Research on Media resource recommendation System and recommendation Technology based on Graph Neural network

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Abstract. In the field of artificial intelligence research, personalized recommendation technology has been rapidly developed. It can not only provide effective recommendation according to the preferences of system users, but also sort out the historical behavior and attribute information of users, and accurately calculate the content of user preferences. From the perspective of the development of the new media industry, in order to better meet the resource needs of system users, a resource recommendation system based on personalized recommendation technology can fully meet their needs for media reading. Therefore, on the basis of understanding the current research status of media resource recommendation system and technology, and according to the basic concept of graph neural network and the main structure of recommendation system, this paper mainly studies the application effect of the recommendation model of outburst neural network that integrates knowledge graph and time weight, so as to provide effective basis for media resource recommendation in the new era.

Keywords: Graph neural network; Media resources; Recommendation system; Knowledge map; Time weight.

1. Introduction

With the rapid development of Internet technology and big data theory, the amount of information resources in the market is increasing, but the content that can be applied is not much. There are bad phenomena such as information overload, and users cannot find the content they need from the massive information. Search services in the traditional sense mainly filter information according to keywords, but when different users search the same keywords, they will provide the same sorting items, and cannot provide personalized information services according to their needs. In the field of artificial intelligence, the recommendation system can make comprehensive use of modern technology, integrate and analyze users' personal data and transaction data, recommend items of interest to them, help them quickly search for the information they need, and effectively alleviate problems such as information overload. Nowadays, recommendation system has been widely used in every aspect of people's life, such as social network, news reading, music search, online shopping and so on. The interactive behavior of a large number of customer groups on the network platform provides rich samples for the recommendation system, and the improvement of the application performance of the recommendation system also brings more economic benefits to the platform. [1-3]According to practical research, recommendation system contributes more than 30% of sales revenue for Amazon, up to 75% of consumption income for Netflix, and 60% of page views for Youtube. From the perspective of network system application services, the recommendation system mainly helps users to screen the content they don't like, provides them with more convenient and accurate functional services, and enhances the appeal of application modules to system users to a certain extent. Therefore, it has a strong development prospect and application value in the future science and technology discussion.[4-6]

With the continuous improvement of computer application performance, deep learning technology has been rapidly developed. Compared with the recommendation system in the traditional sense, the recommendation method with deep learning as the core has strong nonlinear fitting ability and modeling ability, which can quickly obtain the deep relationship between users and projects, and form a high-quality representation of potential features of users and projects. Most application scenarios of recommendation system contain a lot of data information. The application

of graph neural network to recommendation system can quickly obtain the deep nonlinear feature representation of users and projects, and improve the accuracy of system recommendation. Therefore, this paper mainly studies the image neural network as the core of the media resource recommendation system.

Since the 1990s, foreign scholars have extensively studied recommended methods and proposed collaborative filtering technology. In order to further improve the application level of collaborative filtering technology, other recommended algorithms have been proposed by some scholars. According to the types of information filtering methods, there are mainly three types: the first is the content-based recommendation method, the second is the collaborative filtering method, and the last is the filtering method with the mixed recommendation algorithm as the core. The specific structure is shown in Figure 1 below:
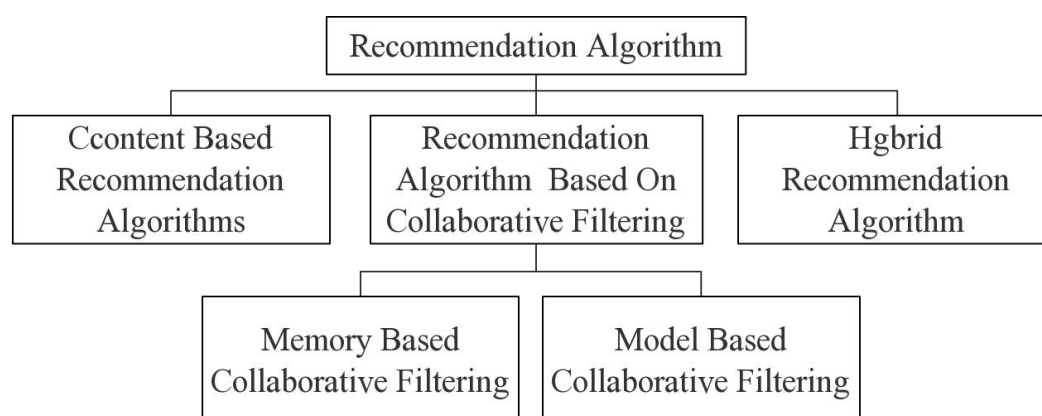
Figure 1 Recommended method structure in the traditional sense

