UNIVERSITY PARTNER

UNIVERSITY OF WOLVERHAMPTON

HERALD COLLEGE KATHMANDU

Project and Professionalism

(6CS007)

A2: Project Report

[Movie Streaming System]

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Cohort : 4

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1. Introduction

1.1. Project Briefing

With the exponential development of available data on the network, individuals can obtain more and more information and have more expanded choices through the Web, which brings extraordinary comfort to people's standard of living. In any case, individuals are too misplaced within the sea of data and it is difficult to form the correct choice. For my final year project, I have decided to build a Movie Streaming web-site. It is an online platform where people can watch, search, rate and review the uploaded/streamed videos easily. This site will also have a recommendation feature where viewers are recommended similar sort of movies and shows they tend to enjoy. There are many similar web-sites like Netflix, Amazon prime, Mixer, etc. with Netflix being the most popular among the lot. But some of the less popular movie streaming sites over the internet doesn't seem to have a proper UI/UX and are less optimized.

This movie streaming website aims to cover the following:

a. Users

There are 2 types of users: Admin and Viewers. Admin user manages the entire site. Viewers are further divided into two groups: registered and unregistered viewers. The unregistered viewers are also known as guests. Viewers can register through completing the entire signup process. Registered users and admins have the facility to log in and out whereas guest can only surf the site.

b. Videos

Movies and shows are uploaded to the site by the site admins with proper description of the uploaded video. Admin have the option the remove any video from the website.

c. Recommendation

A recommendation feature is provided where viewers are recommended similar genre of videos they tend to enjoy.

d. Review/Rating System

All the viewers can watch the video but only the registered viewers have the facility to rate and review the published video.

e. Search Option

The user can search and filter their results on the site according to the given option.

1.2. AI of the Project

For the video recommendation part of my project, I have chosen content-based filtering as the major algorithm.

1.2.1. Short AI Description

A content-based recommendation system uses information provided by the user, either directly (ratings) or indirectly (search terms). A user profile is created based on this information, and it can then be used to make recommendations to the user. The engine becomes increasingly reliable as the consumer provides more inputs or acts on the recommendations.

Content-based filtering is the most common approach when designing recommender systems. In other words, content-based filtering methods are based on a description of the item and a profile of the user's preferences. These methods are best suited to situations where there is known data on an item (name, location, description, etc.), but not on the user. Content-based recommenders treat recommendation as a user-specific classification problem and learn a classifier for the user's likes and dislikes based on an item's features. In this system, keywords are used to describe the items and a user profile is built to indicate the type of item this user likes. In other words, these algorithms try to recommend items that are similar to those that a user liked in the past, or is examining in the present. It does not rely on a user sign-in mechanism to generate this often-temporary profile. In particular, various candidate items are compared with items previously rated by the user and the best-matching items are recommended. This approach has its roots in information retrieval and information filtering research. In order to create a certain user's data profile, the algorithm focuses on information such as model of the user's preference and also the user's previous interaction with the recommender system. (Machine Learning, 2020)

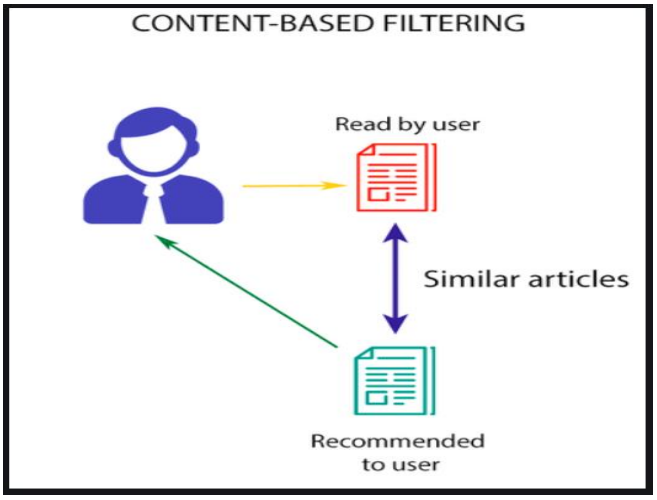


Figure 1: General Logic behind Content-based Filtering

1.2.2. The AI Type

Content-based filtering is a supervised machine learning. Supervised learning is used in the vast majority of practical machine learning applications. Supervised learning permits the collection of data and the output of data from prior experiences. Content-based filtering comes under supervised machine learning as it uses labeled datasets in order to classify data as well as to predict data with a higher level of accuracy. (Guru99, 2020)

1.2.3. Working/ Mathematics Behind AI

Content-based filtering is a simple way to design recommendation models as it does not require multiple user's data while recommending a certain object to an individual. Instead, it surfs the user's profile data and their preference for the recommendation.

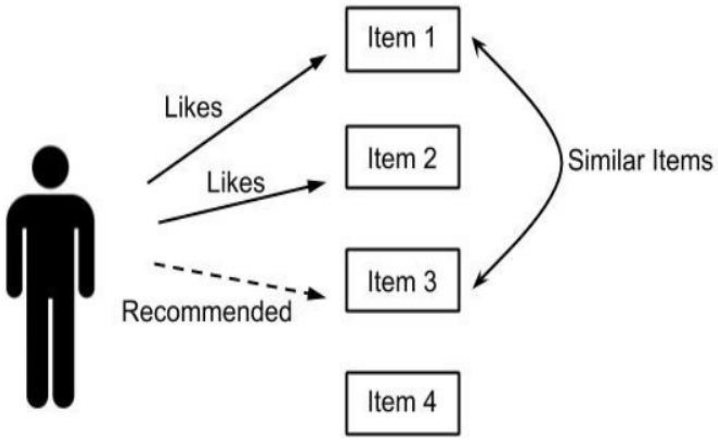


Figure 2: General Working of Content-based Algorithm

For example: Assume a user named Steve who is a frequent viewer of latest movies and shows. Among the latest movies, Steve has recently watched 3 of them that are 'Joker' an action movie, 'Avengers: End Game' a superhero type movie and 'Finding Dory' an animation movie. In the three movies Steve's watched, he has given a good rating to 'Joker' and 'Avengers: End Game' but a bad rating to 'Finding Dory'. Observing the scenario, a user vector for Smith is created based on his 3 ratings.

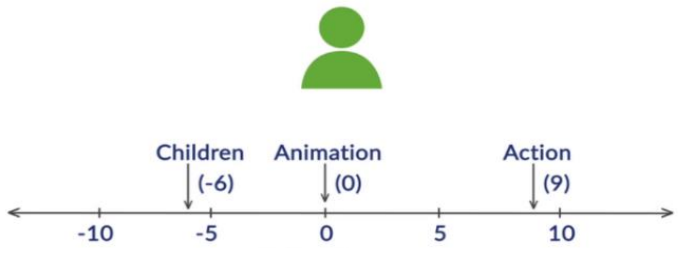


Figure 3: User Vector Scale Sample

Analyzing and calculating the user vector, an item vector is also introduced which consists of properties of each movie i.e., for the movie 'Finding Dory', its item vector is (0, 0, 1) in order of (Action, Superhero, Animation). Then a dot product of User vector and Item vector is required which can be accessed using the formula shown in the figure below: (Medium, 2019)

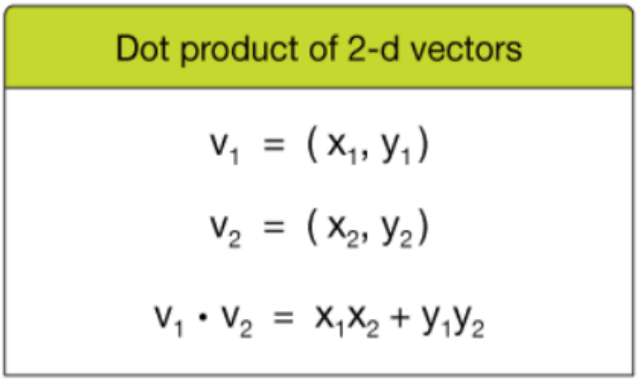


Figure 4: Dot Product of 2D Vectors

After analyzing and comparing the dot products of various movies, the movie with the highest dot product is recommended to Steve.

1.2.4. Agent Description

The project 'Movie Streaming System with Recommendation' is in no way or form linked with any organization, business or external individual. It is only done as my final year project completed under the guidance of my supervisor Mr. Manish Deuja who is also the agent of this project.

2. Aims

i. To provide a simple platform for viewers to enjoy movies and various shows,
ii. To be able to recommend viewers similar kind of videos they tend to enjoy.

3. Objectives

i. To create a suitable environment for the site admins to work on,
ii. To create a stable database of videos and viewers and also to make sure that users' data remains secured,
iii. To make sure that the recommendation provided to the viewers is accurate.

4. Academic Questions

i. What are the features of your project? What are the advantages and disadvantages of having those features?
ii. Can a machine learning model be accurate enough to recommend the users the movies and TV series that fit into their field of interest? If yes, what level of accuracy can it yield?
iii. How can content based filtering sort out various users according to the genre of movies and TV shows they watch?

5. Scope and Limitation of the Project

The project has its own pros and cons. The website certainly overpowers the cons with the pros. The project comes with various features for the viewers to enjoy along with a secure database. The viewers are only recommended the videos that they tend to enjoy and they also have the ability to rate the videos. This makes the users' experience very joyful.

No matter how many the pros are, its limitations still can't be neglected. The project uses content-based algorithm which may not yield as much accuracy as the collaborative filtering. As of now there is no feature for the user to communicate with each other and with the admin panel. These limitations will surely be eradicated to a certain extent in the upcoming updates.

