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Music Recommendation System

• Project Study:

Classifier or Recommender systems are software tools and techniques providing suggestions for items to use to a user. The term item here is generic. It may represent many concepts. For instance, recommender systems may recommend news on a news portal, products in an online shop, or even services. The objective is to reduce users' choice complexity. The recommendations are usually tailored to a given user or a given type of user group. Since recommendations are personalized, they may vary from one user to another or from one user group to another.

• Project Concept Analysis:

Music Recommendation Systems are software tools and techniques providing suggestions for songs to the user. Since recommendations are personalized, they may vary from one user to another or from one user group to another.

The system is broken down into three key areas which help it achieve its goal:

- 1. Music Analyzer:** The Music Analyzer Recommended music uses explicit and implicit attributes. Explicit attributes define concrete facts about a program, such as actors, directors. Implicit attributes are more difficult to define, such as how much action a program contains, for example. These implicit attributes are assigned values through a unique demographic analysis of entertainment music.
- 2. User Profiler:** The User Profiler aims to develop a detailed profile of a user's needs and preferences in entertainment music attributes. For example, it would not only learn that a user likes hip-hop or K-pop, but it would also take this further to understand what type of hip-hop they may like. These attributes are obtained by asking several specially designed mysteries at registration and applying demographic procedures to their solutions.
- 3. Recommender:** The Recommender is the final aspect of the system and uses the attributes developed in the analyzer and profiler to match a person's needs and interests with music that they will find most exciting and entertaining.

• Root Cause:

If one has ever been on the Amazon web page browsing or trying to buy an item, he has probably seen recommender systems at work. In fact, on the Amazon web page, the section "people who purchased this item also purchased..." is the list of items Amazon's recommender systems predicted you might be interested in. There are plenty of other websites to watch the recommender system at work. Some examples are Google news, amazon prime, Pandora, Spotify, Netflix.

For this project purpose, we took Spotify, an example app for online music streaming.

• Proposal of this project:

In this project, we've shown that how a Music Recommendation System works and its process step by step through Use Case diagram, Class diagram, Sequence diagram, State chart diagram and Activity diagram.

Now the purpose, including relevant benefits, objectives and goals is given below:

Purpose: The purpose of this project is to develop an object-oriented model for Music Recommendation System.

Benefits: The advantage of this project is that the system will offer a complete music recommendation system that integrates with arranging to listen to the music of their choice online to help users.

1. The system provides an online interface for the users to log in and listen to music online.
2. The admin is concerned with the log-in issue. Users and Artists can use the system by log-in.
3. Provide a platform for the users and artists to ensure online-based music according to the user's choice.

Objectives: The main objective of creating the document about the software is to know about the list of the requirements in the software. It specifies the requirement to develop a processing software part that completes the requirements. The cores of objectives of the project are followings:

1. To propose a Music Recommendation System.
2. To identify the user requirement for Music Recommendation System.

Goals: The Music Recommendation system is an interface among the Users, Artists, and Administration.

The main aims of the Music Recommendation System are:

1. **Inspire visitors to action:** Suggest content based on behavior, demographics, and context.
2. **Engage users with content longer:** Music Recommendation system helps to keep users on the site longer. Moreover, bring them back more often
3. **Give them what they want:** Instead of serving the common 'most popular content' to everyone, the Music Recommendation system increases the accuracy of the User's choice and boosts the performance, enabling the Artist's profession to be more profitable.

• Use Case Diagram:

Case Study: A use case diagram represents a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved. A use case diagram can identify the different types of users of a system and the different use cases and will often be accompanied by other types of diagrams.

