login credentials |
| Post-Conditions | User logged in and navigate to its user portal. |

|  |  |
| --- | --- |
| Test case Name | TC-02 |
| Application Name | Cleverus |
| Use Case | Recommendation |
| Input Summary | User will select the category and enter its location or give access to system’s location. |
| Output Summary | SUCCESS:  Recommendations will be shown to user.  FAILURE:  There are multiple errors which may occur.   * Invalid location * Server’s access in area etc.   In each case error or problem message related to it will be displayed. |
| Pre-Conditions | User must enter correct location. |
| Post-Conditions | Appropriate recommendations will be shown to user. |

|  |  |
| --- | --- |
| Test case Name | TC-03 |
| Application Name | Cleverus |
| Use Case | Feedback |
| Input Summary | User will click on the “Give feedback” button and after that user will select the category and then business of which want to give reviews. |
| Output Summary | SUCCESS:  User’s feedback will store in system.  FAILURE:  There can be 2 types of error   * Business don’t exist * Either reviews or ratings are missing.   In both cases appropriate error message will be shown to user. |
| Pre-Conditions | User must enter all and correct parameters to give feedback. |
| Post-Conditions | User’s feedback will be stored and success message will be displayed. |

|  |  |
| --- | --- |
| Test case Name | TC-04 |
| Application Name | Cleverus |
| Use Case | View Place Profile |
| Input Summary | User will select the category and search the business in the search bar and select that or click on the business after getting recommendation. |
| Output Summary | SUCCESS:  Business profile will be shown to user.  FAILURE:  Error reasons might be “Business not exist”.  In that case appropriate message will be shown to user. |
| Pre-Conditions | User must search for valid place/business name. |
| Post-Conditions | Business profile will be shown to user. |

|  |  |
| --- | --- |
| Test case Name | TC-05 |
| Application Name | Cleverus |
| Use Case | Model Retraining |
| Input Summary | New user feedback and trained model accessed on Google Colab by Admin. Then trained model will be feed in updated user feedbacks. |
| Output Summary | SUCCESS:  Model has been trained successfully and updated recommendations are stored in database.  FAILURE:  There were problems with either user feedbacks or with the train models. |
| Pre-Conditions | Updated feedbacks must be available for retraining. |
| Post-Conditions | Model has been trained successfully and updated recommendations are stored in database. |

## 1.2 Unit Testing

In unit testing, every one of the segments of the application are exclusively tested. It is the first and most key piece of testing. In this progression, we checked the individual components of our project that execute unit errands and are segments of the task's entire work process.

* Sign-in, Sign-up of User
* View Places Profile
* Give Review and Rating
* Search Place

For unit testing we made two clients to test every part. First we test client sign in and join and check all validation related stuff. At that point after effective login, we check places profile and check right record is shown or not. Survey a spot and check whether the record is embedded in data set. Rate the spot and watch whether the rating is refreshed or not. Looked through better places with various specialities and checked the spot area on Google map.

## 1.2 Integration Testing

## Integration testing is the second step of the product testing strategy. At this degree of testing, the framework is tried subsequent to joining the different units into bunches. It is to test the deficiencies and blunders in the collaboration between the interacted units. We have not done this testing yet.

## 1.3 Acceptance testing

Acceptance testing is characterized as the last advance step for the product testing system. It is to administer whether the necessary details of the framework are met. At this progression, we gauge whether the framework under test is finished with the nuts and bolts and necessities for conclusive handling. We would do this progression toward the finish of the relative multitude of cycles to furnish a framework with appropriate details.

**Chapter 5**

**Conclusion**

# Conclusion

## Problems faced and lessons learned

### Dataset Availability:

Initial problem with starting this project was to find out some reliable, fair quantity and good quality dataset with various end to end business embedded in between. Struggle was big as there is no such dataset available on the internet and for the data crawling part, major websites were not willing to allow.

### Google Colab Limitations:

Provided RAM and storage by the Colab servers are not enough to train NLP problems with sample of the dataset as huge as 500k-600k. Even loading data from JSON file to convert to comma separated format was hard and needs to be divided into batches. Only way to get around was to use partitioning of the data and perform the task into rounds.

### Sentiment Analysis State of the Art Models:

Dataset we had was from Most Famous European Review Community YELP. Dataset was un-annotated which was notifying about another major problem round the corner. Now the race for reliable state of the art sentiment analysis models started which didn’t end that easily. At least 5-7 models were tried on small sampled dataset including Text-Blob, Flair to predict the partiality of reviews. At the end BERT does solve this problem but after training two complete datasets of Twitter and IBDB.

### Team-Work and Task Management

As the time started to pass and project deadline started to plunder, we realize how much of a task our group was assigned and the roadmap we three had to follow to reach some milestone. To follow that roadmap, we had to ensure task management was in order and whole team was putting their full strength in

### Finding Alternatives

It’s must that you will face problems and cons with every step you take towards complex projects. Similar was the case here too as we needed several tweaking’s and alternatives at every inch but that’s how you supposed to become a better debugger and problem solver. Every struggle we had has provided us some knowledge and that how this field has supposed to be, so no worries

## Project summary

## Future work

Some of the future goals are mentioned below which will help to make recommendation applications more user-friendly, robust and flexible while keeping the quality maintained.

* Integrate more modules over the time according to their need.
* We will create the module using which one will make online bookings; this will save the time of the user as well as will help the service providers to interact with our app in a better way.
* Adding the apoinment section with the domain experts like doctors, property dealers etc.
* Make blog within application where ranked pros publish their experience and reviews to aware the people about the latest insights

**Chapter 6**

**References**

# References