6. Artefact

The whole system is split into the following sub-systems:

i. User Management System
ii. Videos Management System
iii. Recommendation Management System
iv. Rate/Review Management System

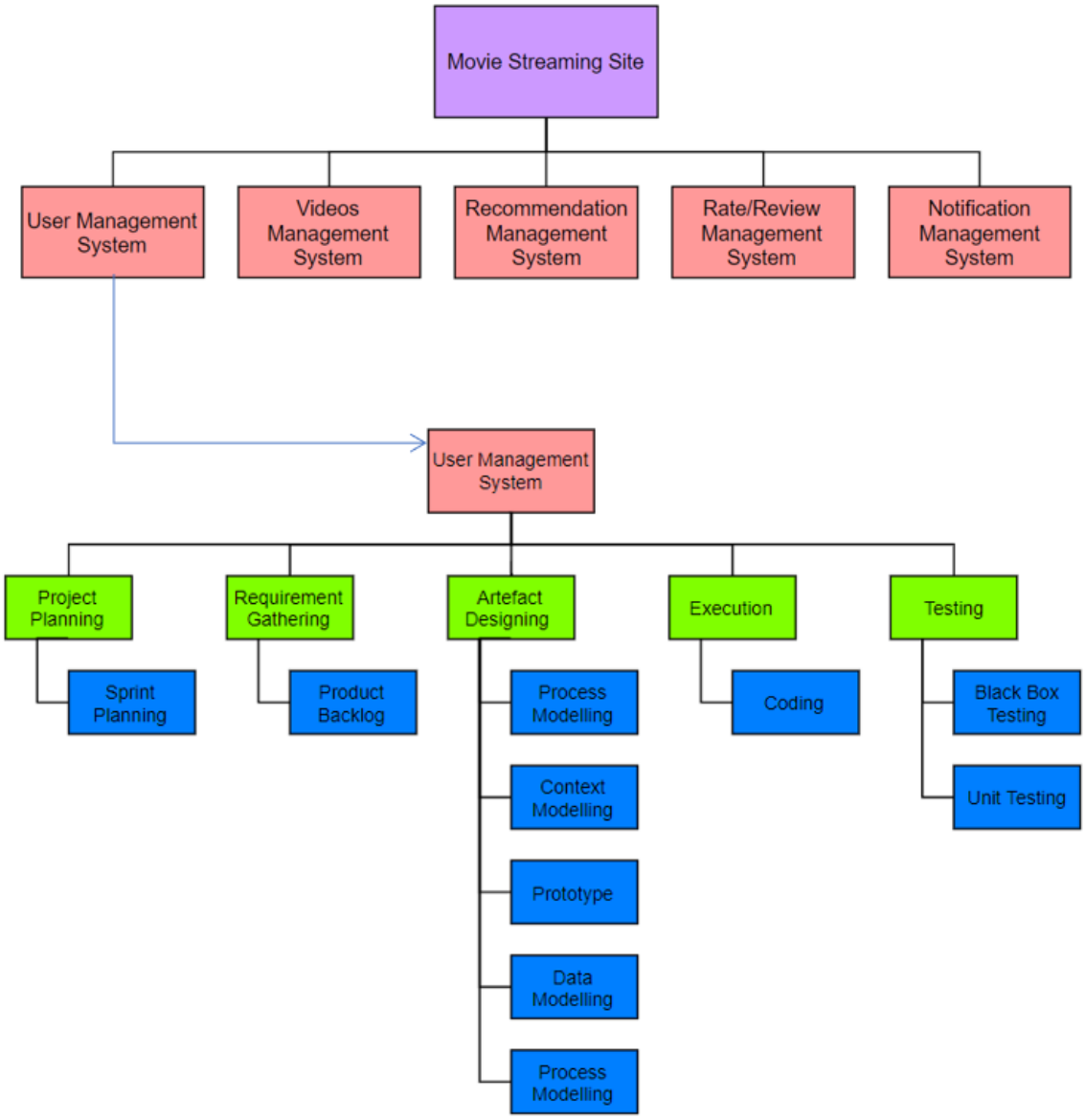


Figure 5: FDD

7. Literature Review

7.1. Investigation Through Research Paper

With the fast advancement of Web technology, today's society has entered the period of Web 2, information overload has ended up a reality. How to discover the desired information within the mass of data has become a hot investigate point. Even the movie platforms have changed over the years. From the classic cinema theatres to own personalized home televisions, the movies these days have overtaken the web platform. Rarely do people these days open their TV to watch videos instead they surf the internet. Movie is one of the most spiritual amusement, but it too has the issue of data overload.
Personalized recommendation attempt to know the characteristics and preferences of the client by collecting and analyzing historical behavior to know what kind of individual the client is, what kind of behavior preference the client has, what kind of things the client like to share and so on, and at last understand that user characteristics and preferences based on the rules of the stage and suggest the information and products which the client interested.

Personalized recommendation system is a kind of data filtering technology. It is an integrated framework which is a combination of a variety of information mining algorithms and client related data, to meet the interface or potential interests of clients. The common recommendation system is categorized as content-based recommendation system, collaborative filtering recommendation system, and hybrid recommendation system. Each suggestion algorithm has distinctive utilize range and utilize condition; it results within the use of different recommendation algorithm for the same data suggestion. Within the actual application of proposal system, the system tends to be a hybrid recommendation system. (Cui, 2017)

7.2. Research Regarding Similar Systems

Some of the systems that are very similar are as follows:

i. Netflix

Netflix is the world's top streaming entertainment benefit with 193 million paid memberships in over 190 countries getting a charge out of TV series, documentaries and feature movies over a wide range of classes and languages. Individuals can look as much as they need, whenever, anyplace, on any web associated screen. Individuals can play, pause and resume watching, all without ads or duties. It works through the following fragments: Domestic as well as International Streaming and Local DVD.

Netflix works with taste groups. Each viewer fits into numerous groups and these influences what recommendations pop up to the best of each onscreen interface, which sort columns are shown and how each row is organized. In the event that your viewing patterns are comparable to another client Netflix will serve up recommendations based on the behavior of that other clients as well.

Each time one press plays and spends a few times viewing a TV show or a movie, Netflix is collecting information that advises the algorithm and revives it. The more one watches the more up to date the algorithm is. The collected information is multi-faceted and complex, but it includes way more than fair processing the sort of a program a client is watching and recommend him or her dramas, romances or comedies. (UX Planet, 2020)

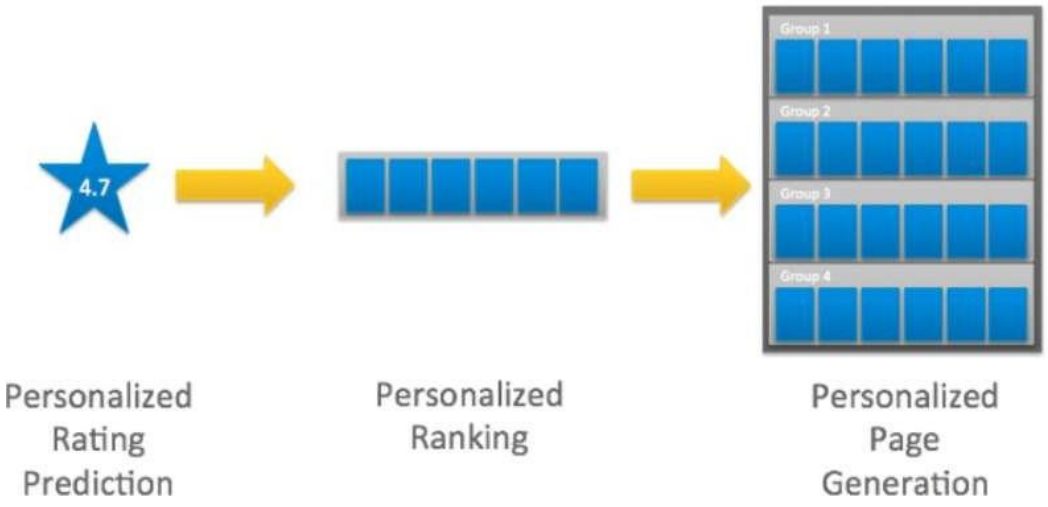


Figure 6: Rating Process in Netflix

ii. Amazon Prime Video

Prime Video, moreover showcased as Amazon Prime Video, is an American Web video on demand service that's created, claimed, and operated by Amazon. Amazon Prime is a paid membership system from Amazon that gives clients access to extra benefits otherwise inaccessible or accessible at a premium to standard Amazon clients. Services consist of same, one or two-day streaming music and video. As of 2019 Amazon Prime has more than 150 million members.

Amazon Prime uses A9 algorithm. The A9 Algorithm is the framework which Amazon uses to choose how videos are positioned in search results. It is comparative to the algorithm which Google uses for its search results; in that it considers keywords in choosing which results are most significant to the search and thus which it'll show to begin with. In any case, there's one key distinction between Google and Amazon's algorithms: the A9 algorithm moreover puts a solid emphasis on sales changes.

Typically, because Amazon is a business, and contains a vested interest in advancing listings and are more likely to result in sales. Subsequently Amazon will rank postings with a strong sales history and tall change rate more highly.

This features an aggregate impact: videos which are more profoundly positioned are more likely to get more activity and hence have a stronger and a much better chance of accomplishing high deals. In turn, this will boost their positioning, and so on. (RepricerExpress, 2020)

Figure 7: Working of A9 Algorithm

iii. Hot Star

Hot Star is an Indian membership video on-demand streaming company claimed and developed by Star India, a backup of The Walt Disney Company India. Hot Star is an Indian site famous for streaming movies, TV shows and live cricket as well as football and movies. Although it is less popular in comparison to its international counterparts like Netflix and Amazon Prime, Hot Star has almost 300 million subscribers all over the world among which 8.5 million are paid premium members. (Android Authority, 2020)

7.3. Research Regarding Similar Algorithms

i. Collaborative Filtering

Collaborative Based Filtering is based on the term 'Sharing Opinion with Others'. Collaborative Filtering is the method of filtering or assessing things utilizing the opinions of other individuals. It works by looking a huge gather of individuals and finding a littler set of clients with tastes comparative to a specific client. It can be considered as the improved version of content-based filtering. Content-based filtering makes suggestions based on client preferences for item features while collaborative filtering mirrors user-to-user suggestions. (Schafer & Ben, 2020)

For example: Ram is considering buying a new watch and if his friends bought similar watch and liked it then he would definitely be buying it. At the same time if his friends tell him that the watch is terrible and a waste of money then he would reconsider buying it. Let's further breakdown this example. Shyam, one of Ram's friends, recommends him the model of watches that Ram likes whereas Hari seems to recommend models of watches that Ram doesn't prefer. Over time, he learns whose opinions he should listen to and how these opinions can be applied to help him determine the quality of an item.