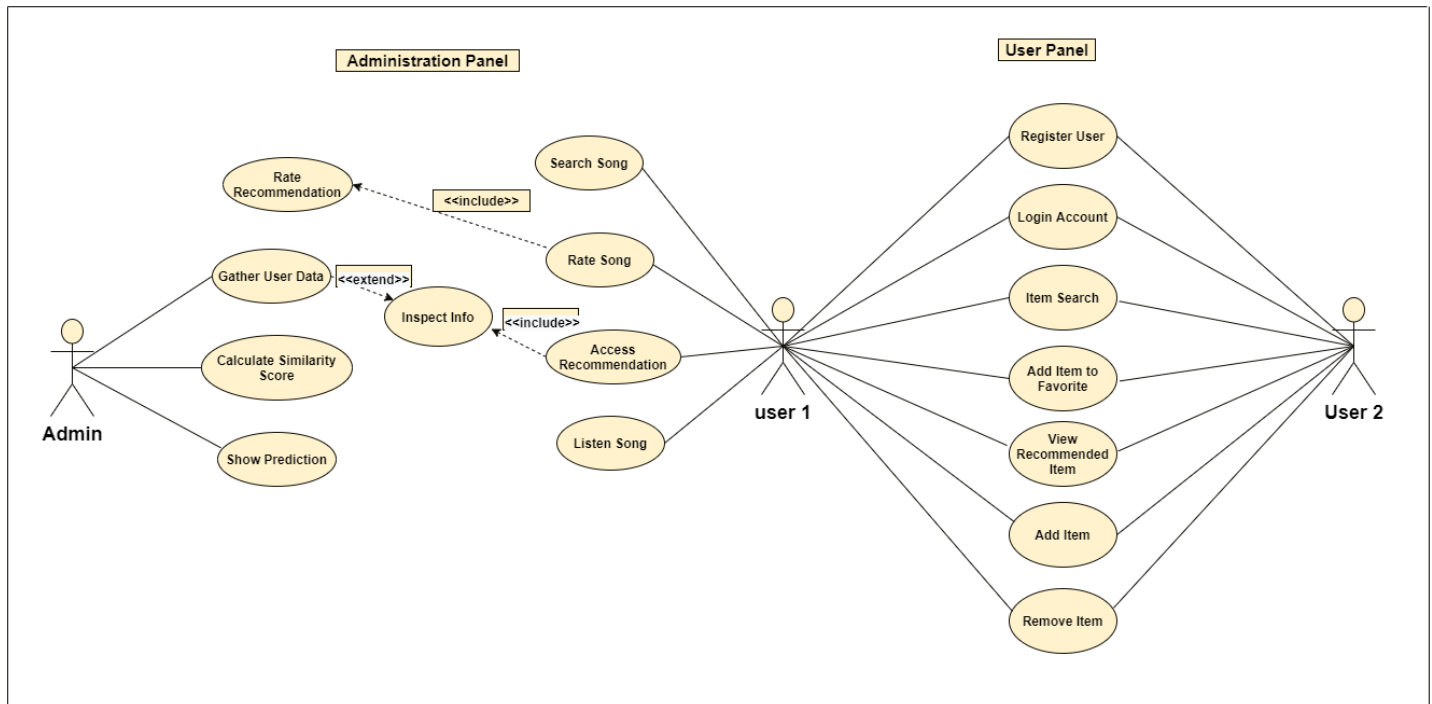
The music recommendation system searches for music and listens to it. After listening, he can rate music, access recommendations, and rate it. Admin can gather data and calculate the score. The user registers and searches for an item, add their favorite item and removes it by logging into the system.

Actors: User 1, User 2 and Administrative

Scheme: Admin has access to collect users' data so that by using that data, admin can evaluate the similarity, and the song predictions might be available to the user. When coming to the user, user1 must give the necessary details for login and accessing the required recommendations according to user taste. Then the user can also rate the song according to her/his view. Users can listen to songs and search for songs whatever they need. Only users can rate the song; there is no access to admin; they get the access recommendation only when the admin has consistent data about them.

Then user1 and user2 have all the access to the portal like they can choose a song, can search for the song, they can also add them to their favorite list they have access to view recommendation items, and they can add items(songs) they needed, and they can delete it too. They can log in/log out by giving the credentials. Finally, any number of user panel users will remain the same, and their accessibility will remain the same.

• Diagram:



