Deep Learning-Based Method for PersonalizedMovie Recommendation

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Abstract :

The internet has become an essential aspect of human existence in recentyears, and we are faced with a plethora of options that make deciding difficult. Companies offer various methods for recommending users to their favourite moviesto reach the user groups. The recommended approach takes advantage of this social process to offer users a narrowed-down set of options from the database. Many individuals find that personalized recommendation systems help them limit the universe of movies to suit their particular tastes; they may enjoy a delightful systemand not overwhelm them with many choices. It is the goal of digital service providers to keep consumers engaged for as long as possible, and these technologies help them achieve that goal. These technologies come into play because they offer the user a more customized experience. Our task is to forecast which movies a user would like based on his or her past viewing habits. Is the user's past behaviour of the sole element to consider when developing a recommendation system? Which recommendation system produces the most outstanding results, whether it is collaborative, content- based, or hybrid? The primary difficulties must be overcome: Create a data collection that contains all the relevant information about a particular movie. Identify the best suitable movie recommendation list. Expand our system so that it can accommodateusers from a variety of geographical areas. Assign weights to different factors to decide.

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1 Introduction

As the number of online users rapidly increases by the year, so do many web-basedproducts and services. These can span across various domains such as e-commerce, entertainment and other item driven websites. Examples of these include items such as e-books, gadgets, movies or other sellable or desirable products. Recommender systems recommend items to users and have been widely integrated among the best item driven conglomerates like Facebook, Amazon and Netflix and for good reasons. Amazon reported a 29 percent sales increase; we can attribute most of this to the sophisticated recommendation system that has been integrated into every part of Amazon's purchasing process. Many e-commerce websites experienced an incrementof 20 percent in sales of their product. Based on the study done by ChoiceStream in 2007, 45 percent of users will be more likely to shop at a website that employs recommender technology. Not only do websites have to show the best items, but these also have to be tailored to the users' or customers' needs. The increasing number of different users and items is a

potential problem for businesses to filter out the best items for a specific user. We can categorize recommenders as content-based, collaborative filtering or hybrid systems. Depending on a description of the item and a profile of the user's interests, Content-based systems suggest an item to a person. Collaborative filtering filters or evaluates items using the opinions of the user. Also, this filtering type can be classified as heuristic or model-based. Heuristic-based systems make rating forecasts based on an entire database of items provided ratings by the users. These types can be used on top of hybrid systems. In comparison, the model approach uses ratings to learn a model for predictions. A hybrid tries to combine the benefits and lessen the weaknesses of content and collaborative approaches. We will present heuristic-based systems and how they can attribute to good recommendations. Then we shall introduce model-based hybrid systems and go in-depth into an example of an excellent hybrid recommender system.

2 Literature Survey

In this paper [1], the authors used two filtering methods for recommending movies. Those are collaborative and content filtering. As the matrix use that is Rating ma- trix R is sparse, the missing entries are predicted. With that author used mean squared error to evaluate the predictions made by the system. All the algorithms are implemented using Apache Spark, which takes lesser time for big datasets.

In [2] Author classifies the recommender system in two categories as collabora- tive and content filtering. Data description uses that is writer gave some attributes having different weights. Based on cumulative weight and K-means algorithm, the predictions to recommend a movie was made.

In [3], the author proposed the hybrid movie recommendation system, which combines the users' interests and will recommend movies rated by other users similar to the user. The method used here is City Block Distance and Euclidean distance. In [4], we need a recommendation system to recommend users to the content according to their liking. The recommendation systems today only focus on one of these two aspects, either the content or collaborative. However, a stable recommendation system, a hybrid of content plus collaborative filtering, should be used. The paper list the detailed description of the Content-based filtering system CBF SYSTEMS) and collaborative filtering based systems (CF SYSTEMS). It overcomes the drawbacks of each algorithm and also helps to improve the recommendations of that system[5-10].

3 System Architecture

3.1 Content based Recommender

We developed two content-based engines: one that used movie synopses and taglines as input and another that made predictions based on cast, crew, genre, and keywords. We created a simple filter to favour films with the most votes and the highest ratings[11-16].

3.2 Collaborative Filtering

Using the robust Surprise Library, we developed a collaborative filter based on single value decomposition. The root means square error (RMSE) was less than one, and the engine provided projected ratings for a specific user and film[17-22].

3.3 Hybrid Engine

The data was obtained and stored from Kaggle. We screened to get the information for making appropriate suggestions. We used the Hybrid Algorithm in our project,as shown in Figure 1.

