MULTILINGUAL NEWS RECOMMENDER SYSTEM USING USERS' PREFERENCES.

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COMSATS UNIVERSITY ISLAMABAD, WAH CAMPUS

WAH CANTT – PAKISTAN

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A DISSERTATION SUBMITTED AS A PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELORS IN COMPUTER SCIENCE

DEPARTMENT OF COMPUTER SCIENCES

COMSATS UNIVERSITY ISLAMABAD, WAH CAMPUS

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Final Approval

Certified that the project report titled, "Multilingual News Recommender system using users preferences", completed by Usman Ghani Mughal (CIIT/SP17-BCS-087/WAH) and Ume Zara (CIIT/SP17-BCS-098/WAH) is of sufficient standard, in our judgment, to warrant its acceptance by COMSATS University Islamabad, Wah Campus for the award of Degree of Bachelor of Science in Computer Science / Software Engineering.

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DEDICATION

We dedicate this project to God Almighty our creator, our strong pillar, our source of inspiration, wisdom, knowledge, and understanding. He has been the source of our strength throughout this program and on His wings only have we soared. We dedicate this project to our beloved parents and helping teachers who supported us in every step of our life. Without them we are nothing and we were unable to get here and Without their support, we would not able to complete our project. We especially thank our teachers who always motivated and helped us out in our difficult times. Special dedication to Dr. Hikmat Ullah Khan. who has encouraged us all the way and whose encouragement has made sure that we give it all it takes to finish that which we have started.

Ume Zara **Usman Ghani Mughal**

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ACKNOWLEDGEMENT

All praise is to Almighty Allah who bestowed upon us a minute portion of His boundless knowledge by which we were able to accomplish this challenging task.

We are greatly indebted to our project supervisor Dr. Hikmat Ullah khan. Without their supervision, advice, and valuable guidance, the completion of this project would have been doubtful. We are deeply indebted to them for their encouragement and continual help during this work.

And we are also thankful to our parents and family who have been a constant source of encouragement for us and brought us the values of honesty & hard work.

Ume Zara **Usman Ghani Mughal**

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PROJECT BRIEF

PROJECT NAME	Multilingual new recommender system using user preferences
ORGANIZATION NAME	Comsats University Islamabad Wah Campus
OBJECTIVE	Our Objective is to build a multilingual News Recommendation Engine using User Interests, Fake News Should be avoided to give a user, Timetable provided Pakistan and world news on a single platform as user Friendly as it can.
UNDERTAKEN BY	1. Ume Zara 2. Usman Ghani Mughal
SUPERVISED BY	Dr. Hikmat Ullah Khan Department of Computer Science Comsats University Islamabad Wah Campus
STARTED ON	February,2020
COMPLETED ON	December,2020
COMPUTER USED	Dell Inspiron Core I5, Acer Aspire v15
SOURCE LANGUAGE	Python, JavaScript, Java, HTML5, CSS Bootstrap4, Xml, Jsx
SOURCE FRAMEWORKS	Scrappy, React.JS, Node.JS, Express.JS
DATABASES USED	MongoDB, SQLite
OPERATING SYSTEM	Window 10
TOOLS USED	Android Studio, PyCharm, Anaconda, Jupiter Notebook, Vs Code, Postman, Google Chrome

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES


NEWS
RECOMMENDER

Chapter 1

INTRODUCTION

1 INTRODUCTION

1.1 System Introduction

This software is Based on Recommendation Engine, in which we are building a news recommendation system. The purpose of this system is to show or provide only those news to our users which are according to their interests and make sure that only authenticated news will be shown to our users as user friendly as it can in less time. Other then that users can see news of multiple news channels on a single plat form. User can also see news of specific category in only one click. We are making its website as well as its android app so user can see news from their smart phones or pc, laptop etc.

1.2 Background of the System

If we look at existing systems there are multiple platforms and news channels that give a lot of news but there are giving every news to every user. Yes, they have classified the different categories of news and showed in managed format but still, the user needs to find out the news of his/her interest suppose a person like to see a sports news so he/she needs to go in the sports section to see sports news. So, in our case, we are trying to reduce this searching problem and show only that news to the user which are related to the interest of that user.

If we look at social media there are a lot of platforms which are providing numerous amounts of news to users but in some cases, they are also passing fake news (maybe for increasing the network traffic) to their user so we will be overcome this problem and make sure no authenticated news is passed to our users.

1.3 Objectives of the System

- User don’t need to search for news of their own interests, we will provide news according to their interest.
- Provide Pakistan and World news on a single platform as user-friendly as it can.
- Provide both web and android interfaces.
- Make a system through user can get more latest news in less time.

- Bring news of all news channels on a single app, so wuser don’t have shift from one app to other in order to see news of other news channels.

1.4 Significance of the System

Today due to social media and easy access over the world there is a huge amount of news in the different category are available on different platforms on daily bases so due to the huge amount and category it is difficult for the user to stay updated on that news which is related to his/her interest or field or department, we are solving this problem by using a recommendation system of news, as we see there are multiple recommendation systems on other products but news recommenders are not often seen in the market so, we decided to build news recommendation system so our user can easily stay updated about what is now happening in Pakistan and world in their fields or related to their interests topics. As news is text data so our system can easily adapt to another field that has text data and our system will be easily integrated also with another domain. Due to the freehand on social media, it is very to spared fake news over the whole globe in seconds, so we are also preventing our user from seeing fake news.

Chapter 2

SYSTEM ANALYSIS

2 REQUIREMENT SPECIFICATIONS

The purpose of requirement specification is to obtain requirements and information from the stakeholders and customers for developing project, and to set goals at any stage and be directed towards the right course. This chapter provides brief information about the behavior, overall description, user and characteristics, specific and other non-functional requirements of the project under discussion.

2.1 Product Scope

For now, its scope lies in the field of news, at this time in version 1.0 the extracted news from different websites are in English (Pakistani or world news both are in English) so, this software cannot work with news in Urdu. But in the future with minor changes in it, this system can be work with Urdu news and may be used for other products, not the only news.

2.2 Product Description

In this section we will discuss about Product Prospective, Operational Environment, Specific Requirements and also functional and nonfunctional behavioral requirements.

2.2.1 Product Perspective

Basically, in the ground of our system, we are scraping news from different giant news providers in Pakistan and the world then classifying the news in different categories and building a recommendation system on top of it to provide news to the user according to their interest and also filter the fake news so the user will get only authenticated news. At first, we are building a content-based recommendation system in which we will provide the news content according to user interest and in the start, we are taking user interest explicitly by using a mechanism that we build on the Front end of our application.

2.2.2 Product Functionality

- It must extract the required news from a website

- classify news correctly if it’s not then in the end major purpose of this software will not be filled full because it will recommend wrong news to the wrong user.
- The system should Recommend news to users according to their Interests otherwise there is no need for it.
- The system should Recommend the latest news on daily basses to the users. Should not recommend old news again and again.

2.2.3 Operating Environment

This Section explain the Software Tools, Development Tools, Programming Languages

Software Tools

- **Python**: 3.7 or above
- **Scrapy**: 2.0.0 or above
- **Data Base**: Mongo DB (4.0.0) or above, SQLite (3.8) or above
- **Android**: mini-SDK 21
- **Node.js**: 12.8 or above
- **Express.js**: 4.17
- **React.js:** 17.0
- **Scikit-learn:** 0.24.0
- **NLTK:** 3.5

Programming Languages

- Python
- Java
- JavaScript
- HTML
- XML
- CSS
- Boot Strap
- JSX

Developing Tools

We have used the following tools for the project development

- **PyCharm (community edition)**
  PyCharm is an integrated development environment used in computer programming, specifically for the Python language. We develop our Api in pay charm.
- **Anaconda (Jupyter notebook)**

- **VS Code**

Visual Studio Code is a source code editor designed for Windows, Linux and mac OS.

- Installed all the basic extensions to get started with development in Visual Studio Code.
- Bootstrap was already included by default in the project.
- Installed bootstrap separately with npm-installer in project for front-end designing.

- **Brackets**

Brackets is a source code editor with a primary focus on web development. We use it to Develop our website

- **Android Studio**

Android Studio is the official integrated development environment for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. We use it to develop android app of our project

- **Postman**

  Postman is a collaboration platform for API development. Postman's features simplify each step of building an API.

Operating System

- Window 10
- Android

Hardware Specification

- Processor: Intel Core i5 6th Generation.
- RAM: 8 GB (ddr3 or ddr4)
- Hard Disk: 256 GB (SSD)

2.3 Specific Requirements

System attributes, functional requirements, database requirements.

2.3.1 Functional Requirements

This section includes the requirements that specify all the fundamental actions of the software system

End-User Functional requirements

- **Recommended News**

  The user should recommend only that news which will be according to his/her interest.
- **Latest News**

  Every user shall have a separate section where he/she can see the latest news.
- **Build and Update Profile**

  Every user can build and update his/her interest topics profile. .

Back End Functional Requirements

- **Gather News**

  System spiders should crawl and extract news from news providing websites.
- **Classify News**

  The category of Extracted news will be correctly classified.
- **Fake news detects**

  Fake news shall be detected so our system can store it in different further needs.
- **News Recommendation using content-based filtering**

  The recommendation engine shall be capable of producing recommendations by interpreting the content and evaluation by the actual user.

2.3.2 Behavioral Requirements

Behavioral requirements are specifications of user interactions with a system often represented as use cases.

Use diagram ram of the system

The use case diagram of the system is representing the whole system in which the system starts from extracting data and follows on to the next steps. In this diagram, we have one user which is the end-user who will relate to the front end of our system android application or web application. Fig is given bellow

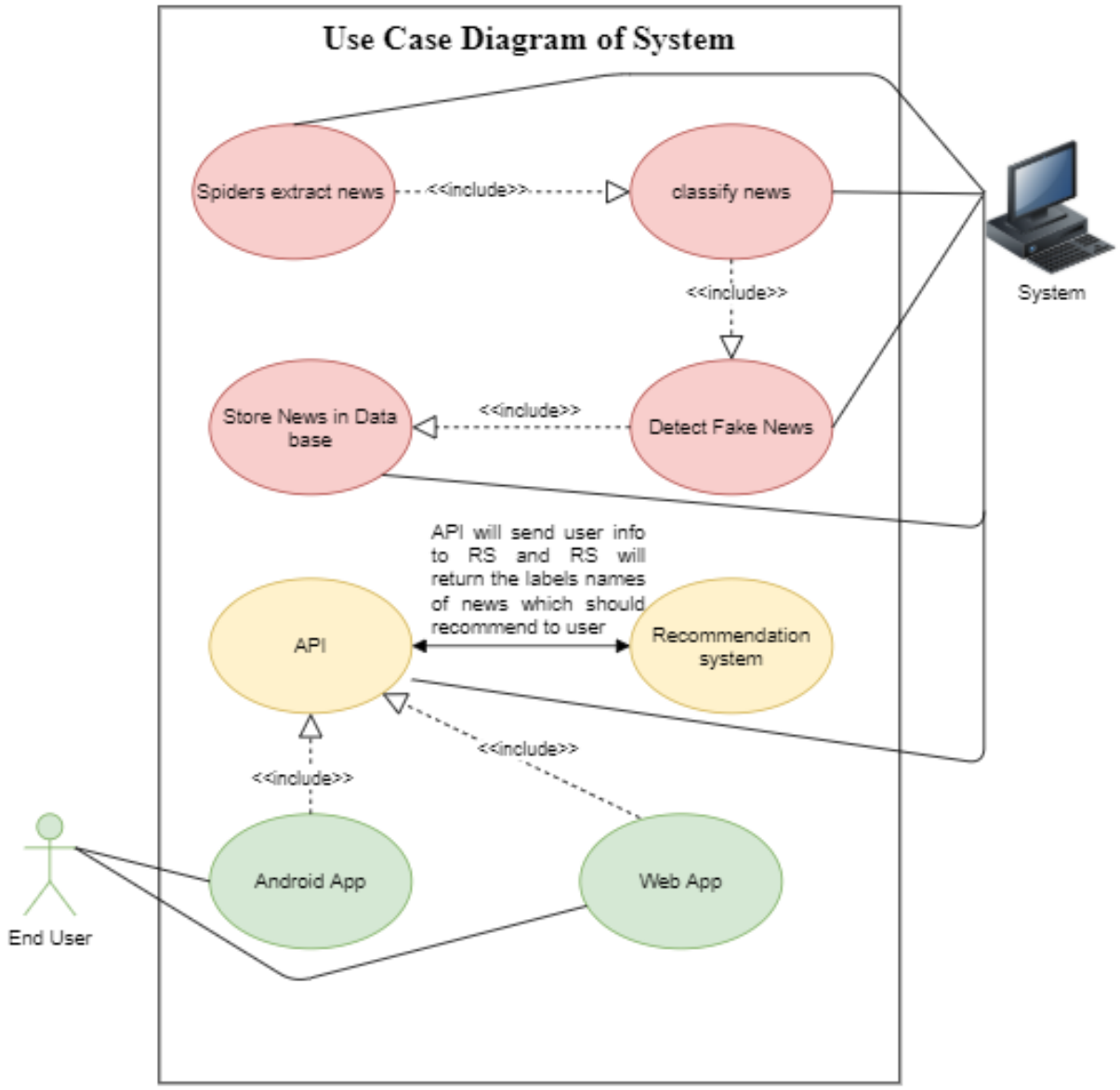


Figure 2.1 – Use Case Diagram of System

Use case Diagram of Android application

This use case diagram will show the interaction between the Android Application and the User. It shows the flow between the activities for example latest news, recommended news, bookmarks, share news, login Signup, and other application settings. All news is coming from backend System API