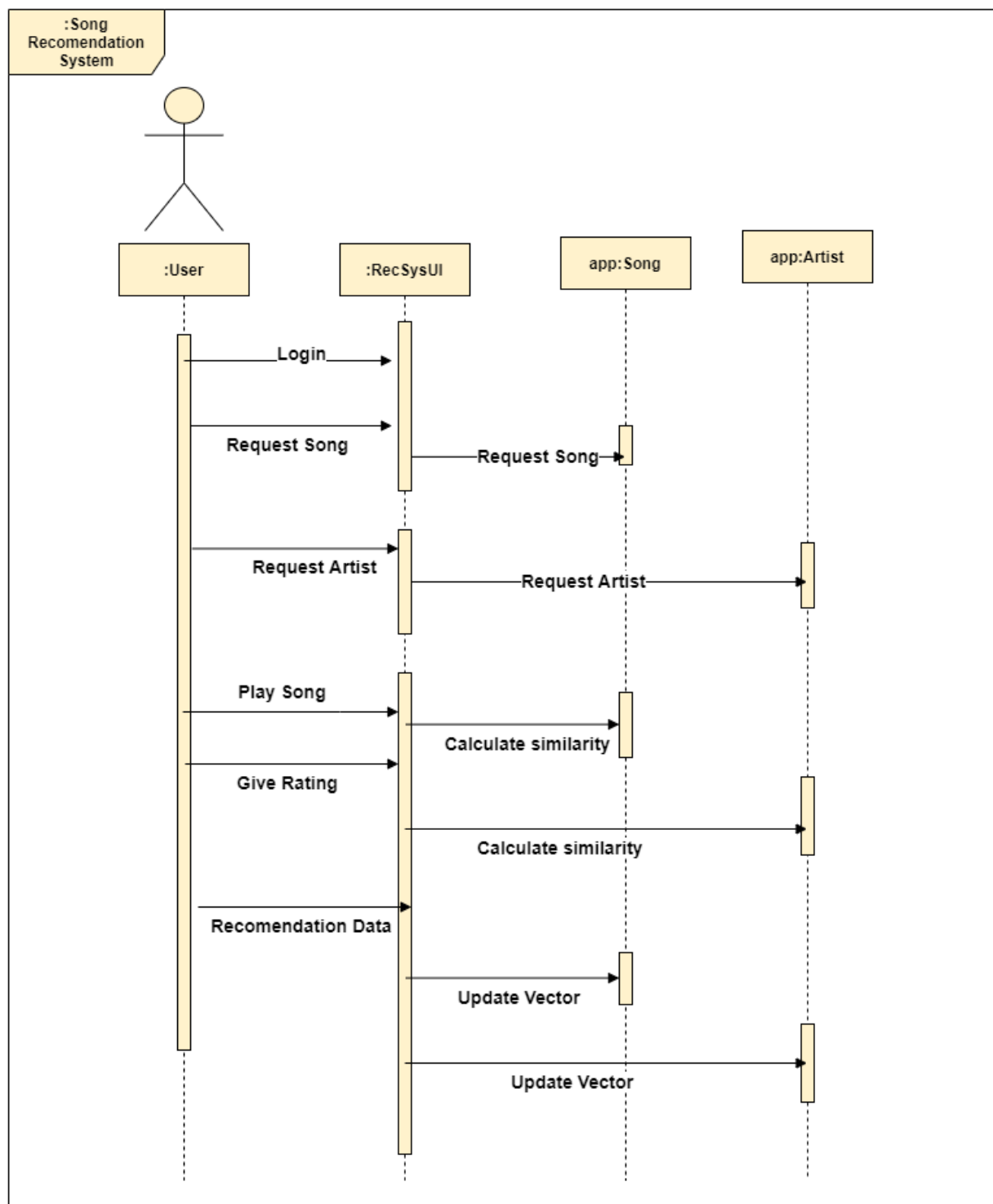
• Sequence Diagram:

Case Study: The sequence diagrams are one of the interaction diagrams that depict the communication between the objects. Here, the RecSysUI object comes into the picture as it is the one with which the user communicates. The RecSysUI class has many visual elements that contribute to the data source in terms of user activity. The search button, the rating elements, the recommendation display section, the song player and play/stop buttons, etc., all contribute to user activity logging. Since only the behavioral nature of the recommender system is being discussed in the sequence diagram, the user interface elements are abstracted out into a single class.

Scheme: The admin maintains the application. The user must be logged into the system to access recommendations. The request is processed as soon as the user enters a query for searching the music. A list generated from the scores showing high values is compiled and recommended.

Besides, a user might log in to the app RecSysUI. The user might request the song. Then, the app navigated to the song app and processed the song request. The user requested an artist then the app navigated to the artist app then processed the request. After that, the user played the song after that similarity was checked between the song and the artist app. Based on that observation, a rating has been given by the user. The user has recommended access to the song and artist app. Based on the communication; a user has given a rating.