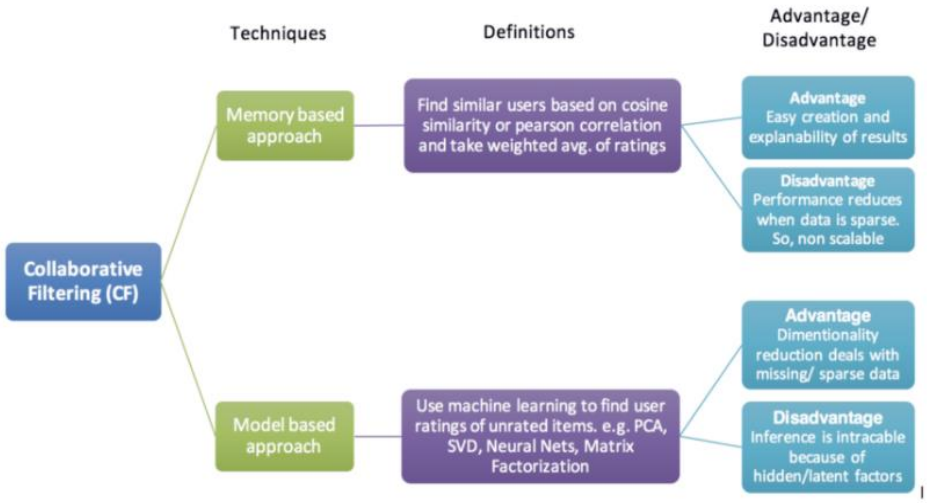


Figure 8: Features of Collaborative Filtering

Although content and collaborative-based filtering fall under the same category of recommendation system, but when it comes to working mechanism and processing both of these algorithms are miles apart. While recommending something to a certain individual, content-based filtering is always confined to the recent history of that individual whereas collaborative filtering observes other people's behavior who in same way or form fall under a similar genre. Statistically, collaborative filtering yields a higher level of accuracy in comparison to content filtering.

ii. KNN Algorithm

In design recognition, the k-nearest neighbors' algorithm (k-NN) is a non-parametric strategy proposed by Thomas Cover utilized for classification and relapse. In both cases, the input consists of the k closest preparing illustrations within the feature space. The yield depends on whether k-NN is utilized for classification or regression. In k-NN classification, the output could be class participation. An object is classified by a majority vote of its neighbors, with the object being relegated to the class most common among its k closest neighbors (k may be a positive number, regularly little). In the event that k = 1, then the object is essentially assigned to the class of that single closest neighbor. In k-NN regression, the output is the property esteem for the object. This value is the average of the values of k closest neighbors. (Analytics Vidhya, 2020)

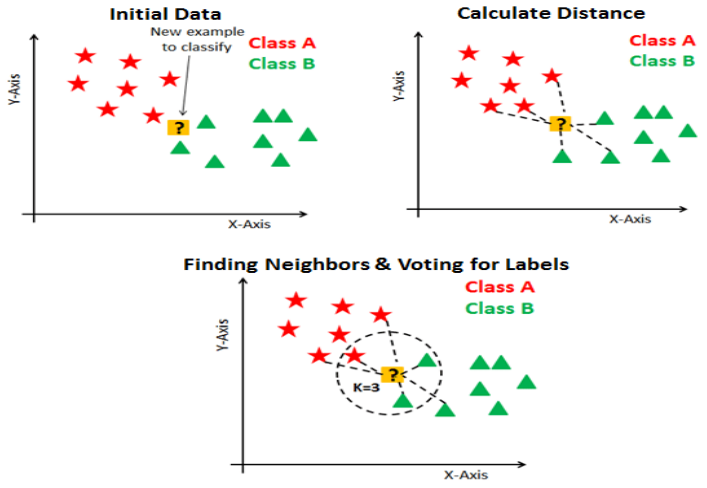


Figure 9: Working of KNN algorithm

The working of KNN algorithm is some what similar to the working of collaborative filtering as both are suitable for classification and regression problems. In fact, these days a hybrid algorithm is very popular that includes both of these filtering process. But having similarity with collaborative filtering means that the KNN algorithm is a lot different than content-based filtering.

8. Project Methodology

8.1. Considered Methodologies

i. Waterfall Development Lifecycle

During the basic research while planning the project, it was not that difficult to figure out that waterfall model is not the right approach for the system. This methodology is not suitable for such a fairly complex project and the model also does not favor revision. So, if any thing has to be changed during mid project, then whole phenomenon had to be redone. (Geeks for Geeks, 2020)

ii. V-Shaped Software Development Lifecycle

Although the V-shaped model is an upgrade from the basic waterfall model, it isn't still a perfect methodology for this project. This model is very rigid for such project and if the agent demands any change throughout the development process, the requirements and all the documents have to be redone. (Geeks for Geeks, 2020)

8.2. Selected Methodology

- Agile Methodology

Agile methodology eradicates most of the drawbacks possessed by waterfall and V-shaped model which makes it the perfect methodology for this project. Handling of changes is very simple in this model and the project can be of a better quality as there is a frequent involvement of both developer and the client.

What makes the agile model one of the most efficient is its strategy called as scrum. The whole project is divided into simpler sub systems and are worked on one at a time. The system is firstly initiated and is followed by planning and estimation. Then the implementation is carried out through coding and other means and finally the project is deployed after successfully reviewing all the work done on the sprints. (Scrum Study, 2020)

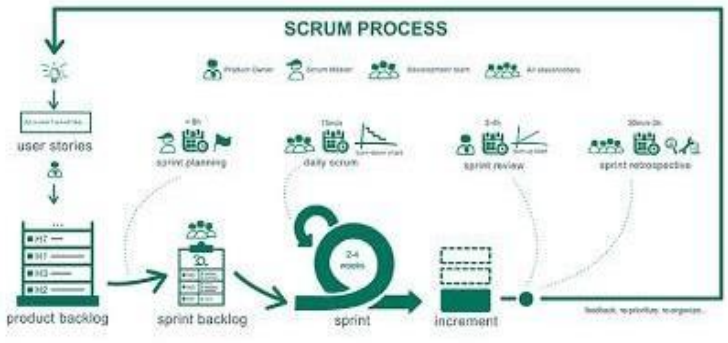
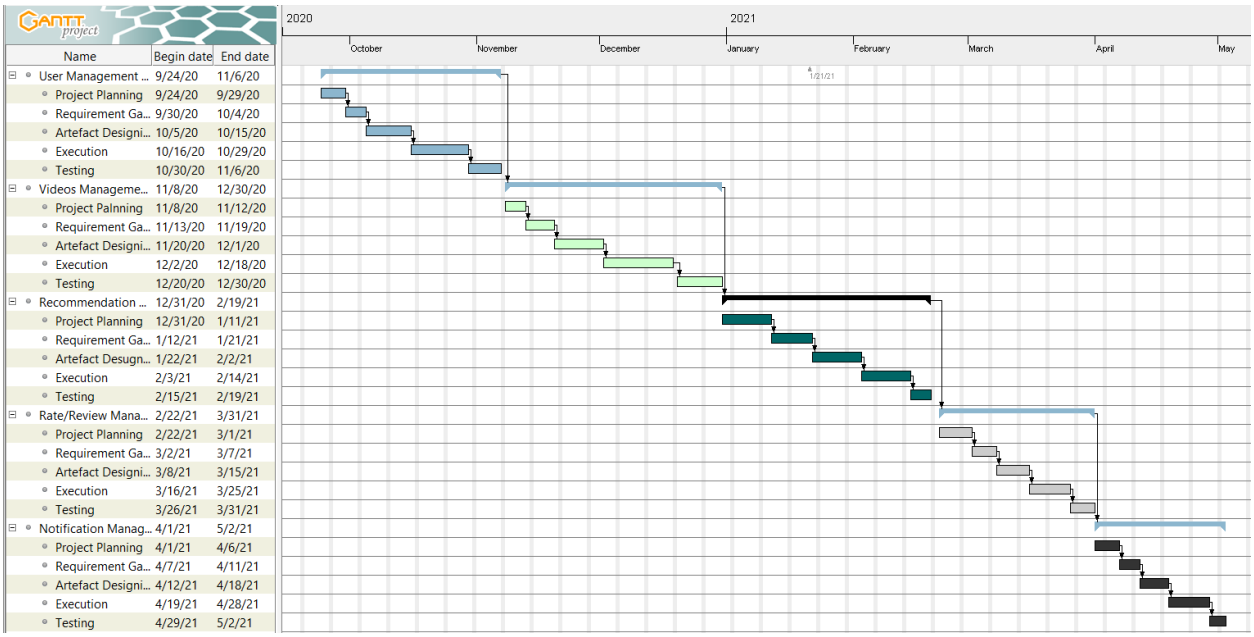


Figure 10: Scrum Process

8.3. Gantt Chart

The plan/schedule of the development of the entire system is shown in the Gantt chart below:



Name	Begin date	End date
User Management ...	9/24/20	11/6/20
Project Planning	9/24/20	9/29/20
Requirement Ga...	9/30/20	10/4/20
Artefact Designi...	10/5/20	10/15/20
Execution	10/16/20	10/29/20
Testing	10/30/20	11/6/20
Videos Manageme...	11/8/20	12/30/20
Project Palnning	11/8/20	11/12/20
Requirement Ga...	11/13/20	11/19/20
Artefact Designi...	11/20/20	12/1/20
Execution	12/2/20	12/18/20
Testing	12/20/20	12/30/20
Recommendation ...	12/31/20	2/19/21
Project Planning	12/31/20	1/11/21
Requirement Ga...	1/12/21	1/21/21
Artefact Desugn...	1/22/21	2/2/21
Execution	2/3/21	2/14/21
Testing	2/15/21	2/19/21
Rate/Review Mana...	2/22/21	3/31/21
Project Planning	2/22/21	3/1/21
Requirement Ga...	3/2/21	3/7/21
Artefact Designi...	3/8/21	3/15/21
Execution	3/16/21	3/25/21
Testing	3/26/21	3/31/21
Notification Manag...	4/1/21	5/2/21
Project Planning	4/1/21	4/6/21
Requirement Ga...	4/7/21	4/11/21
Artefact Designi...	4/12/21	4/18/21
Execution	4/19/21	4/28/21
Testing	4/29/21	5/2/21

Figure 11: Gantt Chart with Major Milestones

9. Tools and Technologies

9.1. Programming Language

Python is used as the major programming language for the backend development as it is easier to learn, write and execute for website development over other programming languages. Python is also open-sourced and is found freely in its official website. Python also supports a number of libraries. Hence, python is ideal for the backend development of this project.

HTML and CSS are used for the frontend part as these are very familiar and is easy to execute even for beginners. Bootstrap is used in certain portions of the website to make attractive navigation bars and footers.

Django framework is selected as it is written in python language. Django comes with a suitable administration interface and is very scalable.

9.2. IDE and Designing Software

Microsoft Visual Studio is preferred over other IDE as it comes with a quick debugging feature and can be customized as per the user's requirement.

Balsamiq is used to design wireframes and Star UML is used to draw required modelling and designing diagrams.