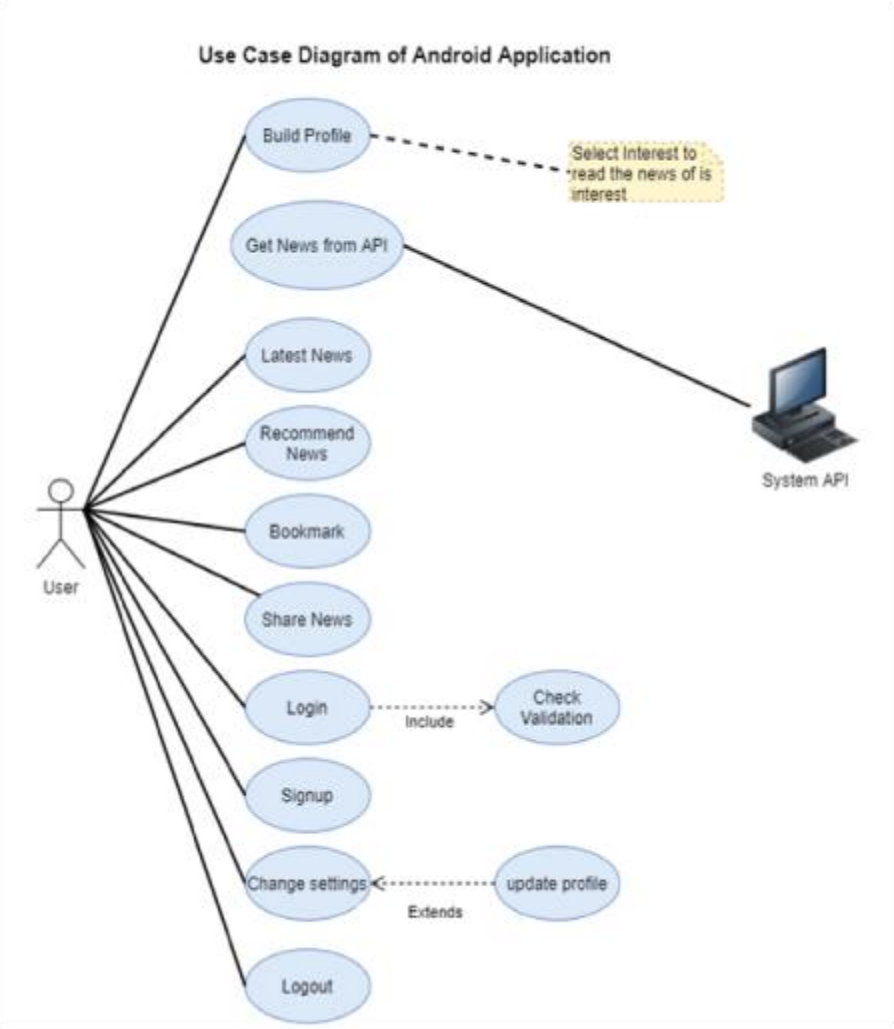


Figure 2.2 – Use Case Diagram of Android App

2.3.3 External Interface Requirements

External interface requirements are types of functional requirements. They're important for embedded systems. And they outline how your product will interface with other components.

User Interface

The user interface (UI) is the point of human-computer interaction and communication in a device. This can include display screens, keyboards, a mouse and the appearance of a desktop. It is also the way through which a user interacts with an application

Android Application

Login

In login activity, users have different options for login they can log in using a Google account or using username and passwd.

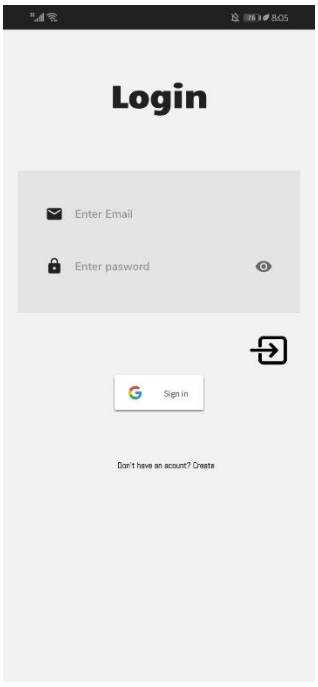


Figure 2.3 – Login Interface of the news APP

Signup

In Sign up the user will require to give the Username Email, and Password for Signup.

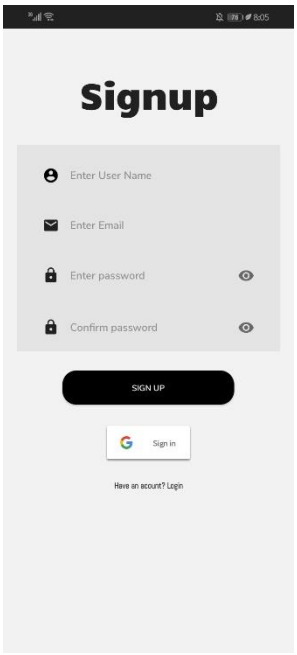


Figure 2.4 –Signup Screen of android App

View News

In view, news user can see the news which is recommended for him

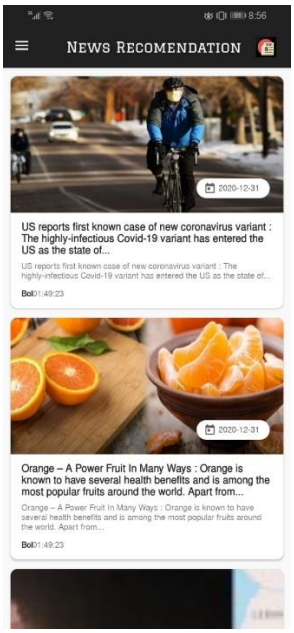


Figure 2.5 – View News of android app

Dashboard Interest

In Dashboard, users can select a topic according to their interest

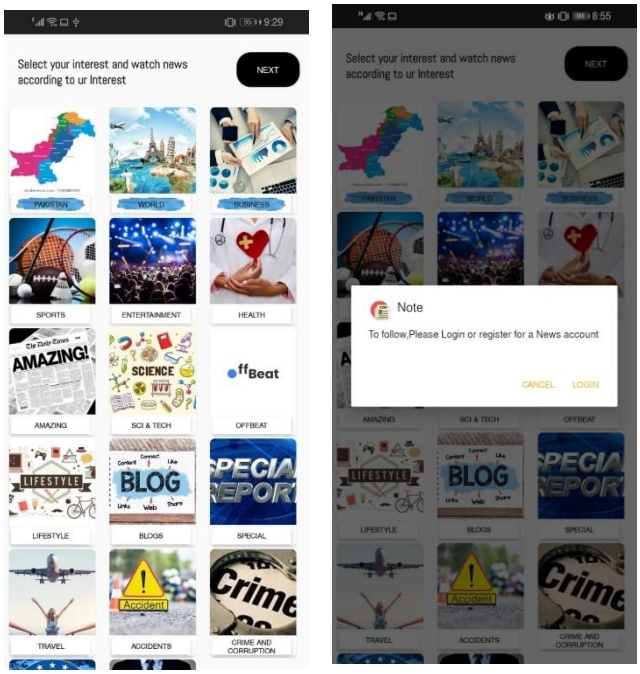


Figure 2.6 – Collect Dashboard Interest

Read News

In this View, users read news and also share this news with others and if the user wants to open that news in the browser, they can also do that.

Figure 2.7 – Read News, bookmark. Share

Share News

In this View, users read news and also share this news with others.

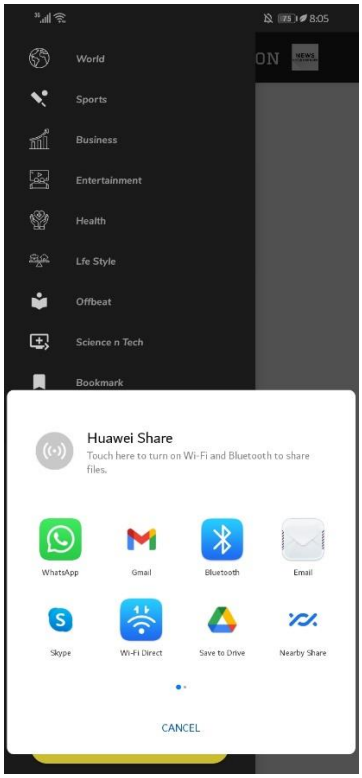


Figure 2.7 – Share News

Navigation Drawer

In this View, users Navigate to different News Categories Or Whole Application Options also logged out to the Application

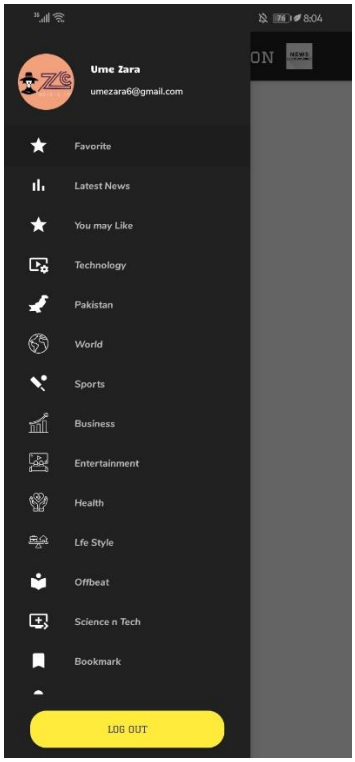


Figure 2.8 – Navigation View

Web Application

Sign In

In login activity, users have different options for login they can log in using a Google account or using username and passwd.

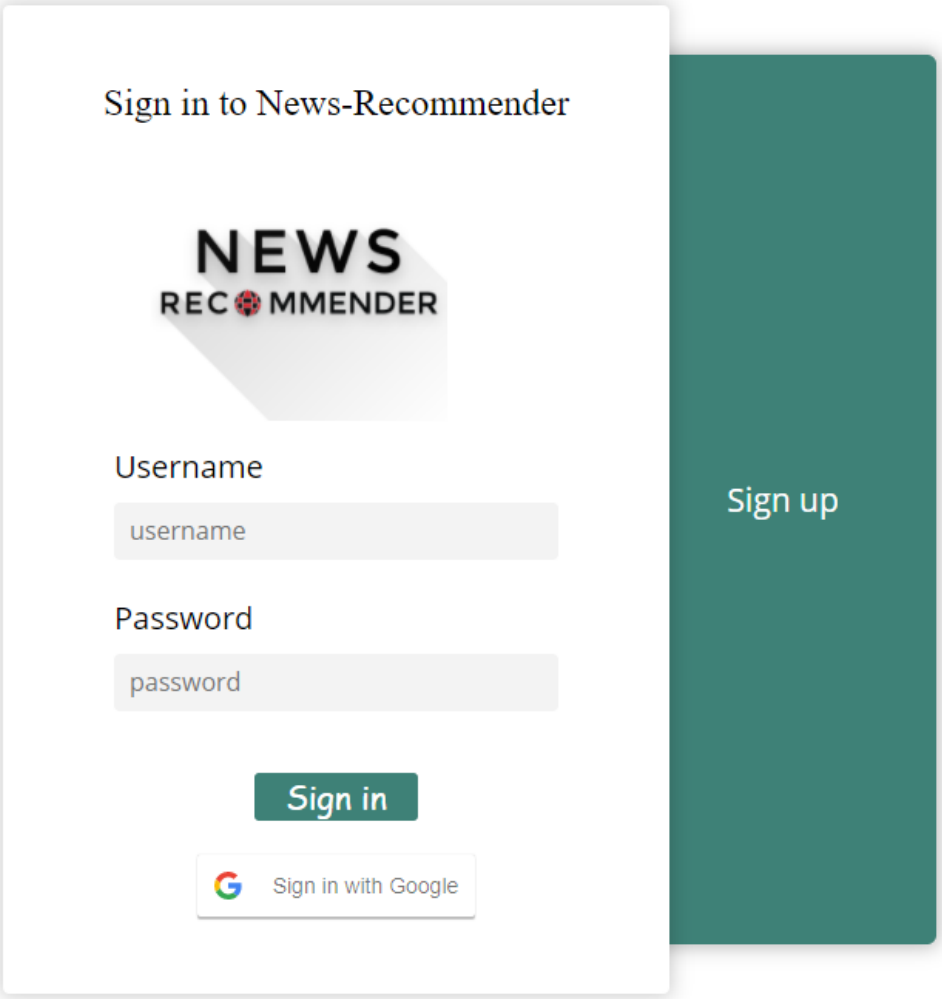


Figure 2.9 – Sign in Screen of the web app

Sign up

In Sign up the user will require to give the Username Email, and Password for Signup.