• Diagram:



• Class Diagram:

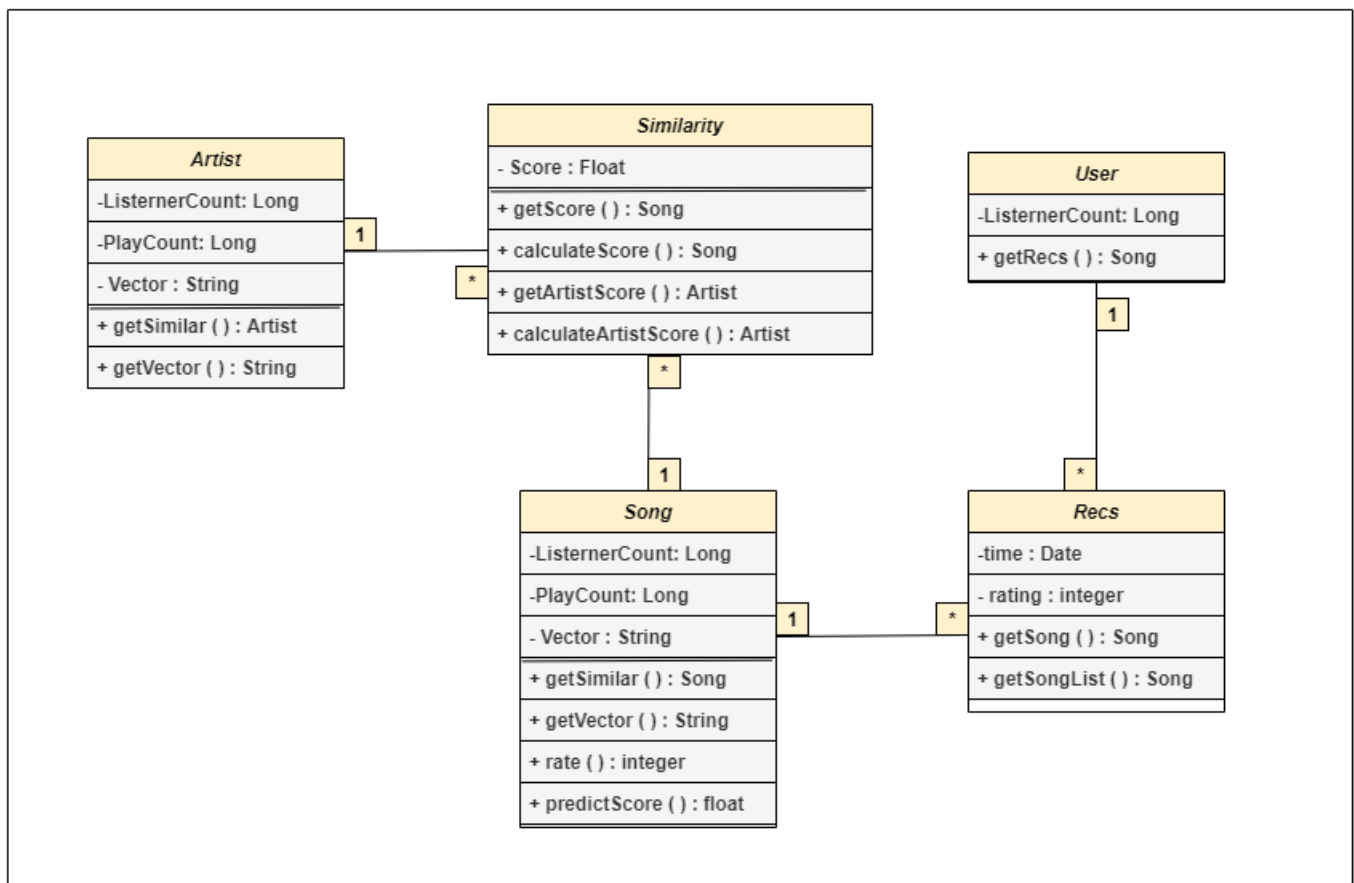
Case Study: The class diagrams describe the structure of the system being modeled. They are the building blocks, so to speak, for object-oriented modeling, as with them comes all the object-oriented concepts that exist among various individual components of the system. The three-compartment figure of classes holds the name, the list of attributes, and the operations.

In the current song recommendation system being modeled, there are three main classes: the User, the Artist, and the Song. The additional two classes, Similarity, and Recs are for calculating similarity scores and getting recommendations of songs and artists. These classes depict the business logic part of the system and not the user interface.