10. Artefact Designing

Each of the sub system is now separately deployed with their own SRS, Activity Diagram, use Case Diagram, ERD, Class Diagram and Sequence Diagram. The legends for SRS of each sub system are shown below:

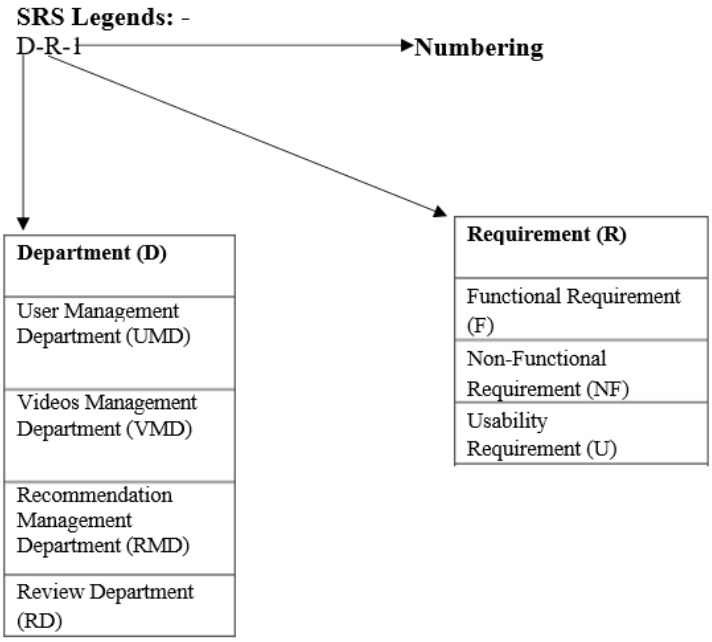


Figure 12: SRS Legends

10.1. User Management System

10.1.1. SRS

Requirement ID	Requirement	Requirement Specification	MoSCoW
UMD-F-1	Sign Up	Building a sign-up feature to the users who are new to the system	Must Have
UMD-F-2	Login	Designing a login feature for the users who have already signed in	Must Have
UMD-NF-1	Error Handling	Displaying an error message if the entered username or password is incorrect	Should Have
UMD-U-1	Interface	A delightful interface for the user to enjoy	Must Have

10.1.2. Designing/ Modelling Diagrams

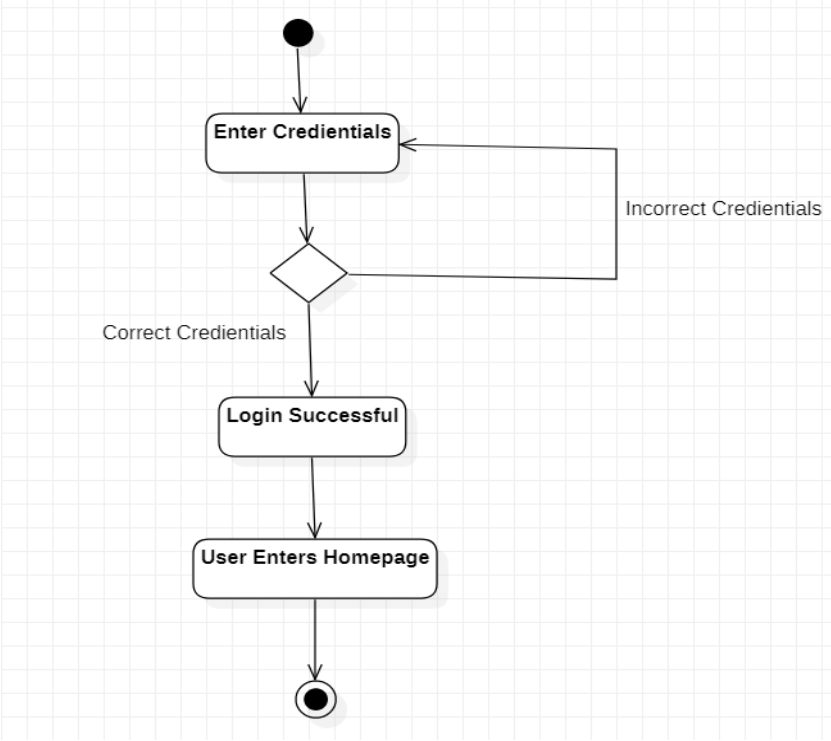


Figure 13: Activity Diagram for User Management System

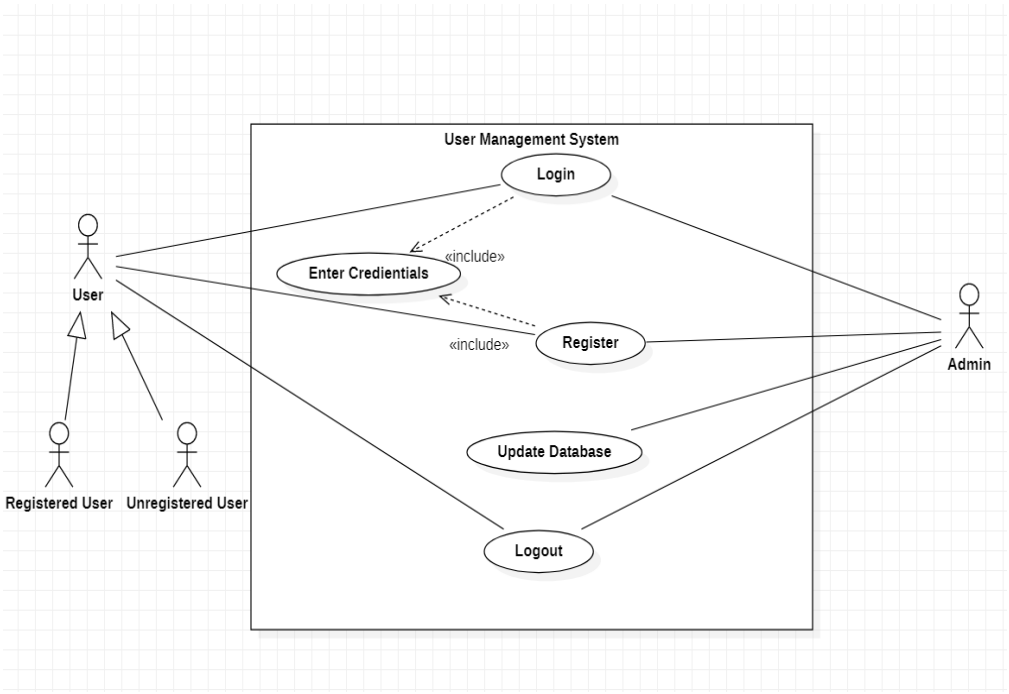


Figure 14: Use Case Diagram for User Management System

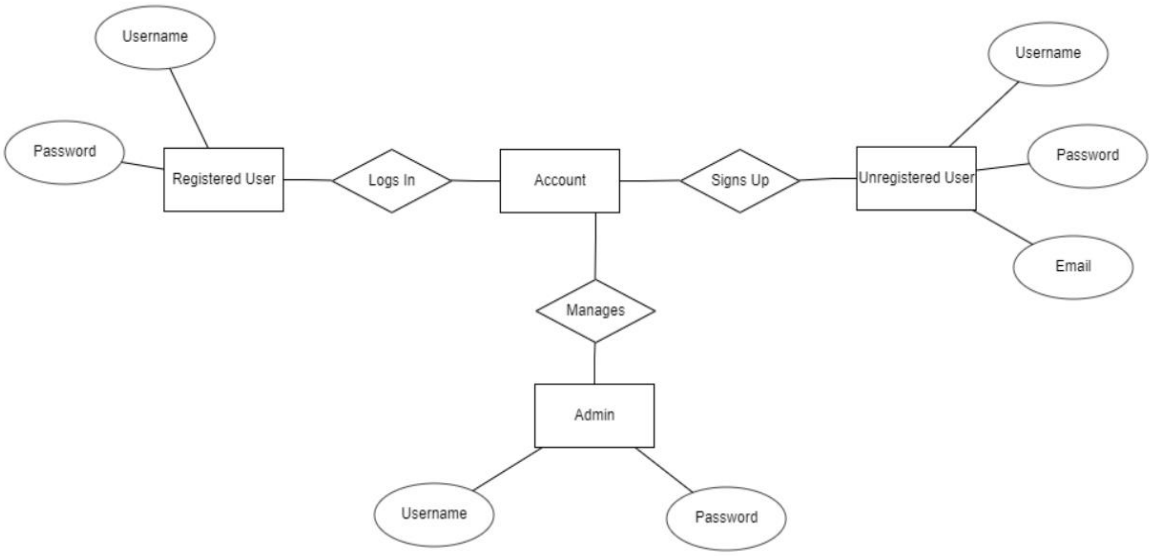


Figure 15: ERD for User Management System

Data Dictionary

Field Name	Field Size	Data Type	Description	Example
User Name	20	Text	Name of the user	John Adams
Password	15	Int	Certain number chosen by the user to keep the account secure	1234567
User Id	10	Int	A certain id number given to the user	199
Address	30	Text	Address of the user	Tokyo, Japan