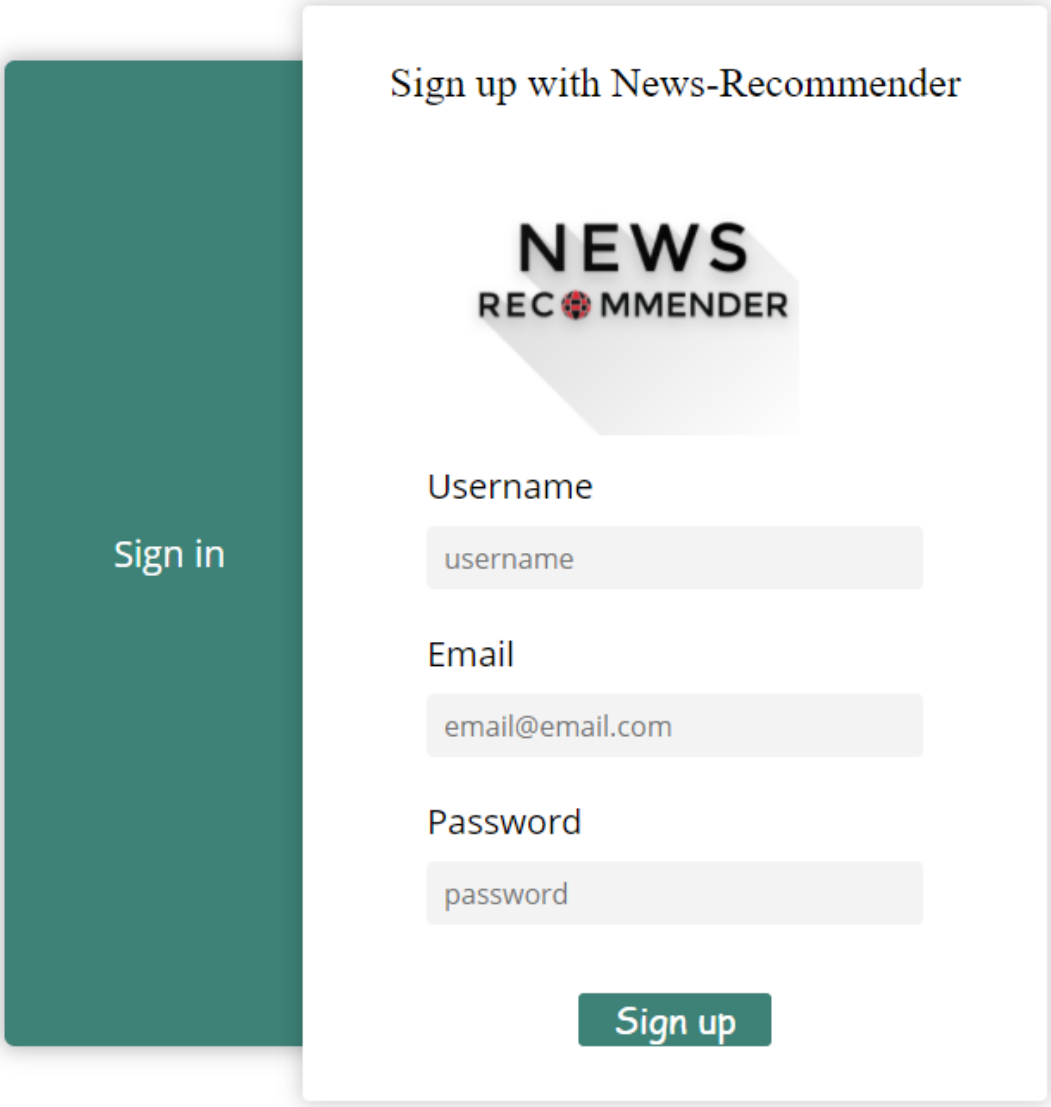


Figure 2.10 –Sign up Screen of web app

Select Interests

In select interest screen user have to select three topics of his/her interests.

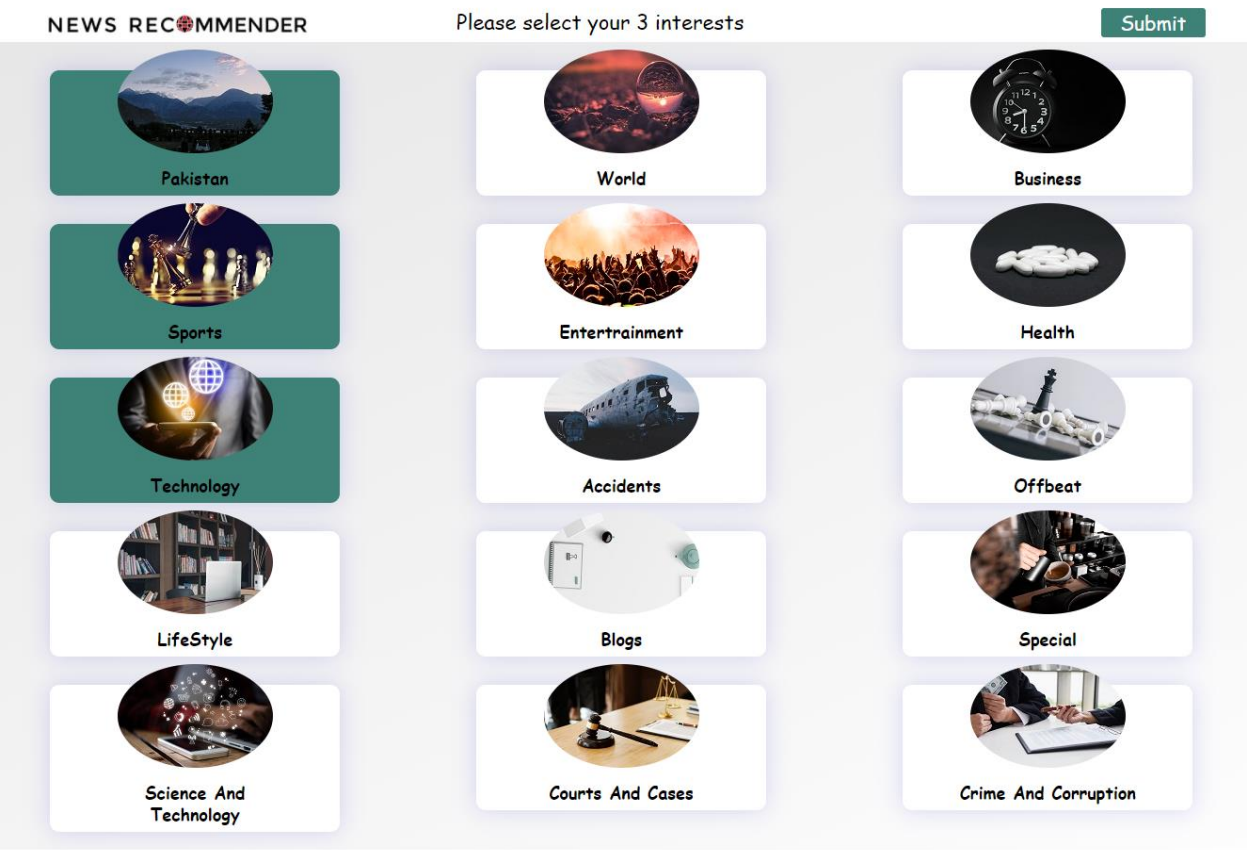


Figure 2.11 –Select Interests Screen of web app

View News

In view, user can see the news of his own interests and also that news which are recommended for him/her. User can also have options to see news of particular news channel or a specific category even if it is not in his interest. User can see the latest information related to covid-19 cases in Pakistan. User want to see detailed news he/she can click on read article he/she can see that particular news in detail.