Graph neural network (GNN), as a deep learning model used to learn data types with graph structure, has a strong application advantage in the task of learning graph structure data, and has become a widely used graph learning method. Essentially, the core idea of GNN is to apply embedding propagation to the neighborhood embedding representation of the nodes of an iterative aggregate graph. By stacking propagation layers, each node in the graph can access information about higher-order neighbors, rather than directly accessing information about first-order neighbors as traditional methods do. From the perspective of practical application, this algorithm has the following advantages: on the one hand, the output of graph neural network has no relationship with the order of node input, so it can be better applied in unstructured data; On the other hand, the graph neural network will update its own embedded representation by the weighted aggregation of itself and its neighbor nodes during the propagation of the preceding term, which can quickly obtain the basic information of the graph structure and form a high-quality node embedded representation. Therefore, after clarifying the application advantages of graph neural network, based on the media resource recommendation system and related recommendation technology, this paper mainly studies the application effect of the recommendation model of sudden neural network that integrates knowledge graph and time weight, and uses practical cases for verification and analysis, so as to provide effective basis for the follow-up technology research and development.[7-9]

2. Method

2.1 System Requirements

From the perspective of the development of the new media industry, the design and application of the media resource recommendation system are mainly divided into two roles, one is the ordinary user, the other is the administrator user. The former can be registered and logged in after the information view, information collection, news browsing and other functions; The latter, in addition

to the rights of ordinary users, can also manage the system's internal news information, login users, storage logs and other content.[10-12]

2.2 System Structure

The design of media resource recommendation system with graph neural network as the core is mainly divided into three parts. The first part is data processing, the second part is algorithm model, and the last part is system application. The specific structure is shown in Figure 2 below:
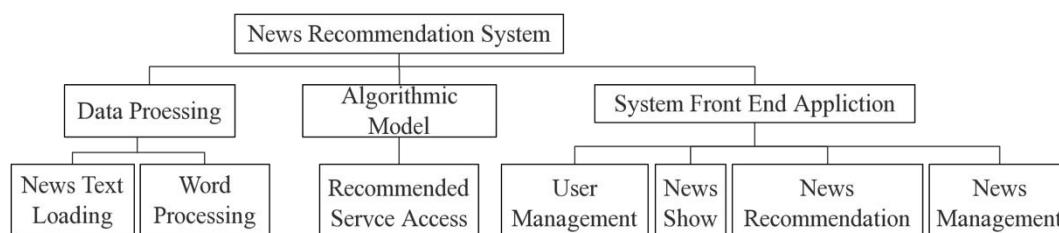

Figure 2. Structure of media resource recommendation system

First, data processing. This part is mainly responsible for input processing data information. Usually, news content contains pictures, text, videos and other contents. In this research system, news picture data is not involved, so the data processing function will filter and retain the text content. Since the news text information is quite different, the dimension transformation should be carried out before the input recommendation system.