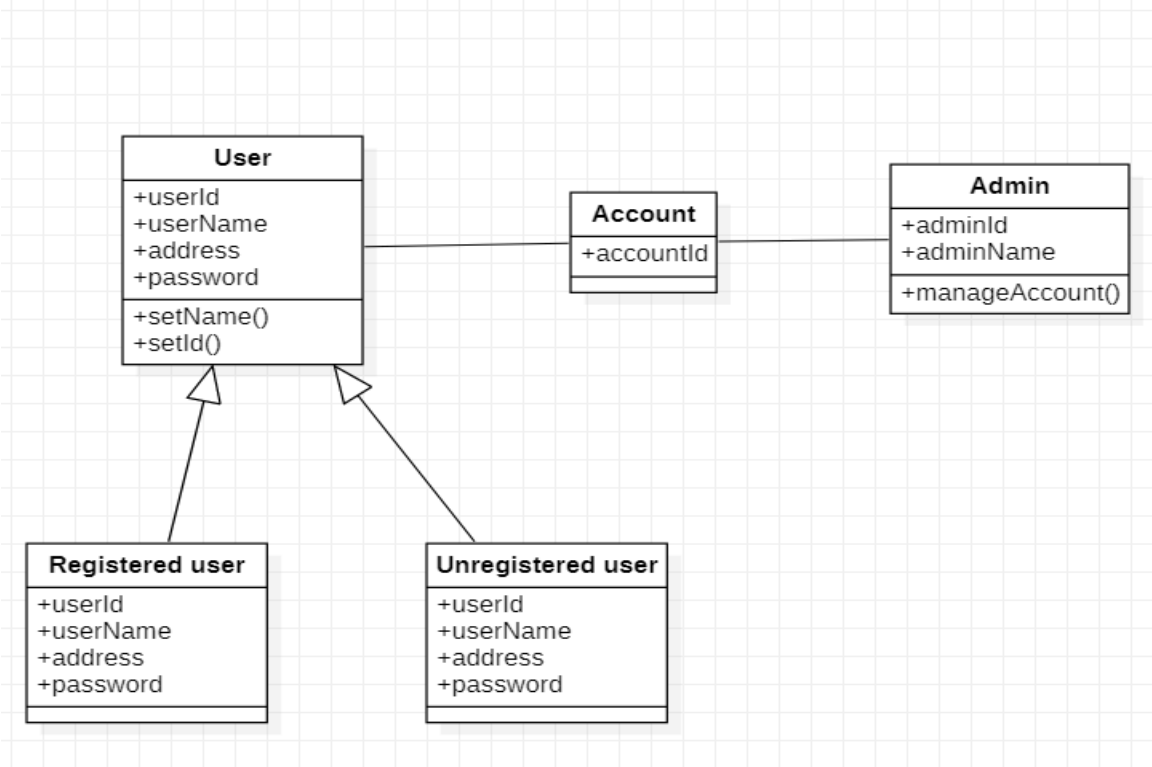


Figure 16: Class Diagram for User Management System

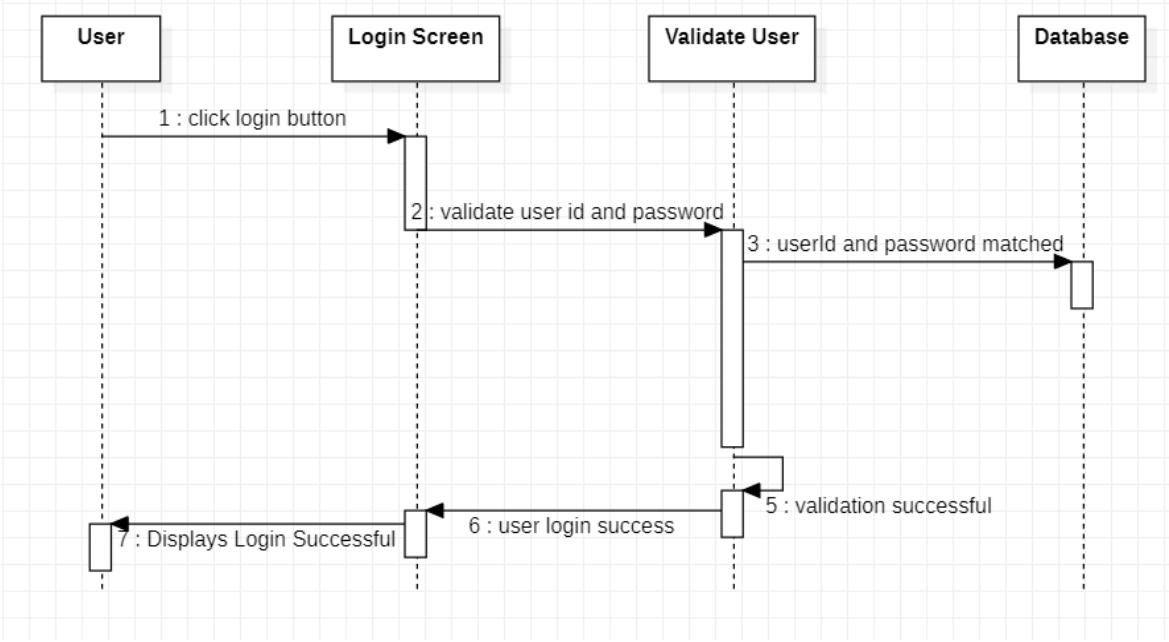


Figure 17: Sequence Diagram for User Management System

10.1.3. Testing

Test Objective: To test whether login process applications well or not.

S.N.	Test Data	Expected Result	Actual Result
1	Correct Username and Password	Login Successful	Login Successful
2	Incorrect Username and Password	Login Unsuccessful	Login Unsuccessful
3	Incorrect Username and correct Password	Login Unsuccessful	Login Unsuccessful
4	Correct Password and incorrect Username	Login Unsuccessful	Login Unsuccessful

Test Result: Test Successful

10.2. Video Management System

10.2.1. SRS

Requirement ID	Requirement	Requirement Specification	MoSCoW
VMD-F-1	Quality videos with title	Uploading quality videos with title every day	Must Have
VMD-NF- 1	Description	Providing brief description to the videos i.e., name of actors, release date, etc.	Should Have
VMD-U-1	Video Interface	A delightful interface for the user to enjoy the videos	Must Have

10.2.2. Designing/ Modelling Diagrams

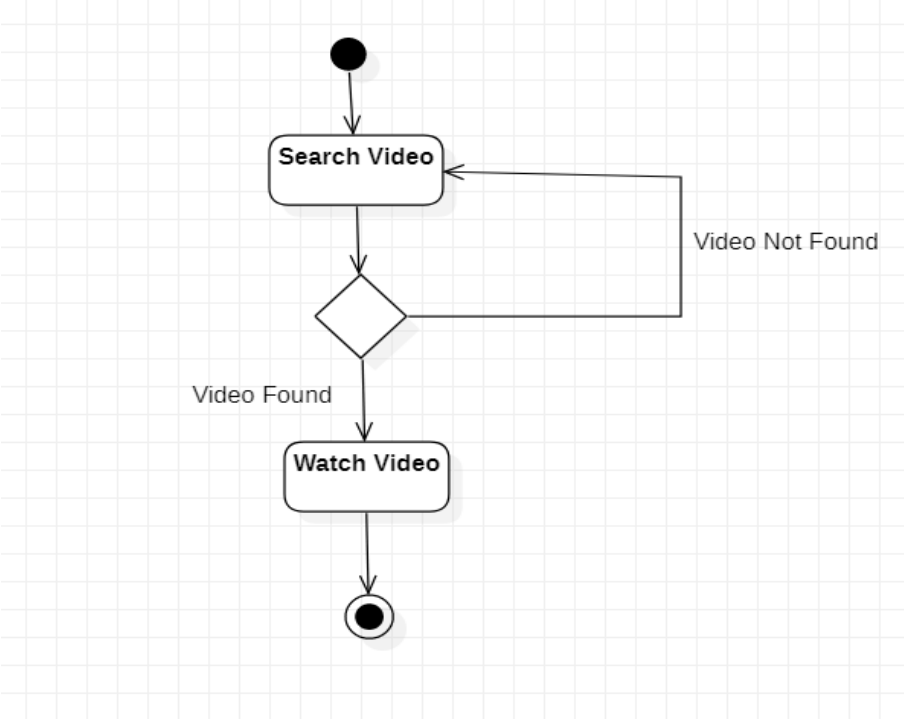


Figure 18: Activity Diagram for Videos Management System

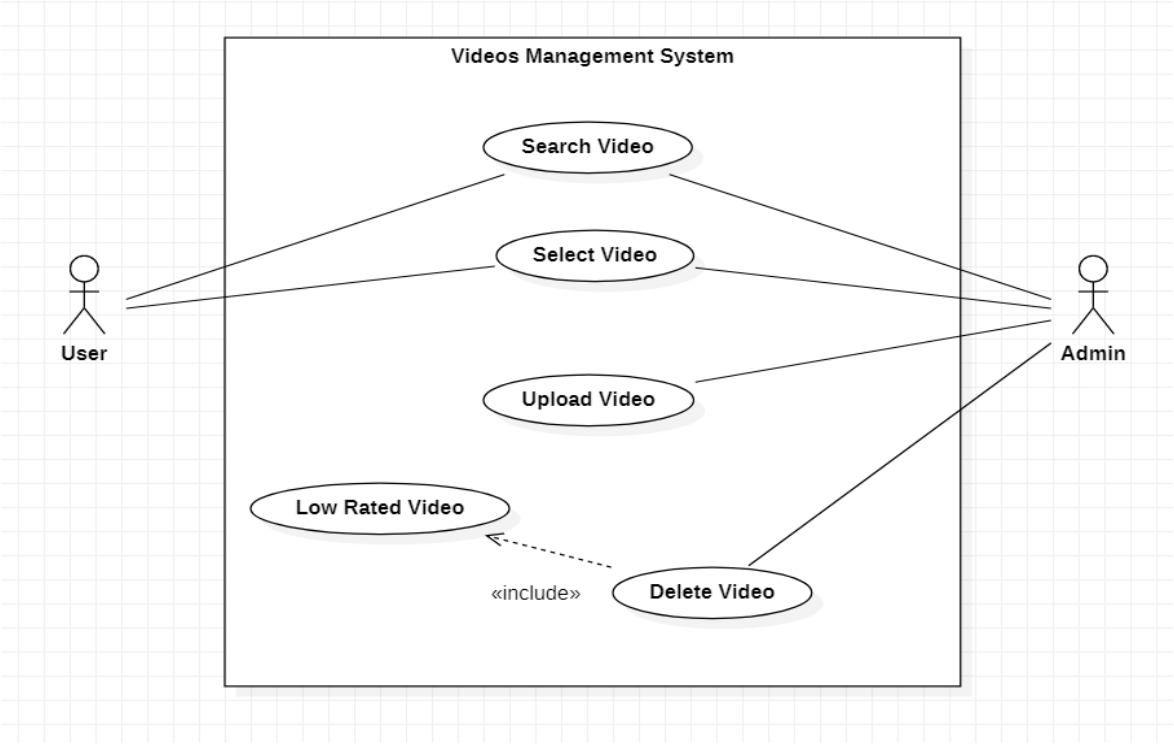


Figure 19: Use Case Diagram for Videos Management System

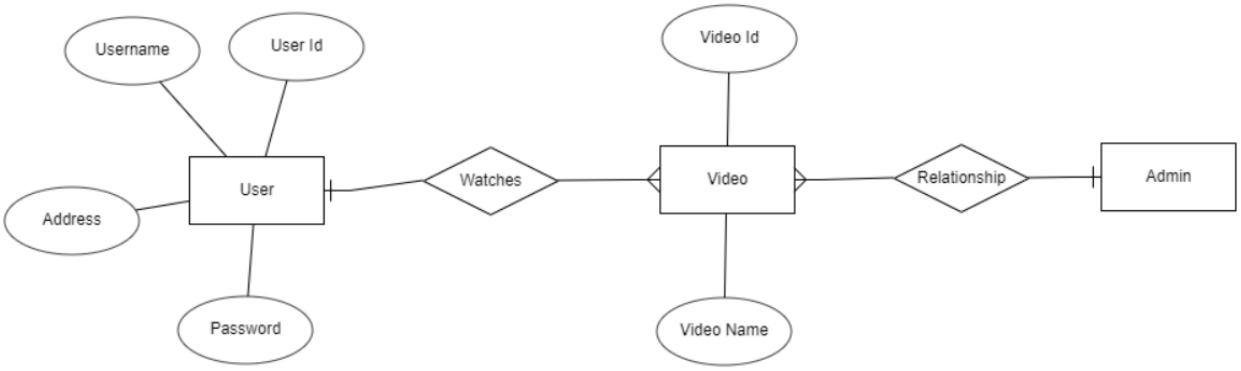


Figure 20: ERD Diagram for Videos Management System

Data Dictionary

Field Name	Field Size	Data Type	Description	Example
User Name	20	Text	Name of the user	John Adams
Password	15	Int	Certain number chosen by the user to keep the account secure	1234567
User Id	10	Int	A certain id number given to the user	199
Address	30	Text	Address of the user	Tokyo, Japan
Video Id	10	Int	A certain Id given to the video	25
Video Name	30	Text	Title of the video	Avengers Infinity War