Some of the functions in this music recommender system implementation are:

- initMusicRecSys(...) – create a new instance of the system.
- loadUserProfile(...) – authenticates and loads a user profile.
- processRequest(...) – analyses the query entered by the user.
- dispResults() – get the results and display them.
- logUserActivity(...) – play count, timestamp, etc. are all logged for further calculation.
- getRecommendation(...) – show the recommendations after calculating similarity and prediction scores.
- logExplicitRating(...) – user rating to a specific song is noted for further calculations.

• Diagram:



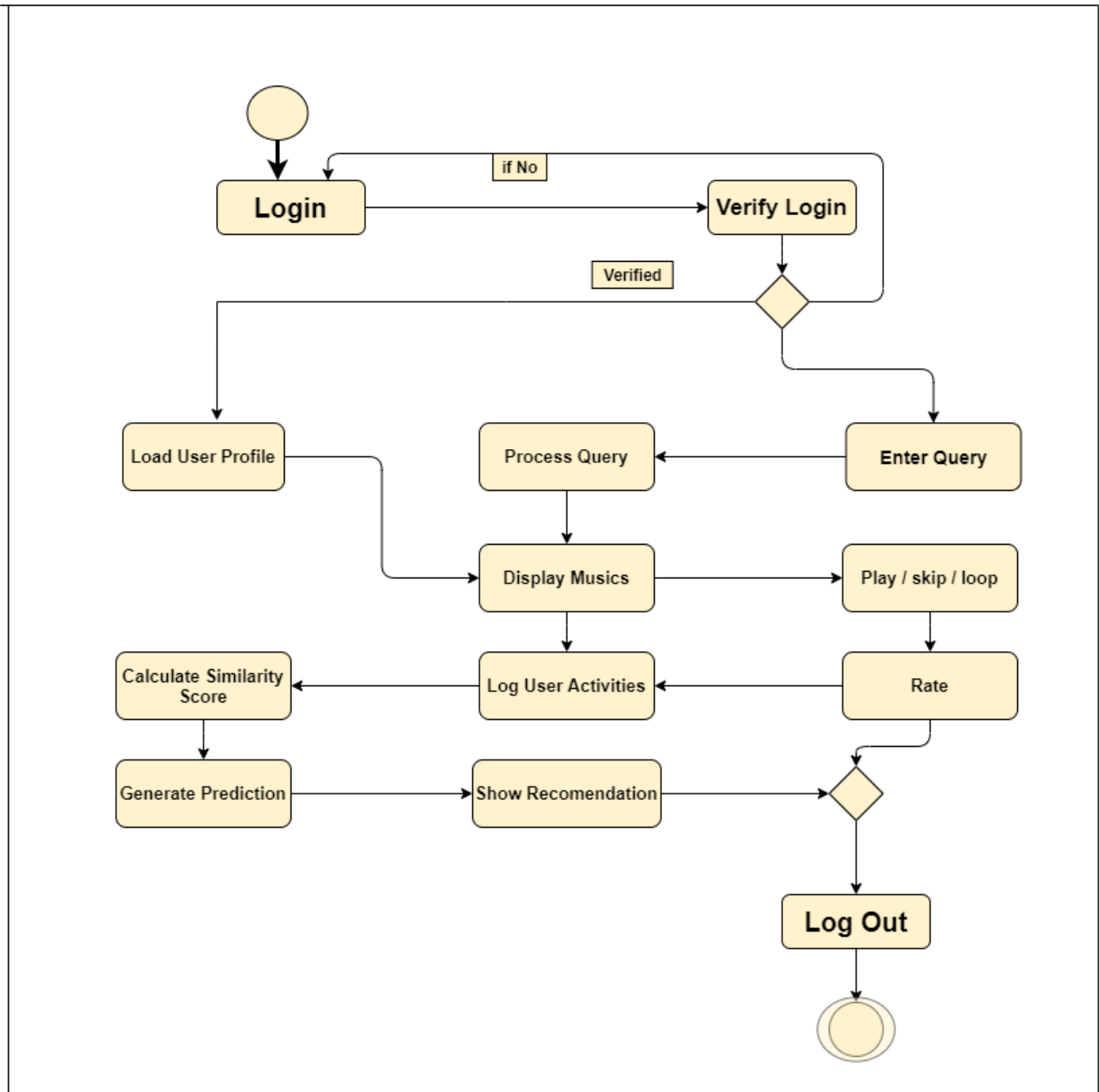
• Activity Diagram:

Case Study: Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration, and concurrency. In the Unified Modelling Language, activity diagrams are intended to model computational and organizational processes. Activity diagrams show the overall flow of control.