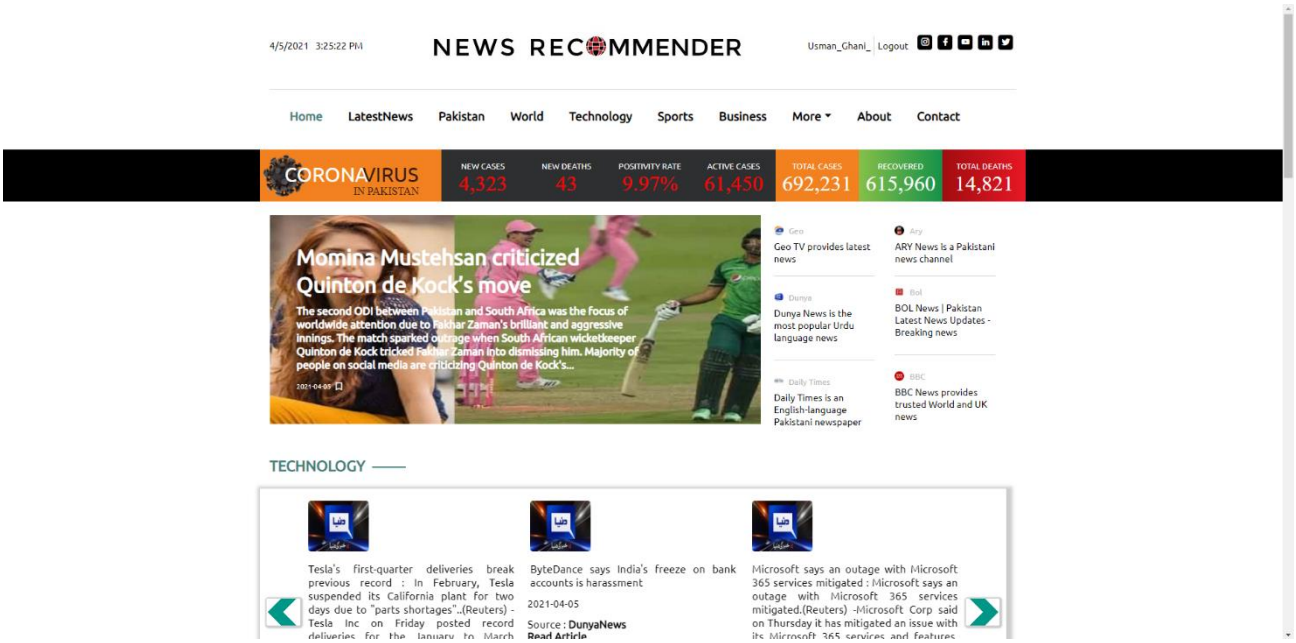


Figure 2.5 – View News of web app

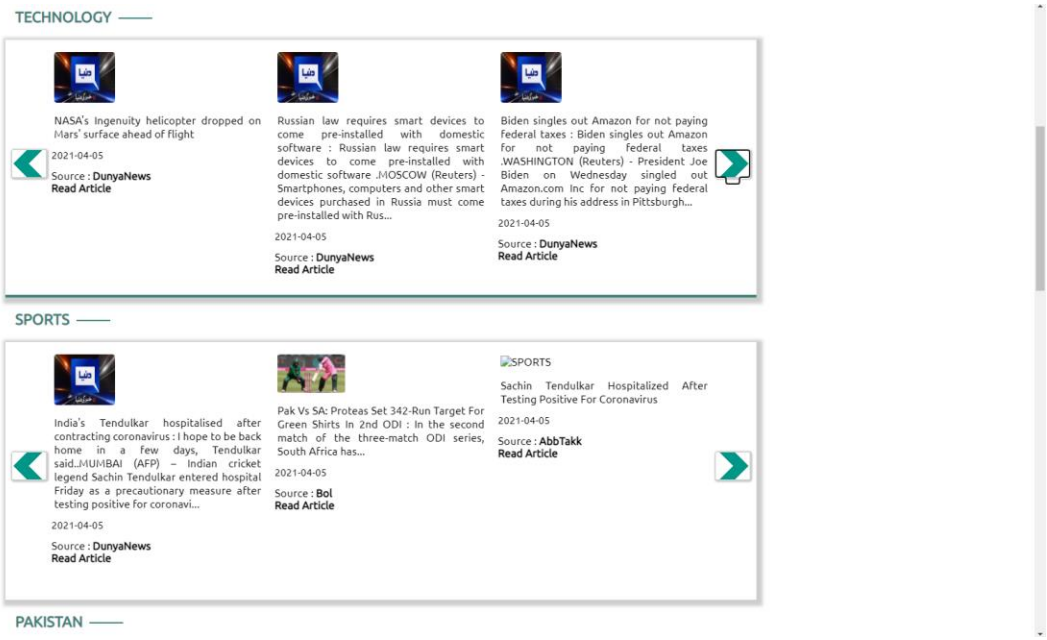


Figure 2.12 – View News of web app

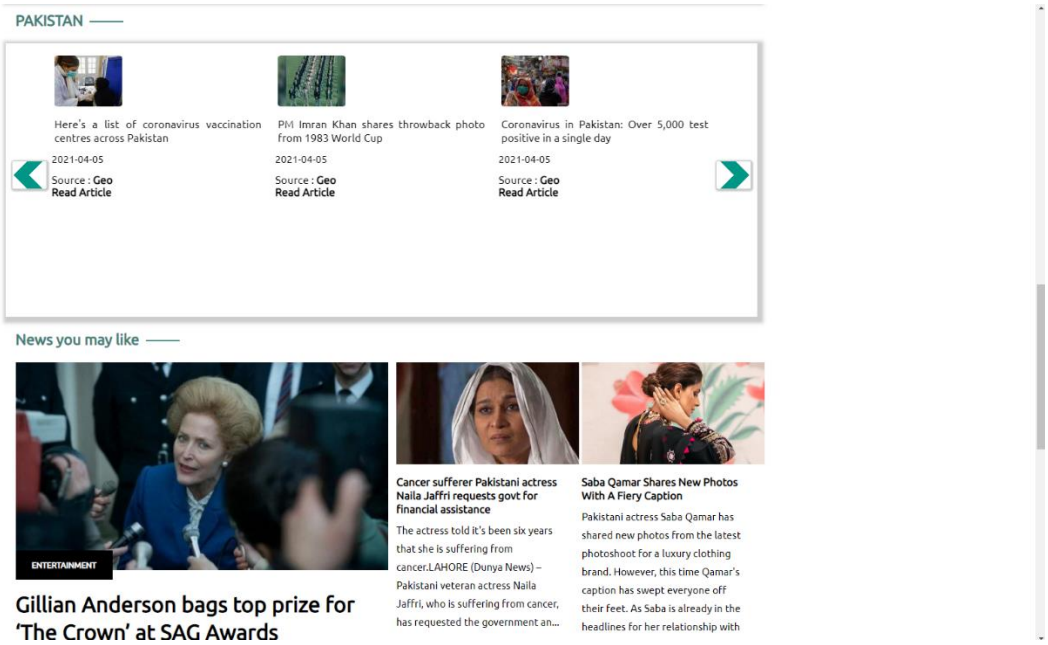


Figure 2.13 – View News of web app

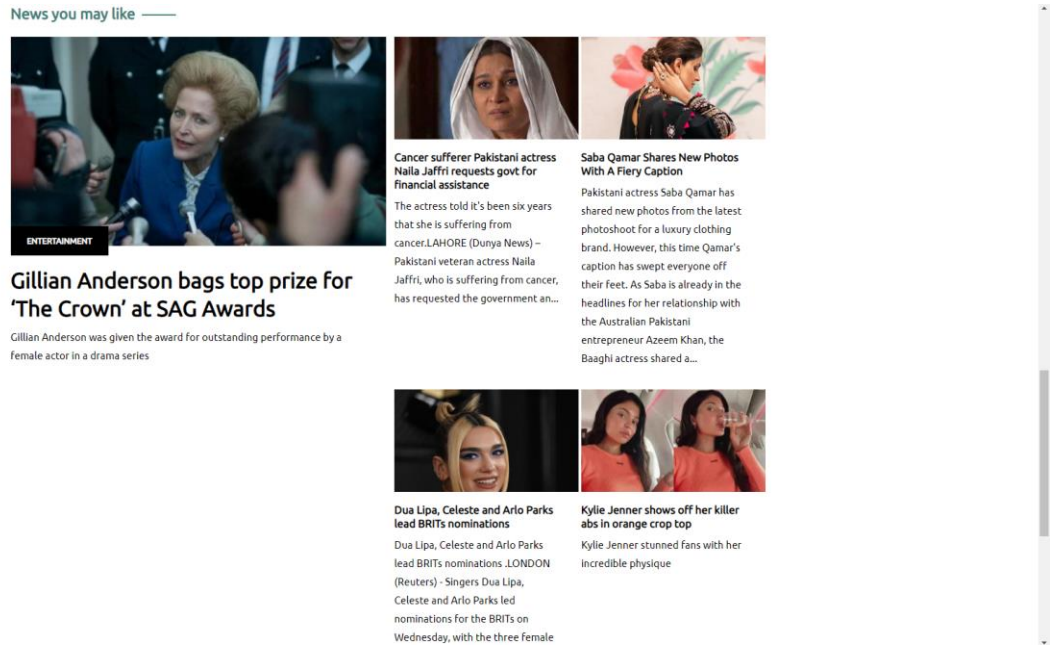


Figure 2.14 – View News of web app

Specific Chanel news

From main screen if user wants to see only Geo news then user can click on geo news icon and then they will be redirected to this page where user can see only those news which are from Geo news channel.

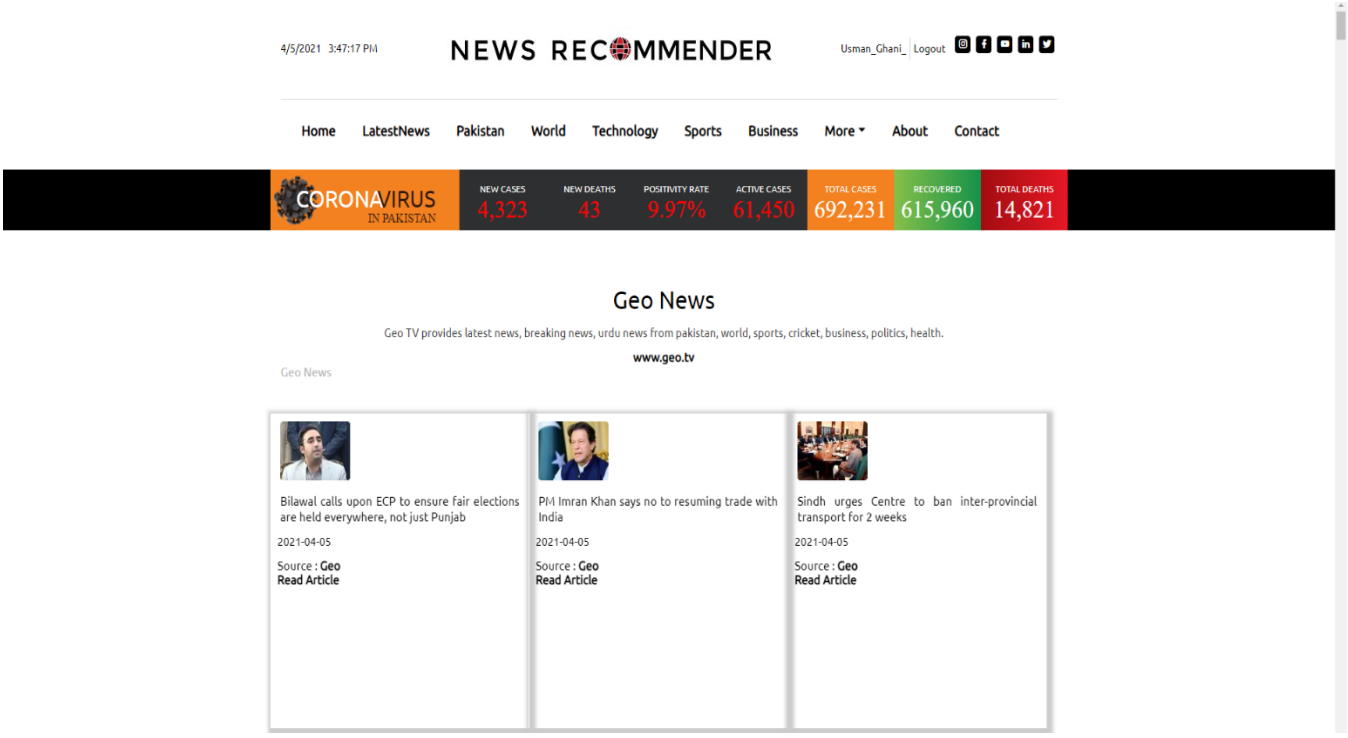


Figure 2.15 – Geo News

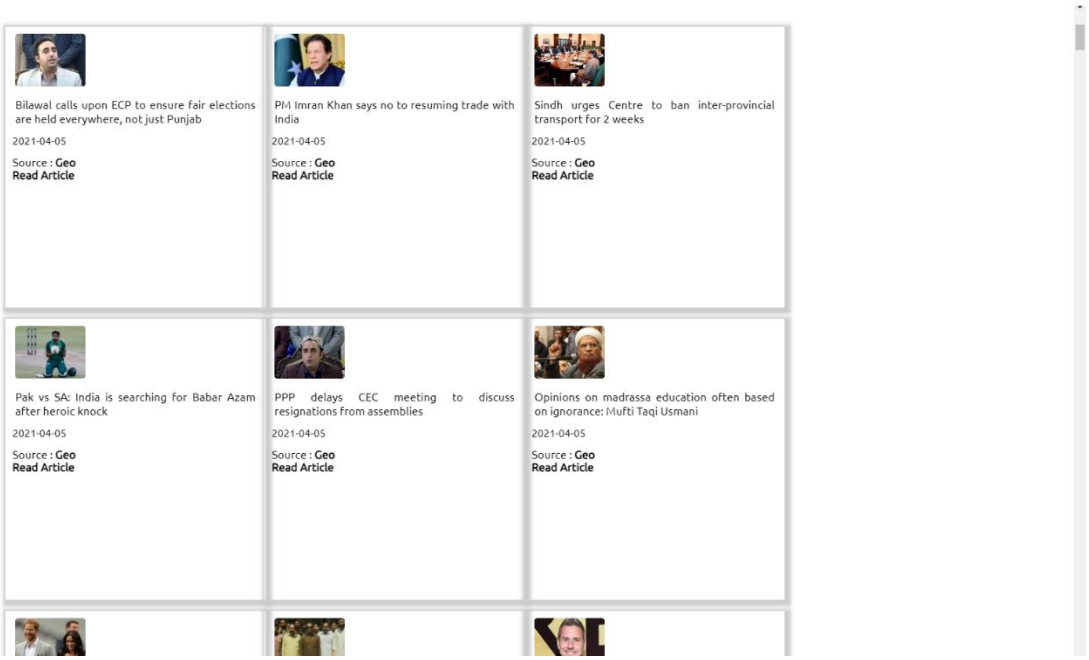


Figure 2.16 – Geo News

Specific topic news

If user wants to see news related to specific topic then he/she can click on the topic name on the menu bar, by clicking this user will be redirect to page where only selected topic news will be shown.