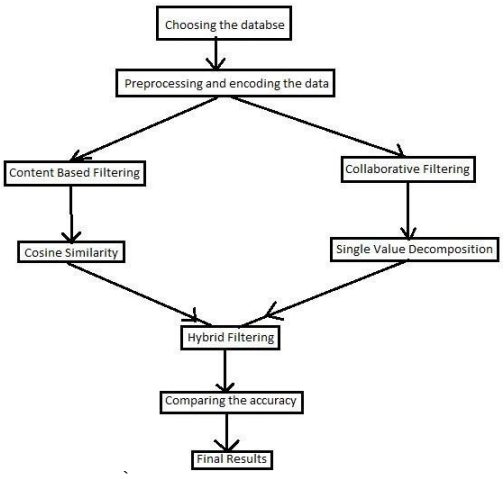

Fig. 1 Work flow of filtering engines

4 Mathematical Model

After collecting and storing the data from Kaggle, we filtered it to extract the relevant information required to make the final recommendations. We used Hybrid Algorithm in the project, as shown in Figure 2.

Our hybrid Proposed System consisted of a random algorithm and KNN algorithm.To solve the cold start problem, we used a random algorithm that reduces this problem. In the KNN algorithm, we found similar users by computing the cosine value. Each user recommends a certain number of items or movies. Let TR be the threshold of KNN recommendations. It determines whether to use the KNN algorithm. b_r u_i is the number of searched items by user u_i. [23-39,40]

5 Results and Discussion

As shown in Figure 5, despite the movie being identical, our hybrid recommender produces unique recommendations for individual users. As a result, our recommen- dations are better tailored to particular people. We used content and collaborative filtering ideas to build an engine that recommended movies to a particular user based on the estimated ratings that the engine had internally calculated for that user.

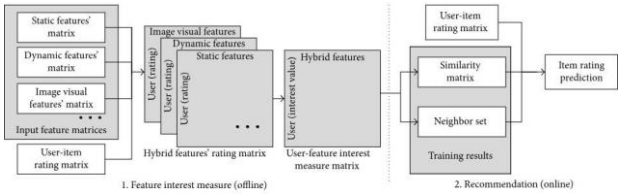

Fig. 2 Block Diagram

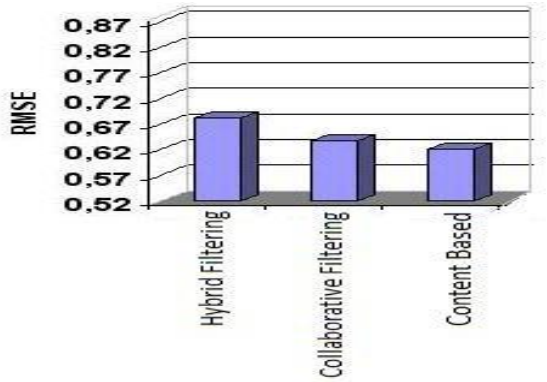

Fig. 3 Comparison between Content Based, Collaborativeand Hybrid Filtering

6 Conclusion and Future Work

From a pure design principle, heuristic techniques were mainly used to support exist- ing hybrid systems and rarely as standalone collaborative filtering systems. Heuristics improve the overall performance of arbitrary recommender systems but face humanerrors and customer satisfaction. Hybrid systems can span across multiple problem domains and also outperform standalone collaborative or content systems. A common issue among most hybrid systems was still the cold-start problem, which might be contributed to the lack of sophistication of the content-based predictor. We should improve the content-based predictor in hybrid systems for future work and combine them with heuristic approaches. So the focus should be on finding better similarities between items based on their features. We could consider this a semantic problem; just like finding similar websites, we could find similarities between itemfeatures. The best feature in movie datasets is the genre. Genre is the only feature that already categorizes a movie. Sub-categorizing movies until they reach an appropriate number of similar items could also be a potential approach to building an excellent content-based predictor. The content predictor should be considered as a text categorization problem. We should not neglect the benefits of user intervention in heuristic hybrid recommendations. These often lead to better recommendations than isolated hybrids, especially considering the cold-start problem. However, in- clude the drawbacks mentioned above with heuristics and could likely be mitigated with marketing intelligent A/B testing. Considering all the benefits of a good rec- ommendation, where a system can improve user satisfaction and product quality, we can conclude that they play an essential role in the overall online user experience.

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