Report On

“Movielens Recommendation System”

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1.Problem Definition and Scope of Project

1.1 Introduction

A recommendation system is a type of information filtering system which attempts to predict the preferences of a user, and make suggestions based on these preferences.There are a wide variety of applications for recommendation systems. These have become increasingly popular over the last few years and are now utilized in most online platforms that we use.The content of such platforms varies from movies, music, books and videos, to friends and stories on social media platforms, to products on e-commerce websites, to people on professional and dating websites, to search results returned on Google.

Two main approaches are widely used for recommender systems. One is content-based filtering, where we try to profile the users interests using information collected, and recommend items based on that profile. The other is collaborative filtering, where we try to group similar users together and use information about the group to make recommendations to the use

1.2 Problem Definition and Scope of Project

Given a set of users with their previous ratings for a set of movies, can we predict the rating they will assign to a movie they have not previously rated? The system provides the recommendation of the movies which they have not watched on the basis of the movies that they have rated and also the rating of other users.

1.3 Users of the system

Any user having the application to watch movies installed in their device.

1.4 Dataset

Dataset consists of the movies which users have watched and its rating. The second dataset used consists of all the data related to the movies

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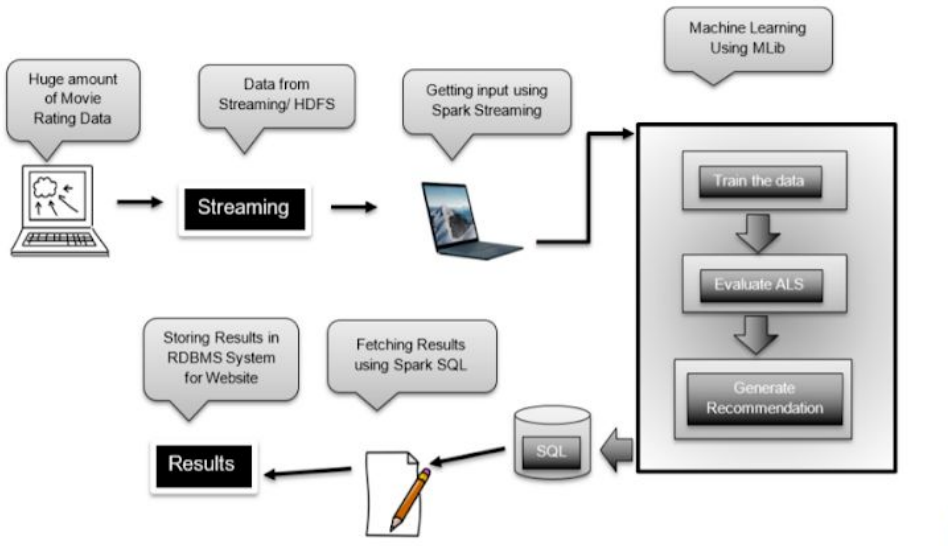
2. Literature Review :

Various collaborative filtering algorithms can be used to find the estimated rating of a movie for users which they have not watched. In this system the ALS collaborative filtering model is used to find the estimated rating of the movie. The movies with the highest estimated rating will be provided to the user as recommendation. The parameters of the model need to be decided appropriately.

3.Conceptual System Design

3.1 Conceptual System Design- CSD Diagram with explanation of each module.



- Get the data from the dataset in the from of RDD and convert this data to Dataframe
- Design a ALS model with suitable parameters
- Train the ALS model with the data
- Provide the output of top 20 movies with the highest estimated rating.

3. 2 Methodology:

3.2.1 Data Gathering / Loading

Data is Loaded from a text file in the form of RDD using the SparkSession.

3.2.2 Data Preprocessing ,Descriptive Analysis

Data loaded in the form of RDD is converted into the Dataframe so that various relational algebra operations can be performed on it. This is because in RDD the data is stored in the form of records and in the Dataframe it is stored in the form of columns.

3.2.3 Filtering

Movies which are rated by more than 100 users are considered to find the estimated rating of the movies for a particular user which he has not watched.

3.2.4 Classification/ clustering etc

ALS model (Alternating least square model) is used for recommendation of movies to the users.
ALS model :
Alternating Least Square (ALS) is a matrix factorization algorithm and it runs itself in a parallel fashion. ALS is implemented in Apache Spark ML and built for large-scale collaborative filtering problems. ALS is doing a pretty good job at solving scalability and sparseness of the Ratings data, and it's simple and scales well to very large datasets.