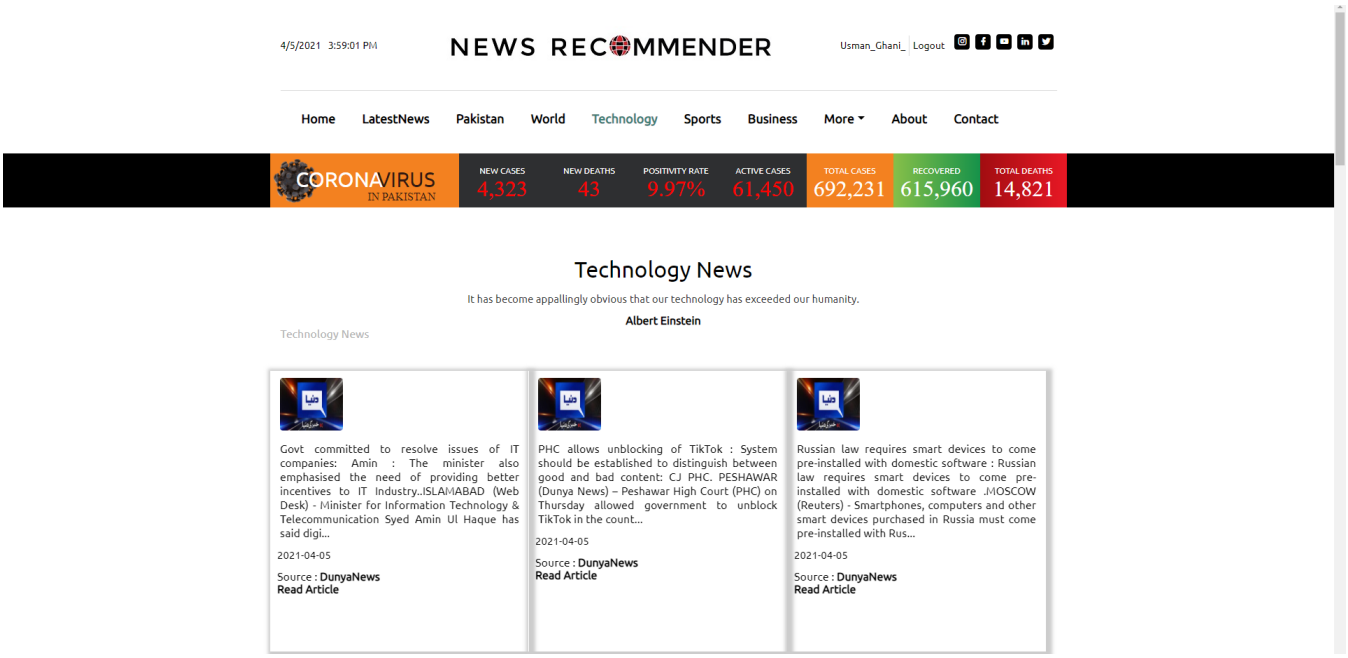


Figure 2.17 –Technology News

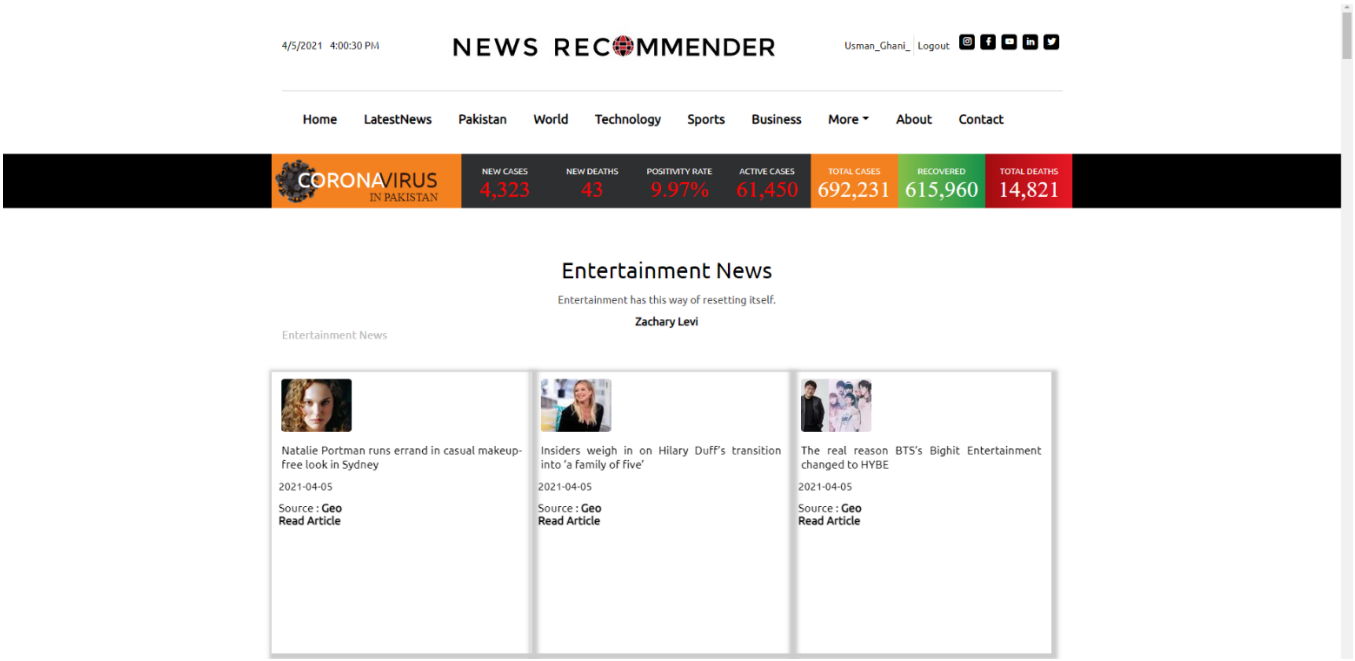


Figure 2.18 –Entertainment News

Hardware Interfaces

- An android phone which sports a minimum version of SDK 21.

Software Interfaces

- SQLite, MongoDB (for the database)
- XML, React (for the front end)
- Java, Node, Express, Python (for backend)

Communications Interfaces

- User can Communicate only when the internet is available.

2.4 Non-functional Requirements

Nonfunctional Requirements (NFRs) define system attributes such as security, reliability, performance, maintainability, scalability, and usability. They serve as constraints or restrictions on the design of the system across the different backlogs

2.4.1 Performance Requirements

- Latest, important and crucial news should be recommendedto3³usersr as soon as possible.
- Same news or old news should not recommend to the user again and again

2.4.2 Safety and Security Requirements

The system has some mechanism in the API module to prevent and detect request is coming from a ser or a program because from front end web app any hacker can directly communicate with our API and use DDOS attack to increase the load on API and Recommendation system module to affect the efficiency of the system.

2.4.3 Software Quality Attributes

Reliability

As each process in a system is clearly defined and program all components using the best practices so the system will be reliable

Availability

As spiders will be crawling websites after every hour and find a new latest news will be available in time to our users

Flexibility

We are using a No SQL database for storing new database schema will not be the big issue we can easily add and remove new attributes related to news so this will increase the Flexibility of our system.

Reusability

As our product (news) is related to text data, our system code will be easily reusable for other products how have text data and we are building our API for providing news to our front end ap so this API can easily be sale out and used by other customers who required news for their system.

Maintainability

We are using logs and exception handling in every phase of our project so it will be easily maintainable.

Chapter 3

SYSTEM DESIGN

3 DESIGN SPECIFICATIONS

A design specification is a detailed document providing a list of points regarding a product or process. It may also give specific examples of how the design should be executed, helping others work properly (a guideline for what the person should do).

3.1 Introduction

A design specification is a detailed document providing a list of points regarding a product or process. For example, the design specification could include required dimensions, environmental factors, ergonomic factors, aesthetic factors, maintenance that will be needed It may also give specific examples of how the design should be executed, helping others work properly

3.2 Logical Viewpoint

The logical viewpoint describes the logical structure and the distribution of responsibilities functionality of a system by means of a network of interacting logical components that are responsible for a set of functions. These logical components and their interactions are arranged in the logical component architecture of the system

Class Diagram of Backend System

The class diagram of the backend system shows the abstract view of classes that are used in the backend these are not all the classes but some which are major and important. In the below class diagram, we have Spiders class which is used to crawl a web page and extract the required information then we can see there is Items class which have an aggregation relationship with Spider because Spider class method parse is using the object of item class if Spider class does not use the Items class object the Items class still exist but never use. Same as News scraper Pipeline is used by Items and so on.

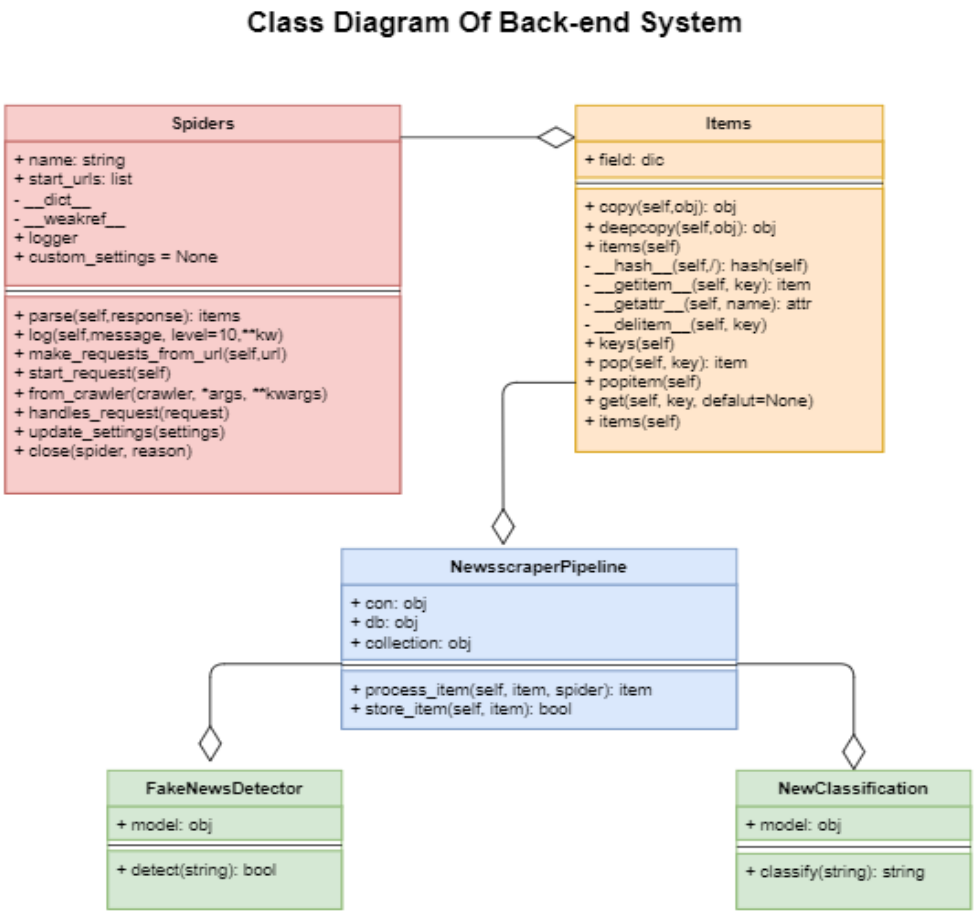


Figure 3.1 – Class Diagram of the Backend System

Class Diagram of Android Application

News application class diagram describes the structure of a news application classes their attributes, operations (methods). And the relationship among objects. The main classes of the news application are home, user interest, favorite, latest news. Fig is given bellow

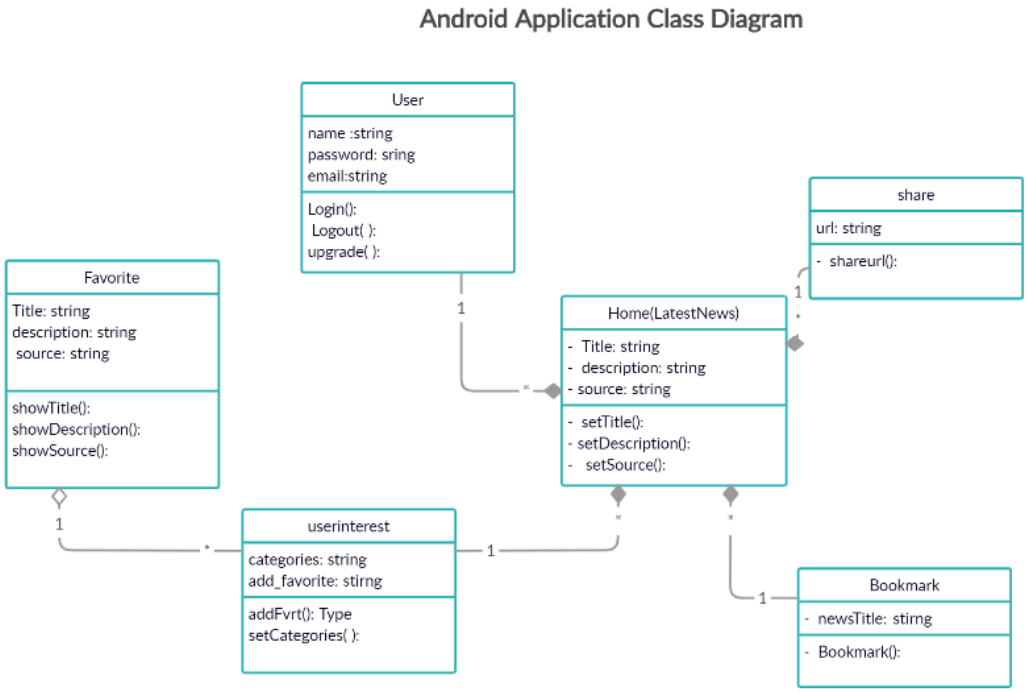


Figure 3.2 – Class Diagram of Android Application

3.3 Information Viewpoint

Describe the way that the system stores manipulate, manages the distributes information

3.3.1 Database design for Mongo DB (system database)

We are using No SQL database and our data did not contain very much relationships between different entities or relations, we have two collection users and news as we know these collections are stored in form of JSON(BSON) so, we can see the schema of our document in the bellow diagram. Fig is given bellow

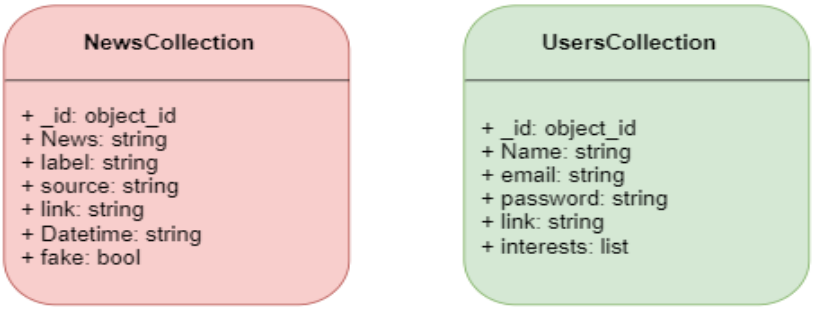


Figure 3.3 – Data Base Design

3.3.2 ERD for Android application

This ER diagram represents the model of news application. It shows all the visual instruments of database tables and the relationship between the contents, latest News, interests, etc. Its use structure data and to define the relationship between the structure data group of news application.