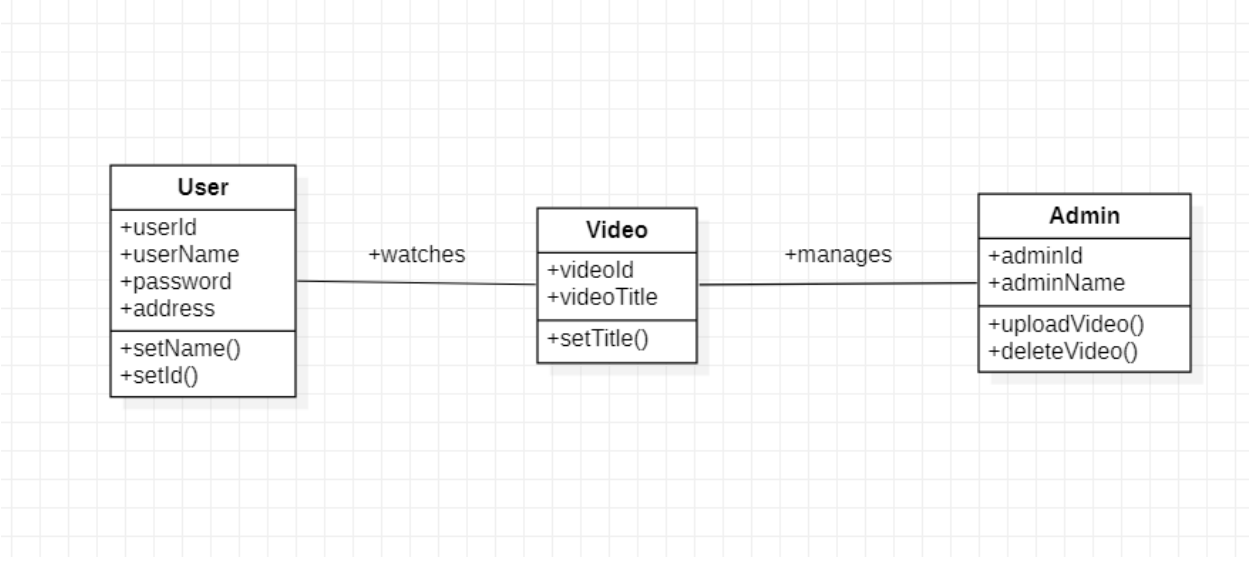


Figure 21: Class Diagram for Videos Management System

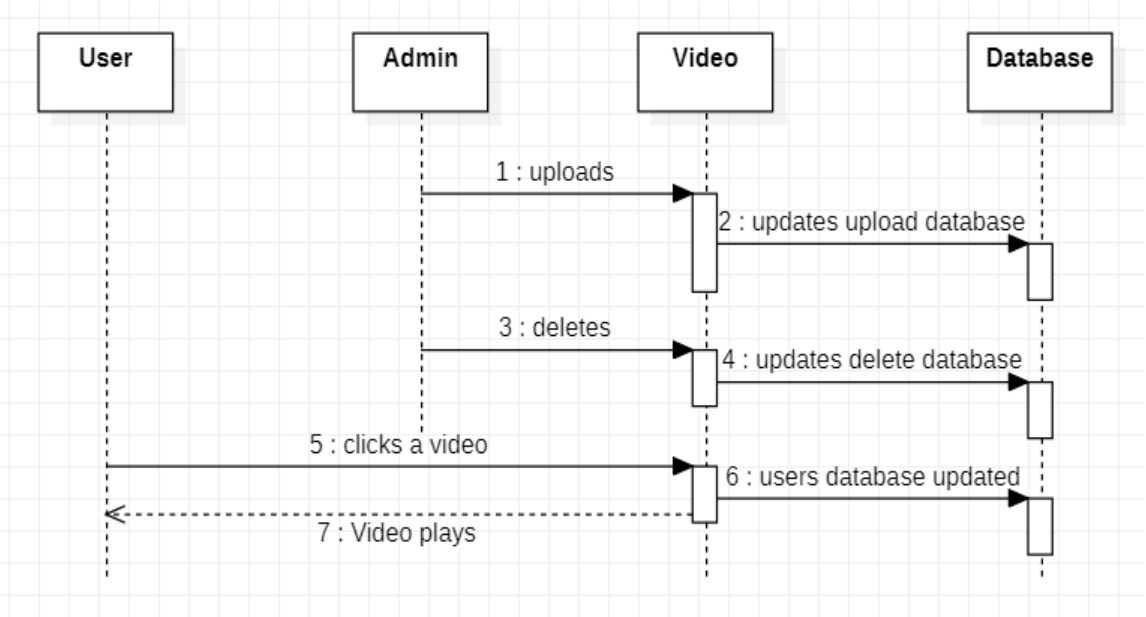


Figure 22: Sequence Diagram for Videos Management System

10.2.3. Testing

Test Objective: To test whether search feature operated well or not.

S.N.	Test Data	Expected Result	Actual Result
1	Search video with incorrect title	Video not found	Video not found
2	Search video with correct title	Searched video is displayed	Searched video is displayed

Test Result: Test Successful

10.3. Recommendation Management System

10.3.1. SRS

Requirement ID	Requirement	Requirement Specification	MoSCoW
RMD-F-1	Accurate recommendation	Recommending users similar video content that they tend to enjoy	Must Have
RMD-NF- 1	Recommending new contents	Apart from similar content, also recommending some extra videos that might be of similar genre	Should Have