Activities: This system belongs to song management. As in the activity diagram, their activities are shown:

1. First, the user opens the site, and the login window popup for login first.
2. Users will log in with their email and password.
3. If user details are correct, it will be successfully redirected to the user profile and load user profile data.
4. After user authentication, the user will enter their query. For example, if the user wants to search for a song, the user will enter a query.
5. After entering a query, the query will be processed.
6. After processing, results will be displayed on the user's screen.
7. Log user activity. It will display user activities based on their filter criteria.
8. When results are displayed on the screen corresponding to the search query, the user can watch a song, skip that song, or repeat a song.
9. After listening, the user can rate that song. Moreover, matching recommendations will be shown.
10. After logging user activity, the similarity score of the user for their choices and selection will be calculated by the system. It means how many times users watch the same type of song.
11. Based on that similarity score, the system will generate the prediction for the user choice.
12. Based on the generated prediction, the recommendation will come out and be displayed on the user screen. When the user rates the song, these recommendations will be displayed.
13. After rating and checking the recommendation, the user could log out from the system.

Diagram:

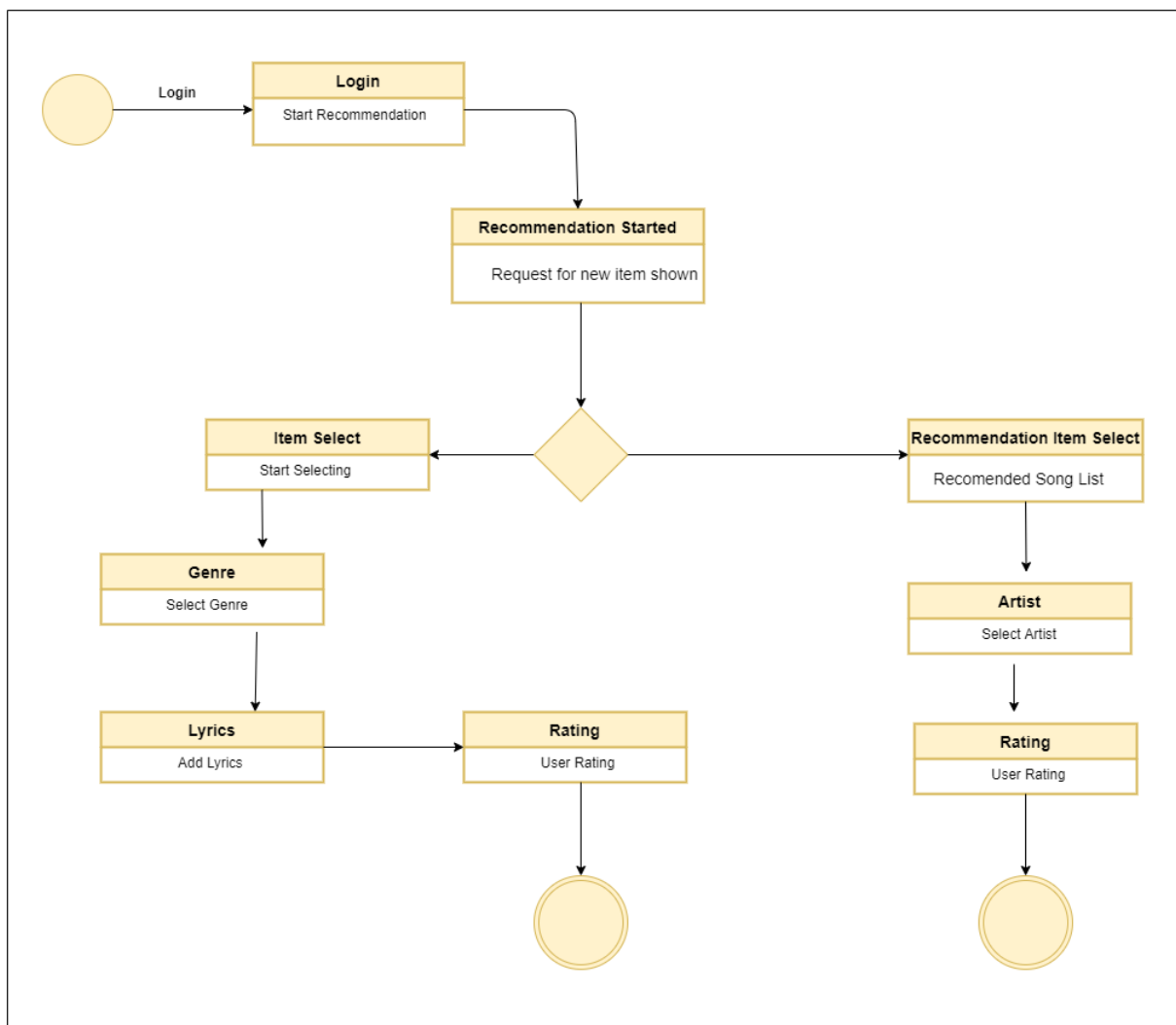


• State chart Diagram:

Case study: The diagram's name clarifies the purpose of the diagram and other details. It describes the different states of a component in a system. The states are specific to a component/object of a system. It is used to model the dynamic nature of a system. They define different states of an object during its lifetime, and events change them.

States: This system belongs to song management. As in the state chart diagram, their states are described: First, login into the system. Now open the recommendation form on the home page. Then go to the items list that is required to be recommended. From the list, select the item and process. If the item is closed, go to the recommendation form again and select another item. Once the item got selected, then start recommending. Moreover, if another item needs to be selected, click on Request for the new recommendation, select another item, and recommend. Once all the required items were selected and recommended, log out successfully from the system.

Diagram:



• Future Development:

The Music Recommendation System application is created based on the user's flexibility to find music. There are three main goals of the Music Recommendation System, inspiring visitors, involving users for longer, giving them what they want. In this application, users can enjoy music according to their choice. But, in the future, this project could be developed by adding many more features to it.

A mechanism might be developed to give the option to the user to evaluate this application by creating a comment section, like and dislike section, question and answer section, suggestion section, etc.