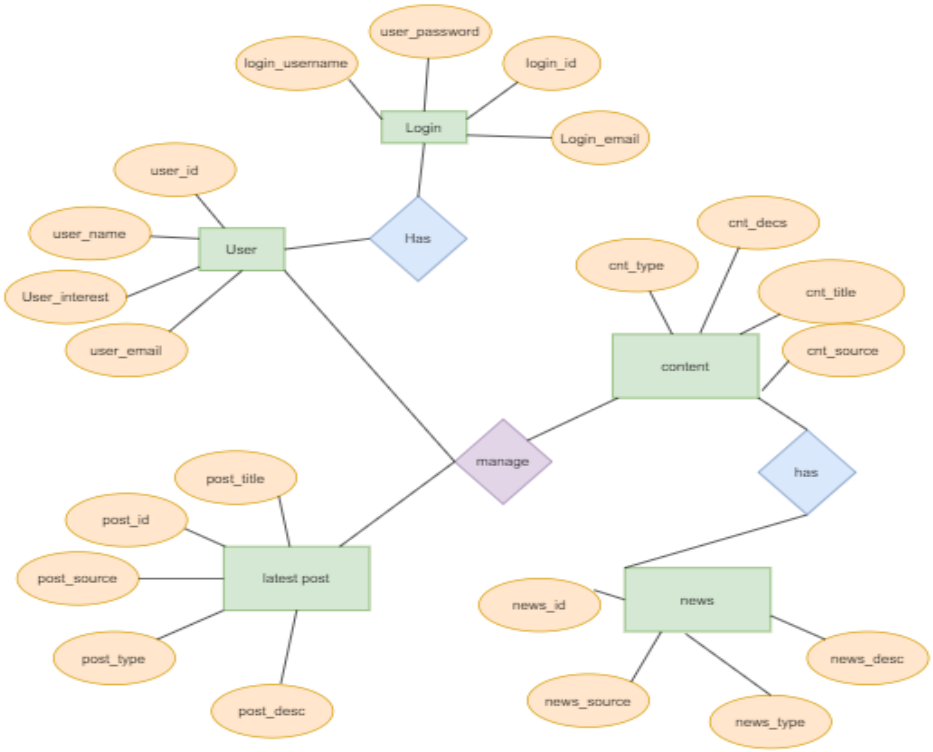


Figure 3.4 – ERD of Application

3.4 Interaction Viewpoint

A viewpoint is a way of organizing the requirements for a software system, based on some perspective such as an end-user perspective or a manager's perspective.

3.4.1 Sequence diagram of a system

A sequence diagram shows how the object is interacting and arranged in a time sequence. In the below diagram, we can see a user is interacting with the application and then the application is

sending user interests to API and API uses the recommendation system to recommend the news related to users interests, and then API will send back a response to the user containing the news which is recommended by users and on the backend spiders are crawling the web pages and extracting the news, giving it to Items and Items gives it to pipeline and then goes for classification and fake detection and store into database.

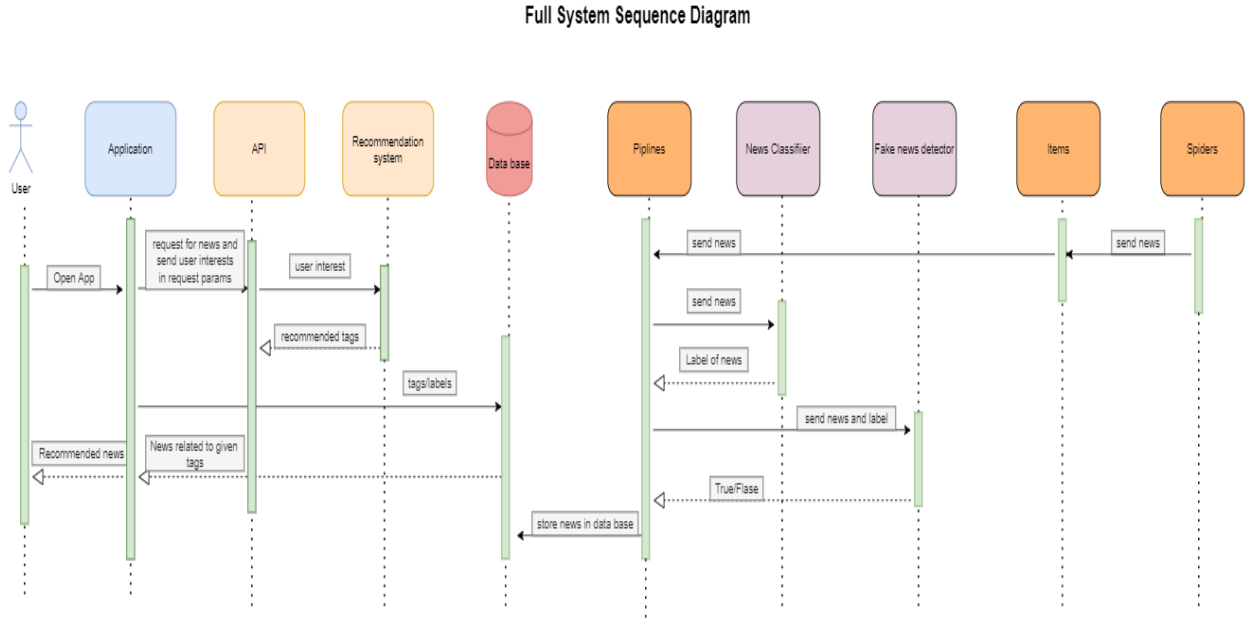


Figure 3.5 – System sequence diagram

3.4.2 Sequence diagram of web application

In this section we explain the Sequence diagram of whole website

3.4.2.1 Sequence diagram of Login

This is a sequence diagram of the news application which shows how objects are communicating with each other. In this sequence diagram, we can see the process or login, user click on login button and application response it as navigates to the login page then user gives its user name and password which goes to API and check for valid user name and password in the database and send a response back.

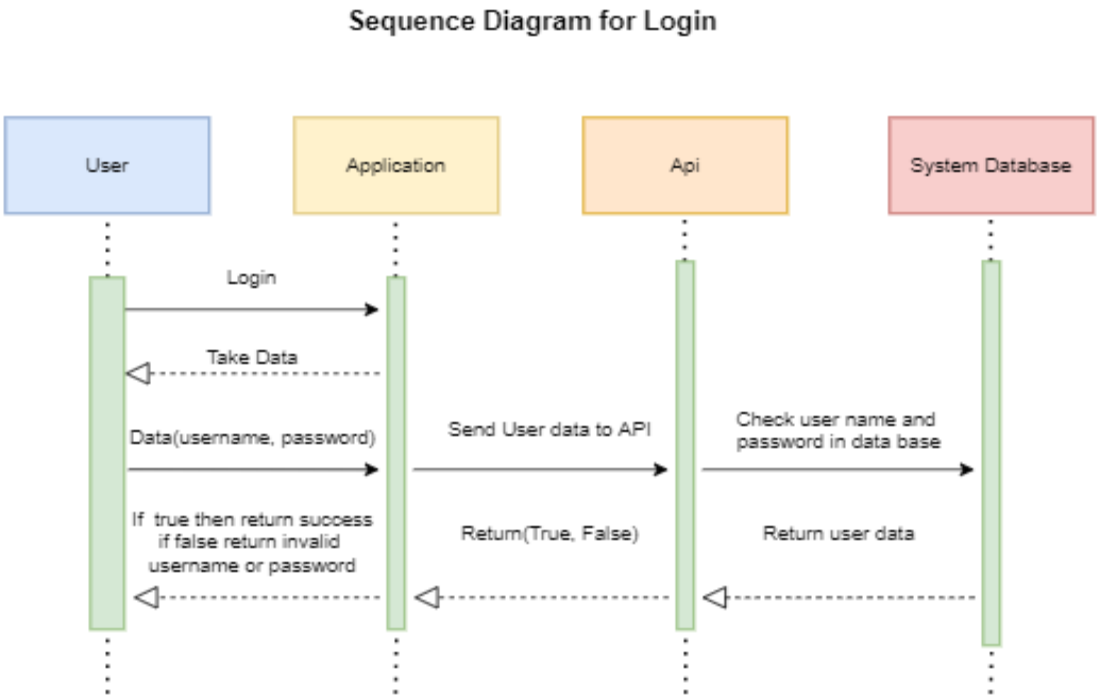


Figure 3.6 – Sequence diagram of Login

Sequence diagram of the latest News

In this sequence diagram, we can see the process of view the latest news the user clicks on the latest news button, and the application will get the latest news from the database and show it to users.

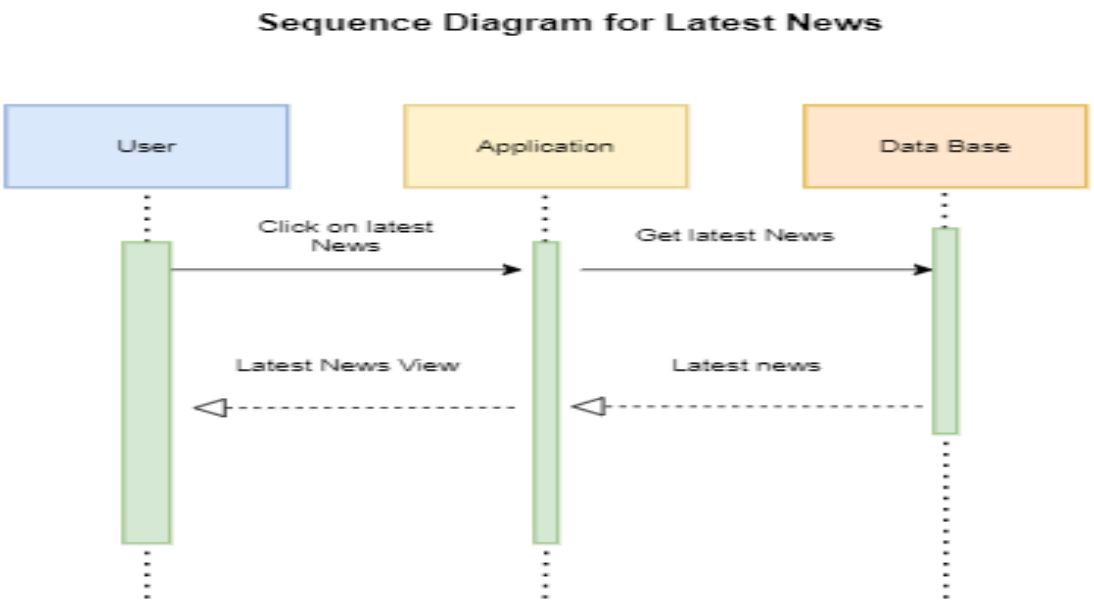


Figure 3.7 – Sequence diagram of latest News

Sequence diagram of Recommended News

In this sequence diagram, we can see how users can see the recommended news. User will click on News Feed and the app will get recommended news from the database and show into the news activity.

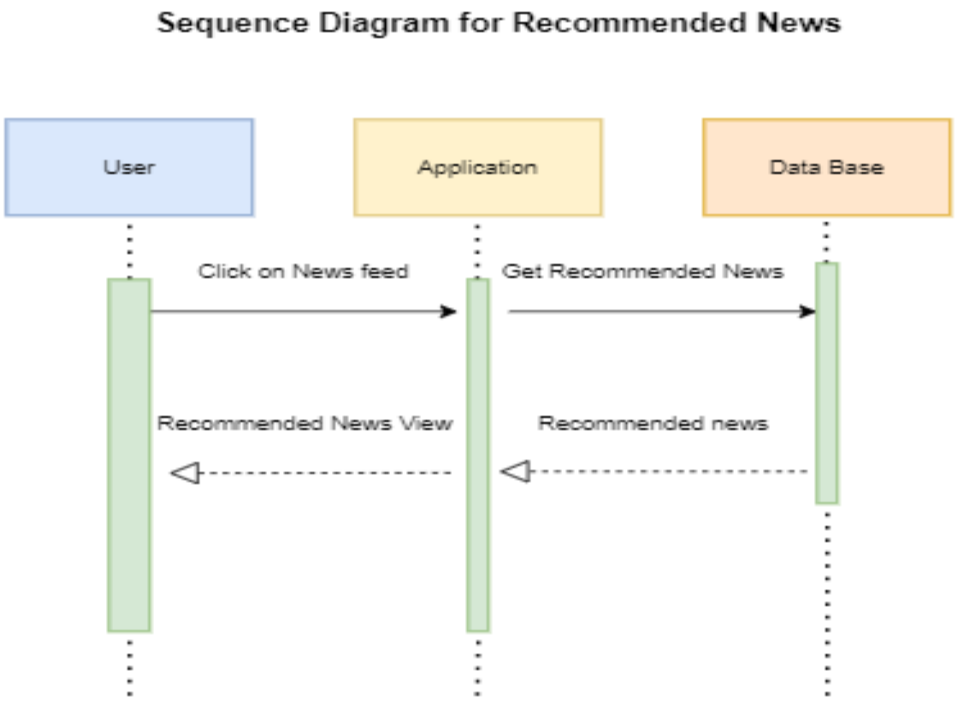


Figure 3.8 – Sequence diagram of Recommended News

3.5 State Dynamics Viewpoint

The behavior of an entity is not only a direct consequence of its inputs, but it also depends on its preceding state. The past history of an entity can best be modeled by a finite state machine diagram or traditionally called automata.