Second, the algorithm model. In the existing news recommendation system, there are many common recommendation methods. For example, content-based recommendation methods mainly use users' historical reading data to recommend news materials related to recording information. The recommendation method with collaborative filtering as the core is mainly to recommend a certain type of news information that users may be interested in by dividing user group labels. The functional requirement of this module is to provide algorithm service for the whole system operation, that is, to recommend the content that users may be interested in in the news database. In order to ensure that the recommendation model can play a full role, this paper studies the system to let the application side directly access the algorithm server, so as to realize the remote recommendation service call.[13-15]

Finally, the application system. The overall system application function is shown in Figure 3 below. The user management module mainly manages user authentication, basic information and other contents. Users with different roles have different operation rights. General roles restrict access to user personal interface and news browsing module, while administrator roles can directly access the user management module to facilitate user information management. The news display module is mainly responsible for typesetting and displaying news materials, focusing on obtaining news resources from the database, and then returning the data to the application side for arrangement and display; The news recommendation module should provide users with news resources they are interested in, pay attention to the use of the recommendation module to calculate and analyze the news information in the database, and then select the news information with high scores to return to the front end. The front end will display the recommended news titles to facilitate the system users to choose independently. News management module is mainly used to manage news information, and administrators can add or delete related news materials.
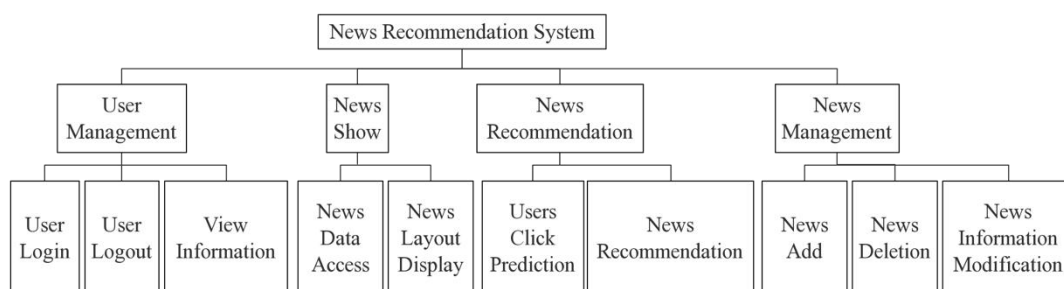
Figure 3. Structure diagram of system application function

2.3 Overall Design

As the media resource recommendation system is an application platform that provides recommendation services to all users, the overall architecture from top to bottom is shown in Figure 4 below, which includes four contents: application layer, business layer, film formation and data layer
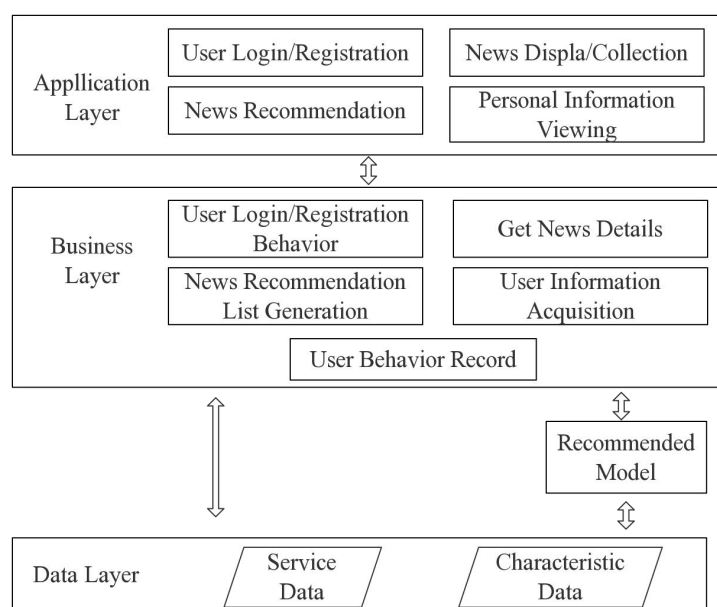

Figure 4 System architecture diagram

First of all, the application layer mainly interacts with system users and provides a graphical operating platform for the interaction between users and the server. It has several modules such as user login, news recommendation, news browsing and information viewing. Secondly, the business layer is to realize the business logic of the recommendation system, which will make scientific adjustments according to the basic operation of users in the application layer, and actively respond to the requests of users, including user login, recommendation calculation, log recording and other functions. Thirdly, the model layer is the core content of system construction and application, which mainly provides users with recommendation services, so as to generate the recommendation list of media resources as soon as possible. Finally, the data layer is mainly responsible for storing the data information required by the recommendation system, performing recommendation calculation when required, and transferring the processed data information to the recommendation model.

