Research and Analysis of Cultural Industry Management in the Context of Big Data

Haoran Ji[1,2] and Mohd. Noor Abdul Hamid[1(✉)]

[1] Graduate School of Arts and Sciences, University Utara Malaysia,
50300 Kuala Lumpur, Malaysia
mohdnoor@uum.edu.my

[2] Academy of Fine Arts, Weinan Normal University, Shanxi 714000, Weinan, China

Abstract. The development of deep learning technology in recent years has driven the rapid evolution of recommendation algorithms, and at the same time has placed higher demands on the feature data of recommendation systems. In order to meet the needs of recommendation algorithms for massive features and real-time processing of data, big data tools are needed to process the data and information. Based on big data and deep learning technology, this paper constructs a recall ranking algorithm for recommendation system and designs a complete recommendation system with movie recommendation as the theme. Analyzing the problems exposed in the development of the red culture industry in the new era, it is found that the main reasons that hinder the development and growth of the red culture industry are cultural resources, cultural education, talent mechanisms, laws and regulations, etc. For these reasons, the relevant departments of the state and the government should pay great attention to the development and protection of red cultural resources, continue to innovate the education model of red cultural industry, make efforts to improve the scientific mechanism of red cultural industry talents, and vigorously strengthen the legal protection of red cultural industry, etc., as to ensure the sustainable development of red cultural industry in the new era.

Keywords: Industry Management · Big Data · Cultural Industry · Vector Recall

1 Introduction

With the rapid development of the Internet and the popularity of smartphone devices, as well as the improvement in the quality of people's living standards, everyone can participate in the production, dissemination and consumption of information in the online world. A wide variety of online services (such as live streaming, video, news, music, e-commerce, games) are also popping up and flooding people's eyes, and with them comes an explosion of information [1]. There is no doubt that we have entered an era of information explosion, and it has become a problem to search for information that interests you in the vast amount of information, and the recommendation system is one of the effective tools to solve the above contradiction [2]. Recommendation systems can provide users with accurate and personalized recommendations using information about users and items when their needs are not clear, and are therefore widely used for various Internet services [3].
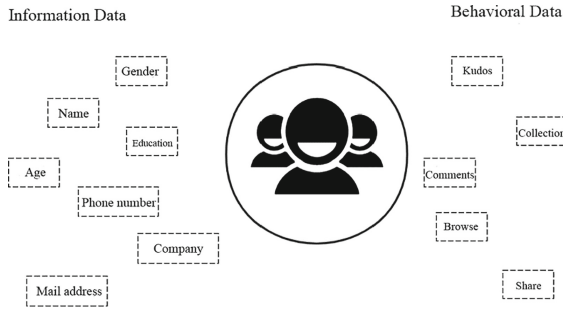
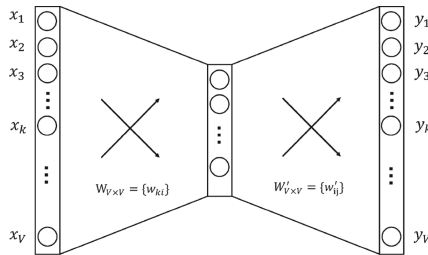**Fig. 1.** Example of user portrait.

Fig. 2. Lookup table in the weight matrix of Word2vec

2 Design of Multiplex Recall Algorithm Based on Pictorial Information

2.1 Question Introduction

The concept of User Profile was first proposed by Alan Cooper, the father of interaction design, and its core is based on business requirements, by modeling the user and abstracting the collected user data records into labeled data to facilitate subsequent analysis. In layman's terms, user profiling is describing user information with tags. We can dig out the user's preference tags for items from the user information and then use the profiling to recall them [4] (Figs. 1 and 2).

2.2 Portrait Construction

Let the dimension of both input and output layers be V. The input vector is a unique hot code (One-hot) for a word, and the output vector is a multi-hot code (Multi-hot) consisting of multiple words. After the training, the row vectors of the input vector matrix $W_{V \times N}$ represent the embedding vectors of the input words, so the input vector matrix is also called the lookup table [5, 6].

2.3   Multi-recall Strategy

Tag-Based Inverted Index Recall

Both user portraits and item portraits contain keyword tags and weight information. The tag-based inverted index recall is to build a tag $\rightarrow$ item inverted index table to associate specific items based on the user's content tags, and then sort the associated items by weight and take Top N to get the recall list (Figs. 3 and 4).