3.5.1 State Machine Diagram

In the state machine diagram we can see how our system will react on different stages we ha have a starting point at an application where the system will have background services that will get news from API and store it into the local machine database then the user can see news. Bookmarks news user can log in and sign up, user can also change settings and upgrade profile, set notification settings, and furthermore. Fig is given below.

State Machine Diagram

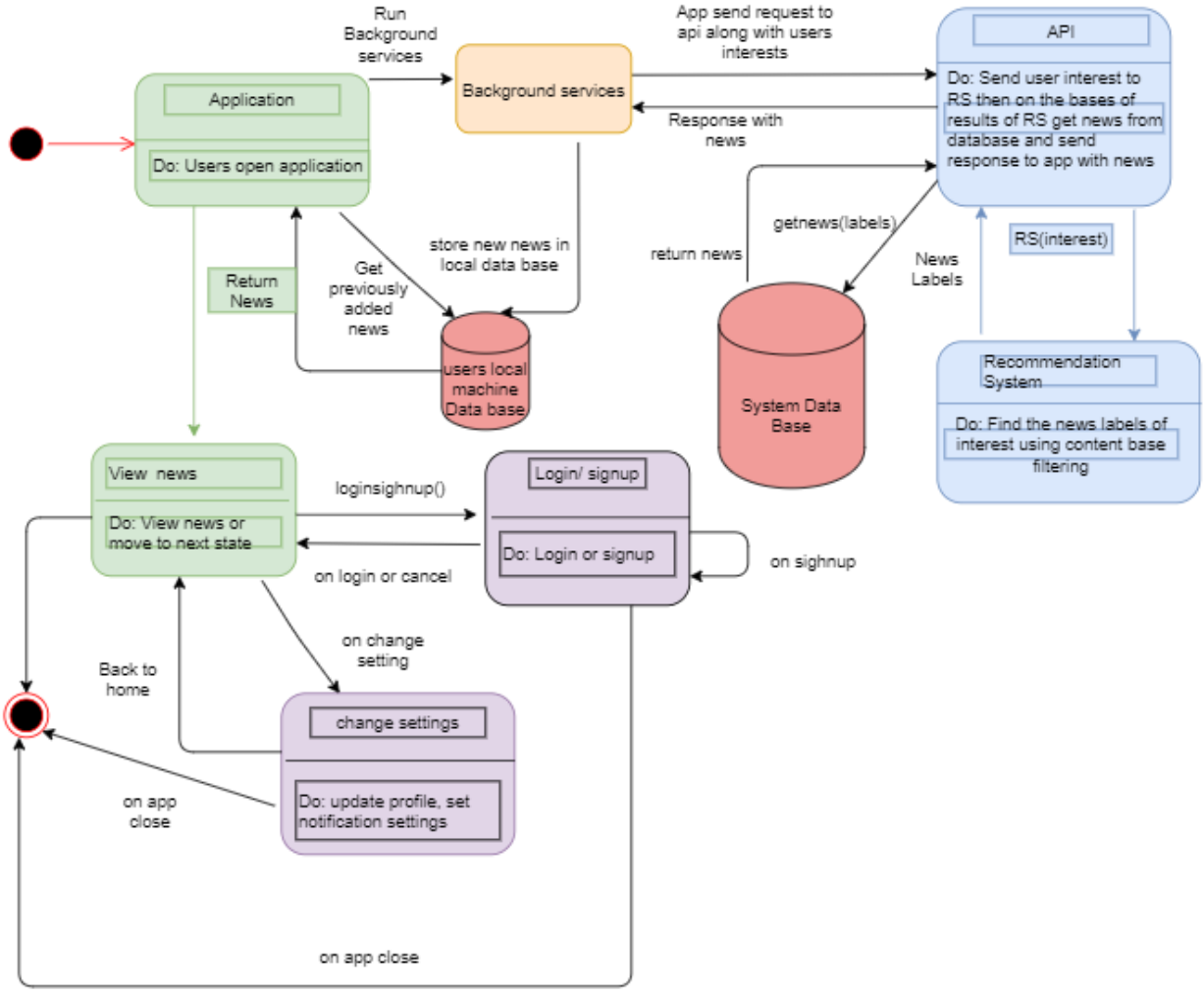


Figure 3.9 – State Machine Diagram

Chapter 4

IMPLEMENTATION

4 DEVELOPMENT AND TOOLS

This chapter is about the overview of the development of the system and tools, techniques and technologies used to develop this project. Development is the most important part of any project when actual work starts. It is the process of making your idea into reality. In this project we have covered modules and software development methodologies and technologies used to develop the project. We adopted agile development methodology. Development is the phase, were vision and plan become reality. This phase involves evaluation, visioning, planning, allocation of budget and provision of financial resources for the project. First, we developed version 1 by adding basic requirements. Then we added other requirements in version 2.
Process whereby "project inputs are converted into project outputs".

• Putting in action the planned activities.
• Putting the project proposal into the actual project
• Management and execution of the project.

It is important to recognize that, planning and engaging in the implementation of any innovation, evidence-based practice, or cluster of practices take time, energy and resources. The change process can be understood and organized using defined steps and subsequent activities that are necessary to shift a concept into reality.

4.1 Introduction

In this chapter, we describe our development plan include all activities duration, Start & End, how much work is done, and the complete plan which we have followed to achieve our goals, our team members, and activities assigned to each member and Also discuss the tools for development, future goals to extend our project. Different languages and frameworks used to develop the project.

4.2 Development Plan

This project is developed by a team of two members.

1. UME ZARA
2. USMAN GHANI MUGHAL

Overall, we work together in the Project and Divide modules as the Development. Front-End and Back-End of Android App Is done by Ume Zara, and Development (Front-End & Back-End) of website, API and Model is done by Usman Ghani Mughal.

4.3 Work Breakdown Structure

ID	Task Name	Duration	Start	Finish	% Done
1	Project planning	3 days	Fri 2/14/20	Tue 2/18/20	100%
2	Proposal	14 days	Monday 1/3/20	Tue 1/23/20	100%
3	Review and Approve Proposal	7 days	Tue 1/23/20	Monday 1/30/20	100%
4	Gather Requirements	2 weeks	Wed 2/1/20	Thursday 2/14/20	100%
5	SRS	1 month	Friday 3/1/20	Monday 3/30/20	100%
6	Review and Approve SRS	10 days	Mon 4/1/20	Wed 4/10/20	100%
7	Outline Design	10 days	Friday 4/12/20	Monday 4/22/20	100%
8	Diagrams	1 Week	Tue 4/23/20	Fri 4/30/20	100%

9	Database Design	20 days	Sat 5/2/20	Fri 5/22/20	100%
10	GUI	30 days	Sat 5/24/20	Tue 6/23/20	100%
11	Integration API with Website	10 days	Friday 10/16/20	Mon 10/26/20	100%
12	Final the Project from Front end to Backend	15 days	Wed 10/28/20	Friday 11/13/20	100%
13	Testing including Test Plans and Test Cases	7 days	Sat 11/14/20	Sat 11/21/20	100%
14	Report of FYP	10 days	Sat 11/21/20	Tue 12/1/20	100%

Table 1 Work Breakdown Structure

4.4 Development Tools

We have used the following tools for the project development

4.4.1 PyCharm (community edition)

PyCharm is an integrated development environment used in computer programming, specifically for the Python language. We develop our Api in pay charm.

4.4.2 Anaconda (Jupyter notebook)

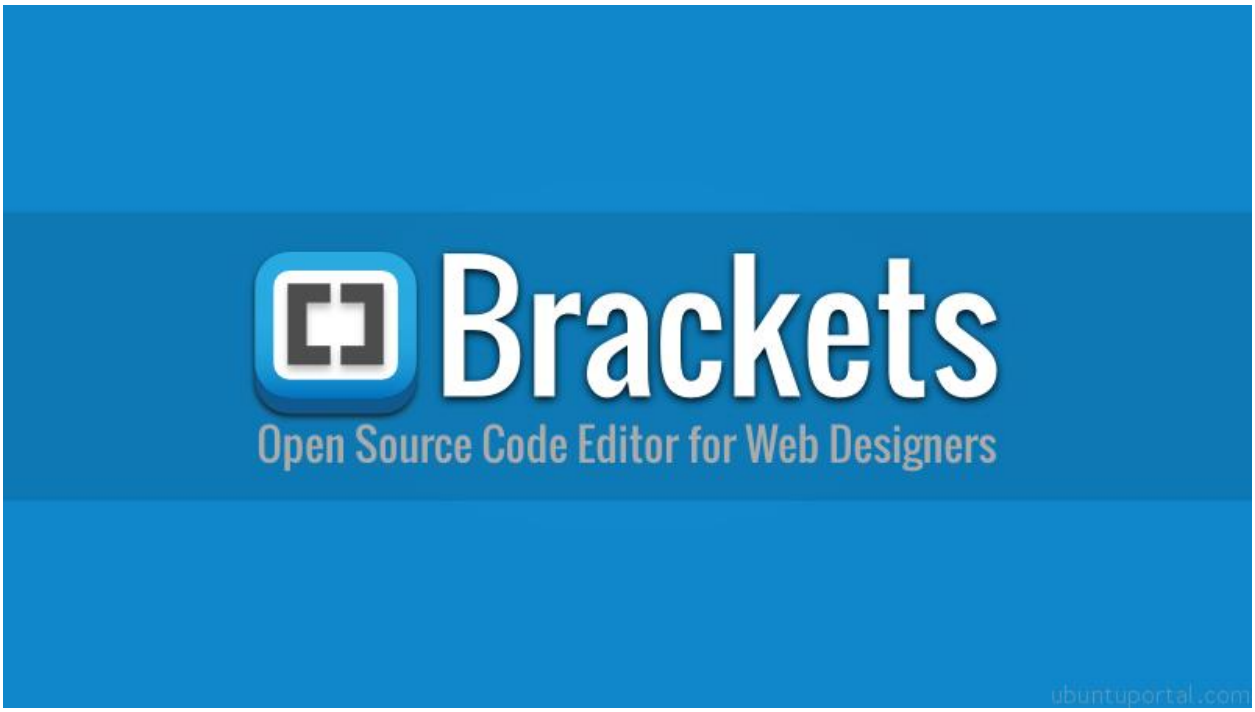
4.4.3 VS Code

Visual Studio Code is a source code editor designed for Windows, Linux and mac OS.

- Installed all the basic extensions to get started with development in Visual Studio Code.
- Bootstrap was already included by default in the project.
- Installed bootstrap separately with npm-installer in project for front-end designing.