10.3.2. Designing/ Modelling Diagrams

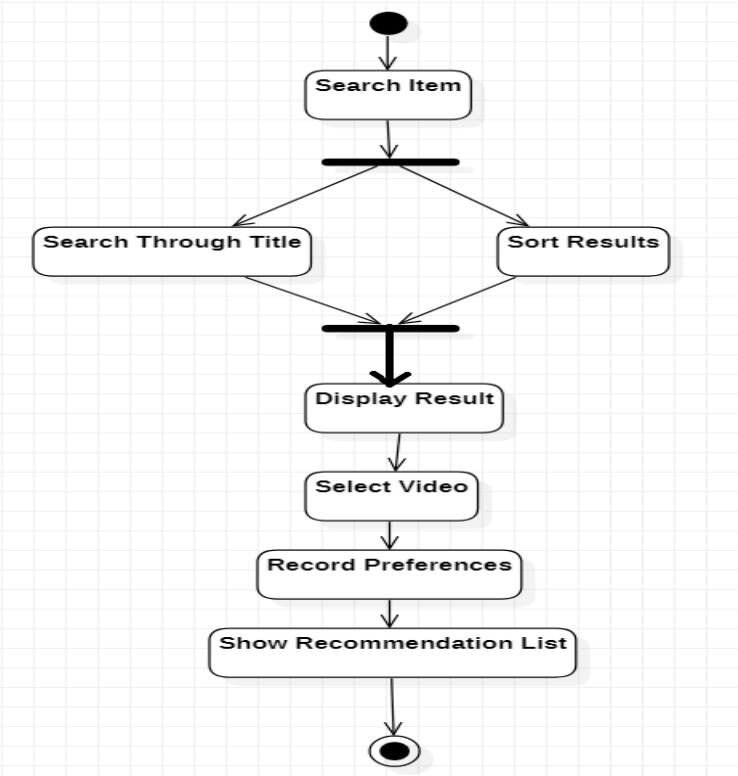


Figure 23: Activity Diagram for recommendation Management System

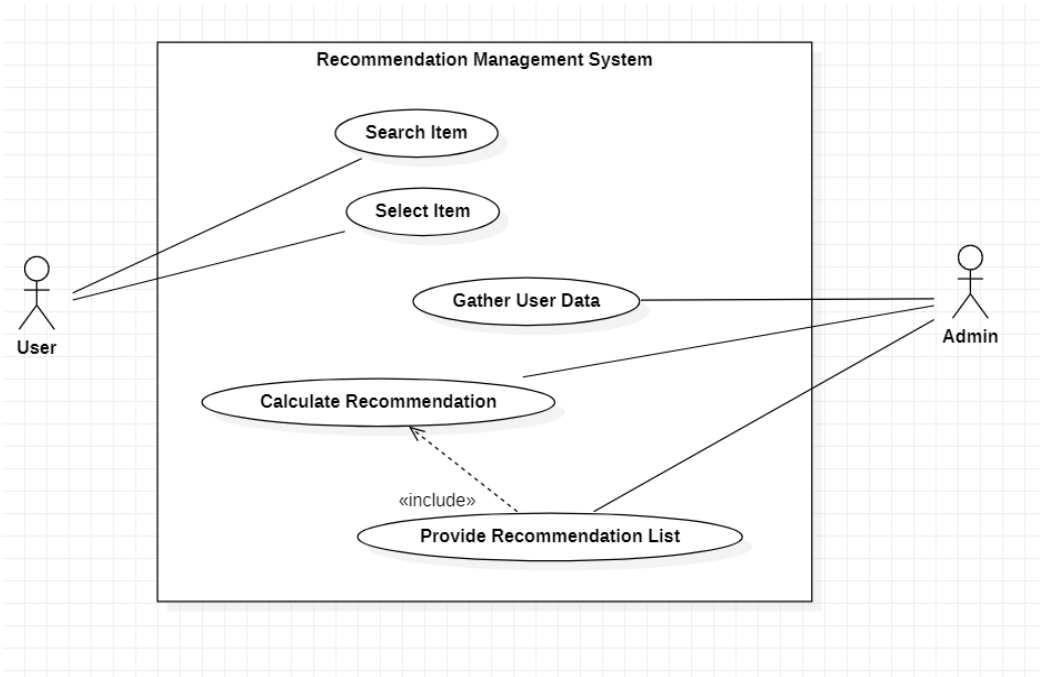


Figure 24: Use Case Diagram for recommendation Management System

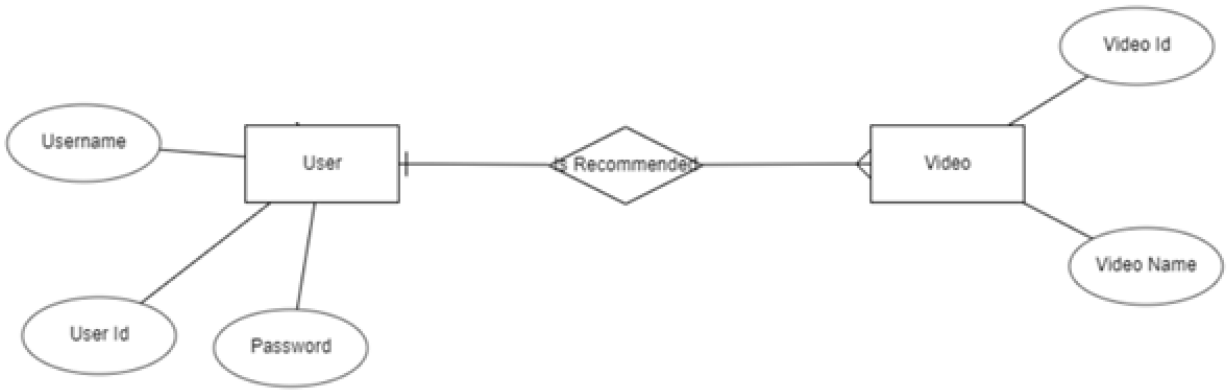


Figure 25: ERD Diagram for Recommendation Management System

Data Dictionary

Field Name	Field Size	Data Type	Description	Example
User Name	20	Text	Name of the user	John Adams
User Id	10	Int	A certain id number given to the user	199
Video Id	10	Int	A certain Id given to the video	25
Video Name	30	Text	Title of the video	Avengers Infinity War

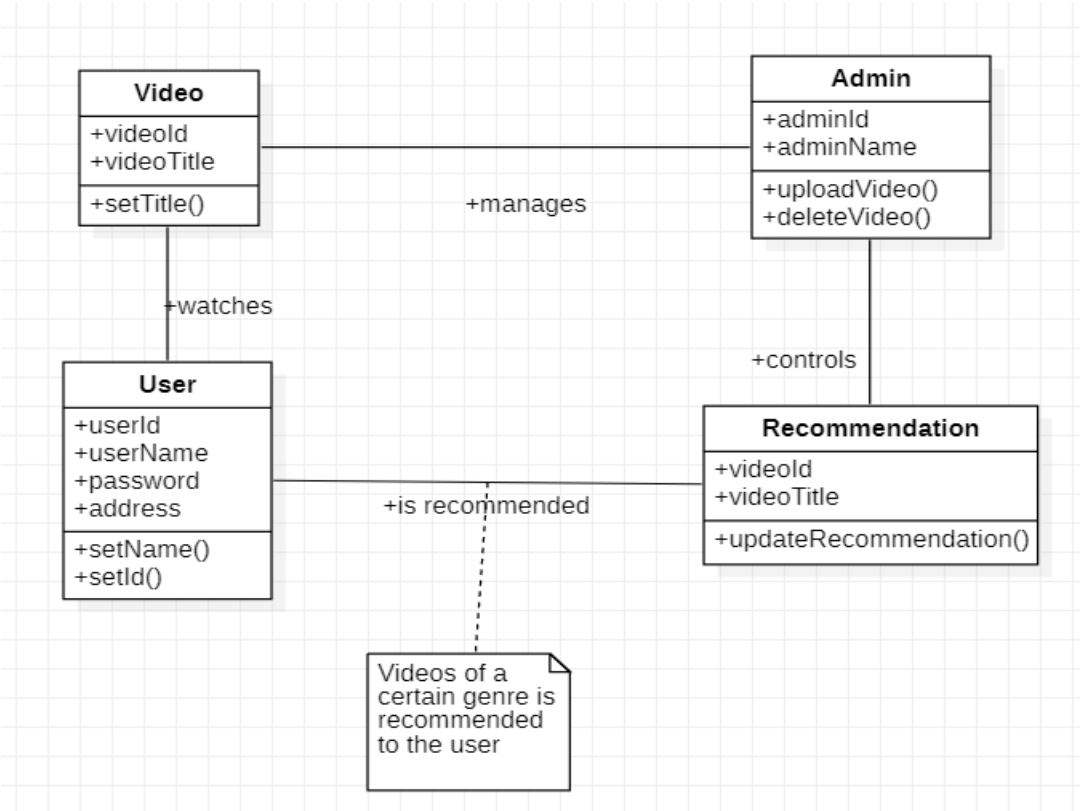


Figure 26: Class Diagram for Recommendation Management System

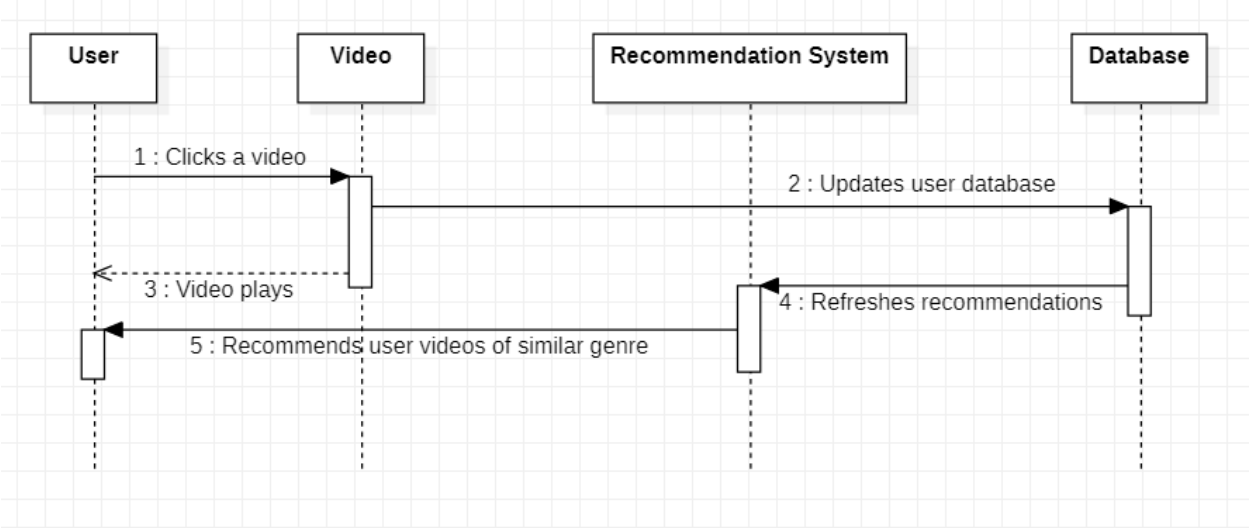


Figure 27: Sequence Diagram for Recommendation Management System

10.3.3. Testing

Test Objective: To test whether the recommendations are accurate or not.

S.N.	Test Data	Expected Result	Actual Result
1	A user mostly watches action videos	More action videos are recommended to the user	More action videos are recommended to the user
2	A user mostly watches comedy videos	More comedy videos are recommended to the user	More comedy videos are recommended to the user

Test Result: Test Successful

10.4. Rate/ Review Management System

10.4.1. SRS

Requirement ID	Requirement	Requirement Specification	MoSCoW
RD-F-1	Rating Feature	Providing the users an option to rate the videos they watch out of 5	Must Have
RD-NF- 1	Comment/ Review	The users can also comment on the videos in the comment section sharing their thoughts	Should Have