Business Plan:

Now, this project recommends only music. We will have a premium version of the software, which will provide many more advanced features like video songs, video content, movies, news portals, social media, online shopping, online tutorials, etc. However, to enroll in it, users must buy the package. In this way, we may be successful in business with our software.

At the end of each song, there will be an ad video, where the listener will see the advertisement of the used musical instrument of the favorite song, the price of it, the link from where to buy it, the link to the paid course for learning that kind of song. We will have software agreements with musical instrument sellers, paid music instructors, and e-commerce sites that we will advertise their stores and websites, in return for which they will give us a regular fixed rate of profit. Thus, our application might help to be successful in business.

• Conclusion:

Recommendation systems are software tools and techniques providing suggestions for items to be of use to a user. In our project, we discussed the idea of a Music Recommendation System, where the purpose is to help users find kinds of music sequentially according to their choice. Here, we have shown how a Music Recommendation System works. We have developed this application as an interface among the Users, Artists, and Administration.

The objective is to reduce users' choice complexity. The advantage of this project is that the system will offer a complete music recommendation system that integrates with arranging to listen to the music of their choice online to help users. While users get bored searching and listening to random songs, this application offered users to recommend their favorite song easily, reduce waste of time, reduce mental stress, and enjoy some quality time.

In our project, we concentrated mainly on the recommendation system of Spotify, where music items are used to be recommended. On the Spotify application, one may probably see the recommendation system at work. If a user searches for a folk song, the system captures that and recommends the same category of songs for that user. In fact, on the Spotify web page, the section “people who listened to this song before, is already played before.” is the list of items of Spotify's recommender systems predicted that users might be interested in. There are plenty of other websites where anyone can watch the recommender system at work. Some examples are Google news, YouTube, the yahoo portal, Pandora, Spotify, Netflix, and so on.

In this short duration of time, we tried our best to make our project more decorated with different kinds of features. Here, we work in a group and decorated our project with scenarios and Use case diagrams, Sequence diagrams, Class diagrams, Activity diagrams, Activity diagrams. In the future, this project might be developed on a large scale, such as video content, movies, newspapers, social media content, and the e-commerce field. There is a plan to develop this project for a multi-purpose activity recommendation system and use this project as a business hub soon