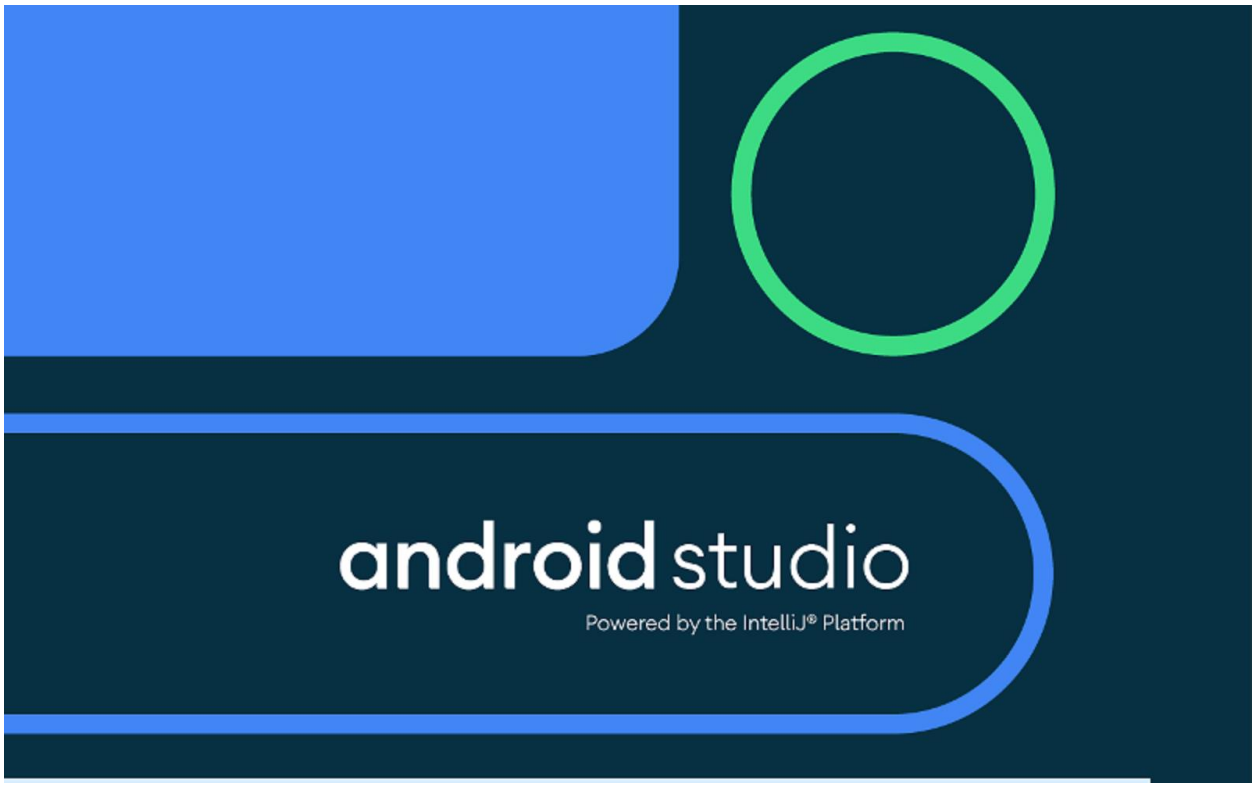
4.4.4 Brackets

Brackets is a source code editor with a primary focus on web development. We use it to Develop our website.



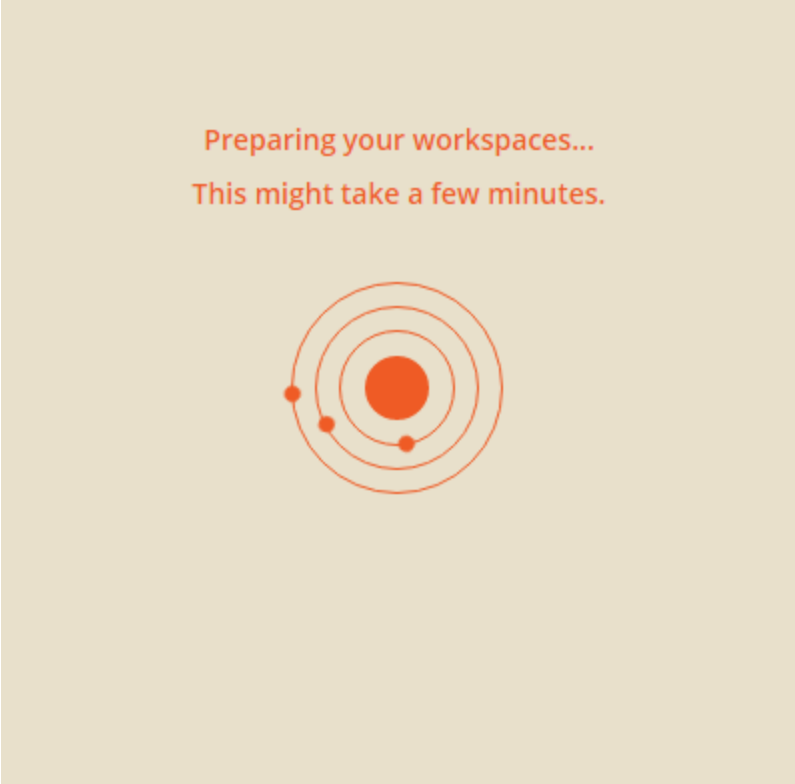
4.4.5 Android Studio

Android Studio is the official integrated development environment for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. We use it to develop android app of our project



4.4.6 Postman

Postman is a collaboration platform for API development. Postman's features simplify each step of building an API.



4.5 Conclusion and Future Work/Extensions

Conclusion In this work, we presented our recommender system to providing relevant news based on streamed data. An API-based recommender has been combined with the most popular News websites. We have evaluated the developed recommender system. The results show that the implemented solution reliably provides precise recommendation results.

Future Work Optimizing, for now, its scope lies in the field of news, at this time in version 1.0 the extracted news from different websites is in English (Pakistani or world news both are in English) so, this software cannot work with news in Urdu. But in the future with minor changes in it, this system can be work with Urdu news and may be used for other products, not the only news.

Chapter 5

TESTING

5 QUALITY ASSURANCE

In this chapter we'll see that how Test plans are developed, and Test cases are performed to produce the best quality system as much as possible. We've ensured the quality of the project and developed Test plans and Test cases that are performed by us during project development. Those are verified successfully as given below.

5.1 Introduction

In this chapter, we evaluate the performance of our system. We debug the system and validate basic functions to determine if different features within a system are performing as expected and to confirm that the system satisfies all customer requirements. We provide the Test plans include Test cases which has a set of test data, preconditions, expected results, and actual results, developed for a particular test scenario to verify compliance against a specific functional requirement to test for problems before the product goes live, a Traceability Matrix to trace each test case against desired Functional Requirement.

5.2 Traceability Matrix

A Traceability Matrix is a document that co-relates any two-baseline documents that require a many-to-many relationship to check the completeness of the relationship. It is used to track the requirements and to check the current project requirements are met.

Traceability Matrix

	Test Case ID	TC_1	TC_2	TC_3	TC_4	TC_5	Test Case for respective requirement
Req-ID							
Req-1		✖		✖		✖	3
Req-2			✖			✖	2
Req-3				✖			1
Req-4			✖		✖		2
Req-5		✖		✖			2
Req-6			✖				1

Table 2 - Traceability Matrix

Traceability matrix for User requirements that maps and traces requirement with test cases.

	Test Case ID	TC_6	TC_7	TC_8	TC_9	TC_21	Test Case for respective requirement
Req-ID							
Req-1		✖				✖	2
Req-2						✖	1
Req-3			✖	✖			2
Req-4					✖		1
Req-5		✖		✖		✖	3
Req-6			✖		✖		2

Table 3 - Traceability Matrix

Traceability matrix for API requirements that maps and traces requirement with test cases.

	Test Case ID	TC_10	TC_11	TC_12	TC_13	TC_25	Test Case for respective requirement
Req-ID							
Req-1		✖				✖	2
Req-2			✖				1
Req-3				✖		✖	2
Req-4					✖		1
Req-5				✖			1
Req-6			✖				1

Table 4 - Traceability Matrix

Traceability matrix for requirements that maps and traces requirement with test cases.

5.3 Test Plan

A TEST CASE is a set of actions executed to verify a particular feature or functionality of your software application. A Test Case contains test steps, test data, precondition, post condition developed for specific test scenario to verify any requirement. The test case includes specific variables or conditions, using which a testing engineer can compare

expected and actual results to determine whether a software product is functioning as per the requirements of the customer. We test our module one by one as they given below.

Test ID	Startup-1
Test name	Application startup
Date of test	10/11/2020
Name of application	News Recommendation
Description	Home screen will be displayed splash screen then category screen Show to select user interest
Input	Tap on the application icon
Expected output	Splash screen displayed after that categories shows
Actual output	Splash screen displayed after that categories shows
Test Role (Actor)	Ume Zara
Test verified by	Usman Ghani Mughal

Table 3: A test case for News Application startup

Test ID	User interest-2
Test name	Recommended News
Date of test	20/11/2020
Name of application	News Recommendation
Description	Category screen Show to select user interest tap on next to save and Read Recommended News
Input	Select favorite categories
Expected output	Select categories show and then next to read news
Actual output	Select categories show and then next to read news
Test Role (Actor)	Ume Zara
Test verified by	Usman Ghani Mughal

Table 4: A test case for News Application User Interest

Test ID	Latest News-3
Test name	Read Latest News
Date of test	25/11/2020
Name of application	News Recommendation
Description	In the Latest news User will read the whole news of the day
Input	Tap on the Latest News
Expected output	Open Latest News and Read
Actual output	Latest news show and open to read news
Test Role (Actor)	Ume Zara
Test verified by	Usman Ghani Mughal

Table 5: A test case for News Application Latest News

Test ID	Latest News-3
Test name	Show WebView
Date of test	2/12/2020
Name of application	News Recommendation
Description	Open the official web in the WebView to read news
Input	Tap on the News
Expected output	Open News
Actual output	Open to read news
Test Role (Actor)	Ume Zara
Test verified by	Usman Ghani Mughal

Table 6: A test case for News Application show WebView

Appendix

Introduction

The purpose of this Chapter is to familiarize the user with the product and/or to guide the user through a series of steps that lead to the completion of a task. It contains all essential information for the user to make full use of the system. If a new person is using it online help will be provided in that we are going to explain each and every step clearly by our product can be useful for any user. This manual includes a description of the system functions and capabilities, Software Requirements and operations, and step-by-step procedures for system access and use. Describing how to install and make the System ready to be used.

Hardware/Software Requirements for the System

Users will use any web browser (including Mozilla Firefox, Internet Explorer, Google Chrome) to access the Website and internet connection. And Any android Device for Android Application above API Level 21

Hardware/ Software Requirements for Website

Users will use any web browser (including Mozilla Firefox, Internet Explorer, Google Chrome) to access the Website and High-Speed internet. For our database, we will be using MongoDB. For the interface that the user sees, we will be using HTML.

Hardware/ Software Requirements for Application

- An android phone which supports a minimum version of SDK 21
- Free space minimum of 20MB

Installation guide for Application

- First, download the Application.
- Check the phone storage before installation.
- If auto play is enabled, the installation screen will appear automatically.

- If autopay is not enabled, navigate to the App where the download Application is stored
- The App should be installed and an application under the name “News Recommendation” should appear. Click the application and the App will start.

Operating Manual

- Launch the application created through the installation
- You should come to the launcher screen after that dashboard of interest categories name show you have to enter a minimum 3 interest and click on next user must login to read their interest news
- After enter your interest user have to complete the registration process create an account and login to the application if you want to login with google you must click on the “sign in google” button
- Now we see the news according to your interest with title and description
- Click on news it will show the whole news in web view also you can share the news and open news in the default browser the user uses on his device.
- Click on the top left drawer to select more options to select the latest news to read about the current situation of the world
- Bookmark news if you want to read news later
- Drawer will guide user manual properly

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Chapter 6

CONCLUSION

This final year project, carried out over two semesters, requires a lot of research and learning in theory, algorithms, technologies, frameworks, etc. Before learning a tech stack, we have fully explored it and understood its down and up sides and compare it with other existing technologies and finally choose the latest and best tech stack considering latest technologies and some other parameters. Our motivation was not only final last year of the project, we also wanted to develop a product that could be brought to market and that would be a solution to the existing problem. And we have reached Alhamdulillah's. Now our end users can sign in with their Google account and view news related to their interests. You can view news from multiple channels on one platform, save, bookmark or share news, etc.

Our first challenge was to get daily news into our system database for that purpose we use the concept of web-scraping to scrap news from different Pakistani news channels like Geo, Ary, Dunya, Bol etc. During First 3 months we scraped only labeled news. In the result of that we got 25,000 news samples. Now we can use them to train our model for news classification so we can also scrap un-labeled news. For News classification purpose we have used the concepts of NLP like stop words removal, word lemmatization, word stemming etc. And Random forest is used for classification. Till this stage we have solved our first challenge and then we move to the next step and build and end points, REST API in order to get those news to the front end applications. While making REST API we also build a recommendation system design in which we use three types of recommendation. First Content based recommendation in which we ask users while sign in to tell their interest topics, then we use the concept of market basket analysis and generate rules using Apriori algorithm for generating rules using Apriori we ask our friends and families to get login into our system and give their three interests, so we have 223 users with their interests with this data we generate rules and now we use these rules for generating users profiles and third Hit based recommendation, when user click on any topic or news which is not according to their interest then we update their profiles. After that we make proper front end apps, Android app using java and xml and single page Web app using Reactjs.

We have learned a lot from this project because we are building it end to end, that is, from zero to final deployment. When we did this, we get familiar with every step from design to testing of Complete distributed system development process.

6.1 **Recommendation for Future Project**

While doing any project we do slip-ups and afterward we gain from that botches same as we have likewise done a few errors in the venture and we took in a great deal from them and for any undertaking in future we will consider these focuses to accomplish better outcomes.

- Make complete UML diagrams before starting implementation.
- Build complete logical scheme of the system data base.
- Become familiar with all technologies that are associated with the project prior to beginning execution.
- Group meetings are necessary continuously throughout the project.
- Time limits for creating and testing of every part ought to be clear and followed.
- Testing team should be different from developing.