10.4.2. Designing/ Modelling Diagrams

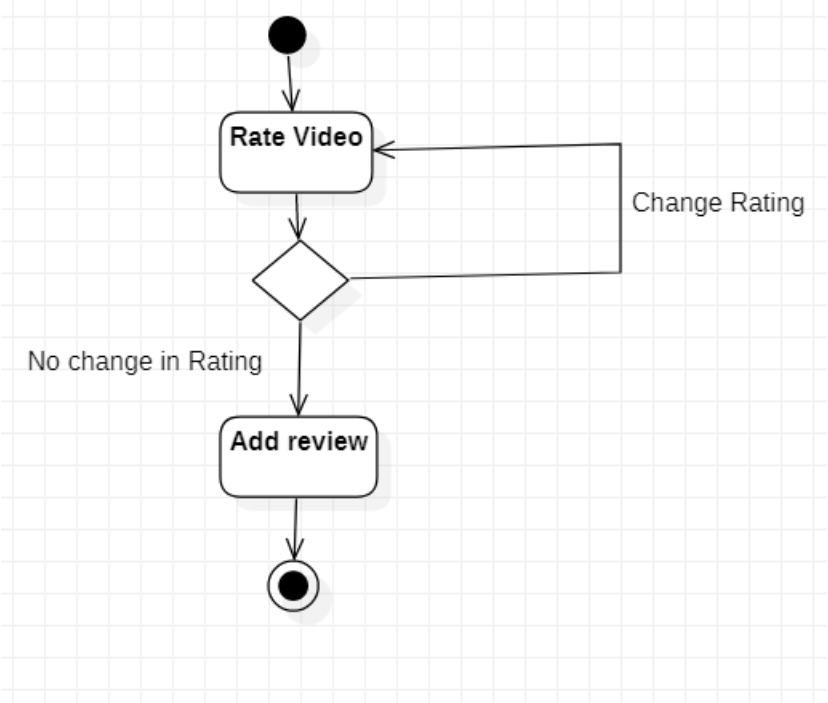


Figure 28: Activity Diagram for Rate/ Review Management System

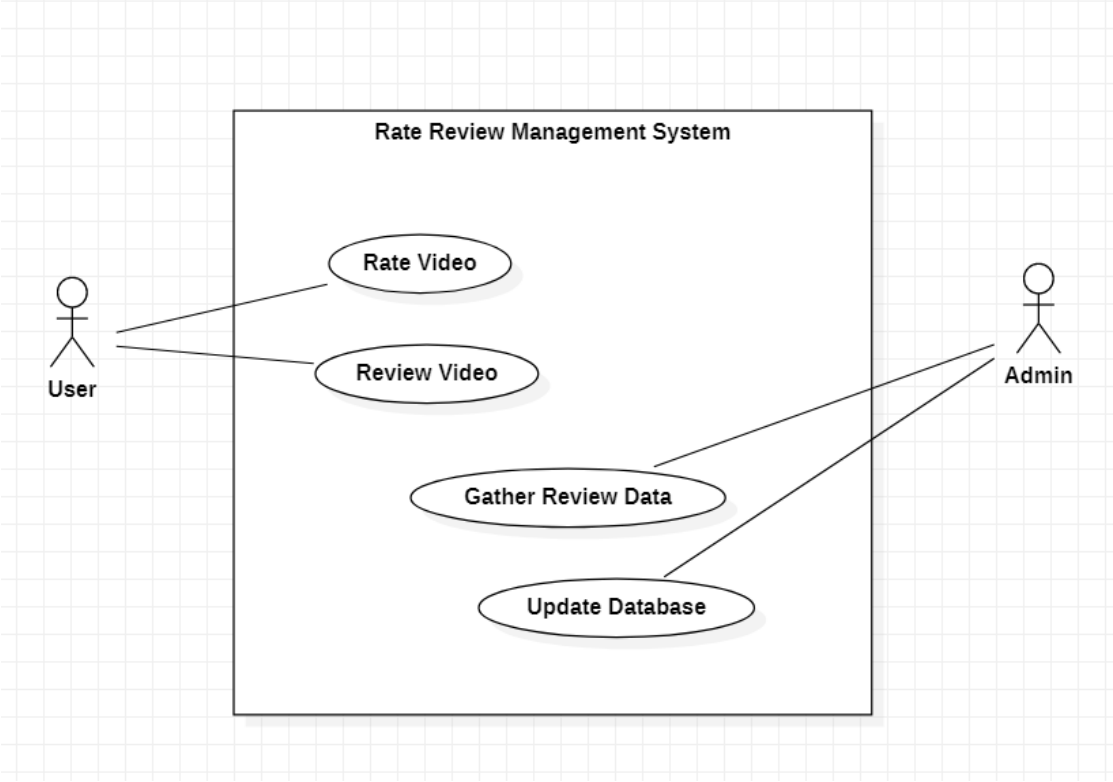


Figure 29: Use Case Diagram for Rate/ Review Management System

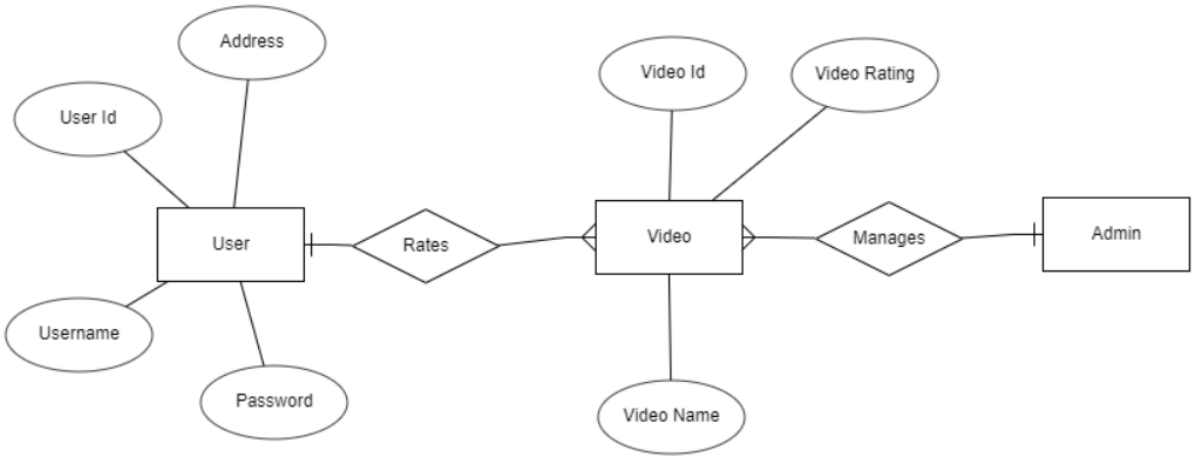


Figure 30: ERD Diagram for Rate/ Review Management System

Data Dictionary

Field Name	Field Size	Data Type	Description	Example
User Name	20	Text	Name of the user	John Adams
User Id	10	Int	A certain id number given to the user	199
Video Id	10	Int	A certain Id given to the video	25
Video Name	30	Text	Title of the video	Avengers Infinity War
Video Rating	7	Float	A rating given to the video out of 5	3.5

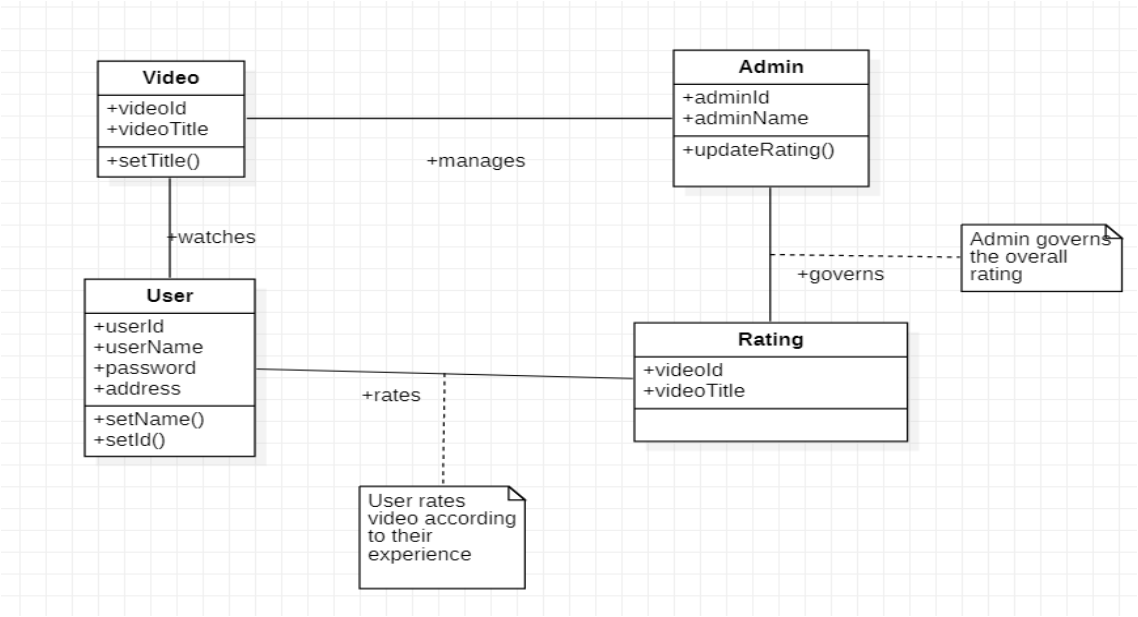


Figure 31: Class Diagram for Rate/ Review Management System

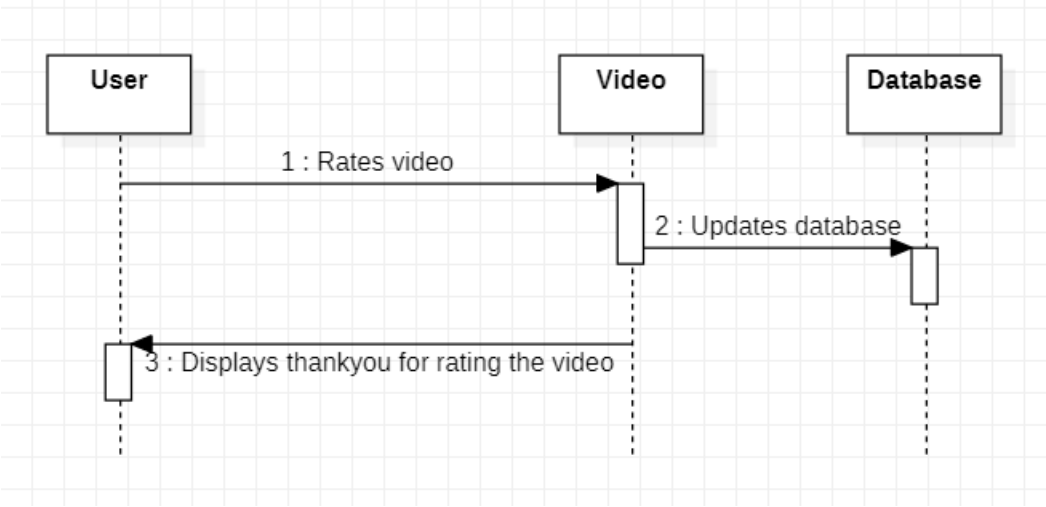


Figure 32: Sequence Diagram for Rate/ Review Management System

10.4.3. Testing

Test Objective: To test whether user can rate/ review a video properly or not.

S.N.	Test Data	Expected Result	Actual Result
1	User rates a video out of 5	Video successfully rated	Video successfully rated
2	User comments/ reviews on a video	Commented Successfully	Commented Successfully

Test Result: Test Successful

11. Conclusion

The project ‘Movie Streaming System’ was completed within the deadline ticking all the goals throughout the development. The project fulfilled all the required aims and objectives. The developed site has a simple yet attractive interface where people can search and watch videos without any complexities and whatever videos they enjoy, a similar genre of other videos are recommended to them. The site also has a suitable environment for the admin panel to work on where admin can figure out their basic tasks. The database is also secured to such an extent that the details of viewers as well as videos remains private. Along with the mentioned features, the project definitely has some limitations. Content filtering is used in the system which although is a famous algorithm for recommendation purpose, it still can’t yield as much accuracy as collaborative filtering. The system no feature for the user to communicate with each other and with the admin panel. These limitations will surely be eradicated to a certain extent in the upcoming updates.

12. Critical Evaluation of the Project

The final year project that I completed on the website ‘Movie Streaming System’ was the biggest project that I did in my entire life. The development of the system that spanned around two semesters was full of ups and downs. Throughout the development, I learned some new stuffs and exceled in some other stuffs I was already familiar with. Python programming language with Django framework was somewhat familiar to me as I had already studied it in previous semester. But after the completion of this project, I certainly feel that I have improved in python. The same goes for database. But the AI part was something that I was new to. But over the past few months, working on my project I definitely improved in implementing algorithms. Completing the project within the deadline was a huge success in itself and I would like to thank my supervisor Mr. Manish Deuja for the essential guidance throughout the completion of this project.

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