3. Result analysis

In combination with the media resource recommendation system with intention neural network as the core proposed in the above research, this paper proposes a graph neural network recommendation model integrating knowledge graph and time weight in the research experiment,

with the purpose of fully considering user interests and changes arising from time migration, so as to scientifically solve the problems such as too sparse data during media resource recommendation. The embedding algorithm is shown in Table 1 below:

Table 1 Representation construction of embedding algorithm

Algorithm 4-1 Embedding representation construction based on knowledge graph
Input:User-item matrix M;knowledge graph KG;input parameters $[i]_{i\in i}$, $[e]_{e\in E,}$ $[r]_{r\in R}$; depth K
Output:Embedding vectors e^*_{kg-i} for all i ∈ I
1.$e^{(0)}_e, e^{(0)}_r \leftarrow Initialize(e,r)$
2.$e^*_{kg-i} \leftarrow e^{(0)}_e[i]$
3.For l=1,...K do
4.For h, t ∈ E to
5.$e^{(l)}_k = \sigma(e^{(l-1)}_k + \sum_{t\in N(h)} a(h,r,t)e^{(l-1)}_t)$
6.End
7.$e^*_{kg-i} \leftarrow e^*_{kg-i} \big\| e^{(l)}_e[i]$
8.End
9.Return e^*_{kg-i}

Since this algorithm model fully considers the influence of time information on the composition of recommendation activities, it will use the graph of time weight factor and convolutional neural network to learn the interaction graph of users and items, so as to generate the embedded vector representation results of users and items. Therefore, in order to better evaluate the effectiveness of the applied model, a large amount of data information should be collected and collated for experimental verification, and the ablation experimental comparison results of the time weight removal part, knowledge graph removal part (GCNRec), Knowledge graph removal part (TGCNRec), time weight removal part (KGCNRec) and the model in this paper should be compared and analyzed. The details are shown in Table 2 below:

Table 2 Comparison results of ablation experiments

Model	Amazon-book		Movielens-100k	
	NDCG@20	Recall@20	NDCG@20	Recall@20
GCNRec	0.0915	0.1721	0.3165	0.3851
TGCNRec	0.0965	0.1745	0.3211	0.3883
KGCNEec	0.0931	0.1726	0.3166	0.3859
KTGCNRec	**0.0973**	**0.1773**	**0.3254**	**0.3908**

Based on the analysis of the above table, it is found that the research model in this paper fully considers the influence of its own attributes on the composition of user interest, uses the graph attention network to mine the collaborative knowledge graph containing project auxiliary knowledge, and through weighted aggregation processing, splices the input multi-layer perceptron to recommend and predict. Finally, the verification analysis on the real data set proves that the recall rate and the cumulative gain of normalized loss of this recommendation model are improved, which can effectively alleviate the problem of data sparsity and improve the application quality of the media resource recommendation system.

Conclusion

To sum up, in the rapid development of big data technology and mobile Internet technology, in the face of more and more data information, the field of new media must use modern technology to

build personalized recommendation system in order to provide system users with high-quality media resources, combined with the application advantages of graph neural network, in-depth mining of users' personal information, historical behavior data and other content. Finally, the media service needs of system users can be satisfied. Based on the understanding of media resource recommendation system and recommendation technology, this paper proposes a graph neural network recommendation model integrating knowledge graph and time weight, which can not only fully consider users' interest characteristics and follow the trend of time change, but also deeply dig various data resources to fully demonstrate the application value of graph neural network model.

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