

A HYBRID APPROACH TO CREATING RECOMMENDATIONS BASED ON TWO-LEVEL CLUSTERING AND FUZZY LOGIC

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Recommender systems address excessive cognitive load and the difficulty of selecting optimal options arising from accessing unlimited online information. Their main task is to provide personalized recommendations based on user tastes. They analyze historical user-item interaction data to predict future user choices.

Improving the recommender system efficiency is a relevant problem. Common approaches like collaborative and content-based filtering have limitations negatively impacting recommendation quality and efficiency, particularly in sparse and high-dimensional rating matrices or when relying on the item metadata quality and availability [1]. There is a need for a method for building a recommender system that enhances user engagement by improving recommendation quality and efficiency through greater individualization of the recommendation creation algorithm.

To overcome these limitations a hybrid approach to recommendation generation is proposed, utilizing fuzzy logic methods and two-level clustering to improve the accuracy and efficiency of recommender systems [2]. The chosen subject area is movie recommendation. The proposed algorithm contains 6 main steps:

1 Item clustering is performed using the k-means method, implementing content-based filtering. This stage proposes to use characteristics like title, description, keywords, genre, director, cast, rating, release year, number of views.

2 The next step is transition from a sparse user-item rating matrix to a lower-dimensional matrix containing the average user rating for a cluster of items.

3 Fuzzy clustering selects the most similar users, implementing collaborative filtering. This allows users to belong to multiple clusters, more accurately reflecting their various preferences and leading to more personalized recommendations.

4 Then a list of items highly rated by similar users is generated.

5 Ratings for selected items are predicted by comparing the user model and the item using a fuzzy logic inference system. To create rules aspects such as the similarity between the user's rated movies and the selected film, movie page visits, the user's interest in the film's series will be considered.

6 Finally, items with the highest predicted rating values are recommended.

To sum up, the proposed algorithm aims to increase the efficiency of recommendations by reducing the dimensionality of the sparse rating matrix and performing clustering on smaller and denser matrices. In addition, the accuracy of the user model is improved through the application of fuzzy logic.

References:

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2. Хоменко С. Г. Підхід до створення рекомендацій на базі нечіткої логіки / С. Г. Хоменко, С. М. Коваленко // *Теоретичні та практичні дослідження молодих вчених* : зб. тез доп. 18-ї Міжнар. наук.-практ. конф. магістрантів та аспірантів – Харків : НТУ "ХПІ", 2024. – С. 184-185.