Suppose the content tags in the user profile are represented as $\{(T_1, S_1), (T_2, S_2), \ldots, (T_n, S_n)\}$, where T_i denotes the tag and S_i denotes the user's tagging weight for T_i the tag. The different tags T_i associated to the list of items are represented as:

$$T_1 \rightarrow \left\{(item_{11}, w_{11}), (item_{12}, w_{12}), \ldots, \left(item_{1k_1}, w_{1k_1}\right)\right\}$$

$$T_2 \rightarrow \left\{(item_{21}, w_{21}), (item_{22}, w_{22}), \ldots, \left(item_{2k_2}, w_{2k_2}\right)\right\}$$

$$T_m \rightarrow \left\{(item_{m1}, w_{m1}), (item_{m2}, w_{m2}), \ldots, \left(item_{mk_m}, w_{mk_m}\right)\right\}$$

where $item_{ij}$ represents the item with label T_i and w_{ij} is the corresponding weight. Then the user's interest preference set is expressed as:

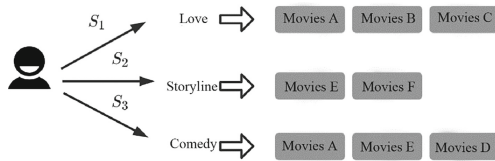$$U = \sum_{i=1}^{n} S_i \times T_i = \sum_{i=1}^{n} \sum_{j=1}^{k} S_i \times item_{ij} \times w_{ij}$$

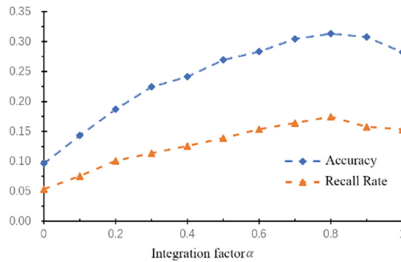**Fig. 3.** Recall based on inverted index.

Fig. 4. Multiplex Recall Fusion

2.4 Experiment and Analysis

Dataset

MovieLens dataset is a classic dataset in the field of recommendation system, which consists of three parts, namely movies.csv (basic movie information data), ratings.csv (user rating data) and links.csv (link data). Movielens contains data sets of multiple sizes such as 100K, 1M, 10M, etc. The experiment in this paper uses a 1M size dataset containing a total of 1 million rating records for more than 4000 movies by 6000 users.

The movies table contains basic descriptive information of movies such as movie ID, title, year, and genre type, as shown in Table 1.

The ratings Table 2 contains information about the ratings of movies by different users as well as timestamps.

The links table contains the movie ID, imdb corresponding movie ID, and tmdb corresponding movie ID information. The links table links two of the world's largest movie databases, imdb and tmdb, so it is also possible to grab other information about the movie based on the link relationship [7].

Evaluation Indicators

The recall algorithms in this paper take the form of TopN recommendations in recall, and use accuracy (precision) and recall (recall) as the evaluation metrics of the recall algorithms. The accuracy of the recommended results is defined as:

$$Precision = \frac{\sum_{u \in U} |R(u) \cap T(u)|}{\sum_{u \in U} |R(u)|}$$

Table 1. Basic information data of the movie

Movie Id	Title	Genres
1	Toy Story (1995)	Animation|Children's|Comedy
2	Jumanji (1995)	Adventure|Children's|Fantasy
...	...	...
2571	Matrix, The (1999)	Action|Sci-Fi|Thriller

Table 2. User rating data

User Id	Movie Id	Rating	Time Stamp
1	2	3.5	1112486027
1	29	3.5	1112484676
...	...	...	...

where R(u) is the recall list of users on the training set and T(u) is the recall list of users on the test set. The recall of the recommended results is defined as:

$$Recall = \frac{\sum_{u \in U} |R(u) \cap T(u)|}{\sum_{u \in U} |R(u)|}$$

Analysis of Experimental Results

As shown in the above figure, the accuracy and recall of multiplex fusion are optimal at $\alpha = 0.8$. This is because the labeled inverted index recall recommends items of interest to the user from another perspective, enabling the performance of the fusion algorithm to be enhanced; however, it also shows that the enhancement capability of the labeled inverted index is limited, so the Item2vec model recall is used as the main recall method in the design of the multiplex recall scheme [8].

3   Conclusion

It is necessary to give full play to the leading role of the Party and the State, lead the relevant departments of the cultural industry as well as red culture enterprises to attach importance to the development and protection of red resources, innovate the education mode of the red culture industry, improve the scientific mechanism of cultural industry talents and strengthen the legal protection of the red culture industry. With the joint efforts of the whole Party and the whole society, we will stimulate the vitality of the development of red culture industry, add momentum to the development of red culture industry, and prompt the red culture industry to open a new chapter of development in the new era [9]. In this paper, we design a ranking layer model LSIN for recommender system mainly based on users' long-term and short-term behaviors, which models users' long-term and short-term behaviors respectively, and predicts users' current interests by both sequence modeling and attention mechanism [10].

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