Some high-level ideas behind ALS are:

- Its objective function is slightly different than Funk SVD: ALS uses **L2 regularization** while Funk uses **L1 regularization**
- Its training routine is different: ALS minimizes **two loss functions alternatively**; It first holds user matrix fixed and runs gradient descent with item matrix; then it holds item matrix fixed and runs gradient descent with user matrix
- Its scalability: ALS runs its gradient descent in **parallel** across multiple partitions of the underlying training data from a cluster of machines

Most important hyper-params in Alternating Least Square (ALS):

- maxIter: the maximum number of iterations to run (defaults to 10)
- rank: the number of latent factors in the model (defaults to 10)
- regParam: the regularization parameter in ALS (defaults to 1.0)

1. A new user inputs his/her favorite movies, then system create new user-movie interaction samples for the model
2. System retrains ALS model on data with the new inputs
3. System creates movie data for inference (in my case, I sample all movies from the data)
4. System make rating predictions on all movies for that user
5. System outputs top N movie recommendations for that user based on the ranking of movie rating predictions

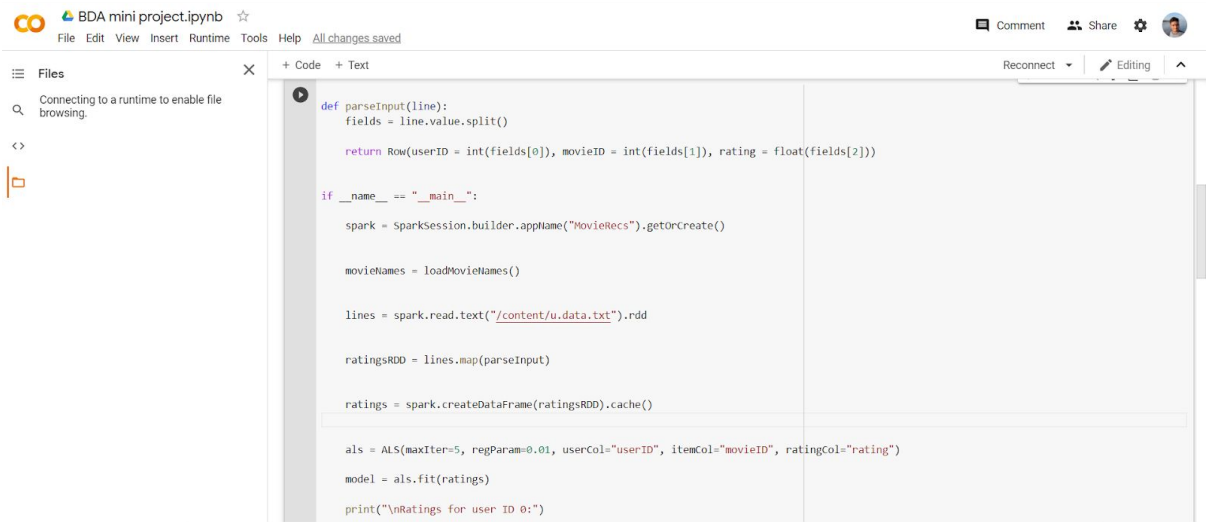
3.2.5 Visualizations

The approximate ratings of the movies which a user has not watched is found out and among them the highest rated 20 movies are recommended to that user as an output.

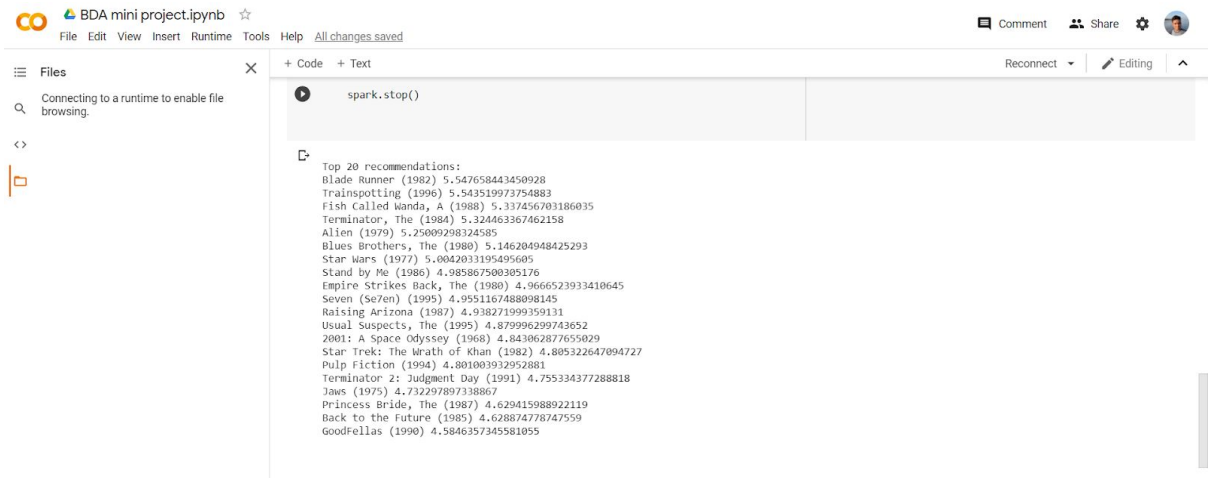
4. Technology Used

- Python
- Pyspark - SparkSession
- Alternating least square collaborative filtering model

5. Implementation



6.Results and conclusion



Movies Recommendation System was executed successfully using the ALS model and it provided the recommendations of top 20 movies to the users depending on their previous choices i.e. the ratings given to the movies.