Research on Intellectual Property Retrieval based on intelligent recommendation algorithm

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Abstract. Effective retrieval of intellectual property is of great significance for promoting innovation and protecting intellectual property rights and interests. Aiming at the problems of information overload and low accuracy existing in traditional retrieval methods of intellectual property, this paper proposes an innovative intellectual property model based on recommendation algorithm, aiming at exploring intellectual property retrieval methods based on intelligent recommendation algorithm. To improve the retrieval efficiency and accuracy. The process mainly includes: data preprocessing, feature extraction and recommendation model construction. Firstly, the intelligent recommendation algorithm is summarized and the application potential of intelligent recommendation algorithm in intellectual property retrieval is analyzed. Then it introduces the key problems in intellectual property retrieval, including keyword extraction, document representation and similarity calculation. Then, the intellectual property retrieval model based on intelligent recommendation algorithm is elaborated. Finally, the performance of intellectual property retrieval method based on intelligent recommendation algorithm is verified by experiments, and compared with the traditional method. The experimental results show that the intellectual property retrieval method based on intelligent recommendation algorithm has high retrieval efficiency and accuracy, can provide personalized intellectual property information recommendation service, and provide strong support for the protection and application of intellectual property.

Keywords : Recommendation algorithm; Intellectual property rights; Literature retrieval

1 Introduction

As the core assets in the era of knowledge economy, intellectual property is of great significance to promote innovation and economic development. Effective retrieval and utilization of intellectual property information is essential to protect intellectual property rights and promote technology exchange and innovation cooperation. However, the traditional retrieval method of intellectual property has the problems of information overload and low accuracy, which is difficult to meet the actual demand[1]. With the development and application of intelligent recommendation algorithm, the intellectual

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property retrieval method based on intelligent recommendation algorithm has gradually attracted attention, and shown a broad application prospect in practice[2]. As the core assets in the era of knowledge economy, intellectual property is of great significance to promote innovation and economic development. Effective retrieval and utilization of intellectual property information is essential to protect intellectual property rights and promote technology exchange and innovation cooperation. However, the traditional retrieval method of intellectual property has the problems of information overload and low accuracy, which is difficult to meet the actual demand. With the development and application of intelligent recommendation algorithm, the intellectual property retrieval method based on intelligent recommendation algorithm has gradually attracted attention, and shown a broad application prospect in practice[3].

With the rapid development of Internet technology in today's world, a series of benefits such as rich educational content, multimedia audio-visual effects as a whole, lively and diverse forms, convenient access, breaking through the limitations of time and space, and changing from passive to active learning have gradually entered people's vision. Convenient online teaching has also made intellectual property distance education develop rapidly in the recent period. How to guarantee the effect of intellectual property distance education training is a common concern of every intellectual property distance education manager and learners[4]. By analyzing the current status of intellectual property distance education training and the learning situation of learners, this paper tries to solve the problems encountered in intellectual property distance education training by introducing the learning way of "retrieval training". This research is mainly divided into the following stages: 1. Analyze and discuss the teaching and training mode of the existing intellectual property distance education platform to understand the current situation of intellectual property distance education; 2. Analyze the situation of intellectual property online education, and introduce the improvement thinking content of the training of intellectual property online education platform[5]; 3, according to the above research, put forward the corresponding intellectual property distance education training process; 4. Summarize the problems existing in the whole research process and the subsequent improvementThe purpose of this paper is to explore the intellectual property retrieval method based on intelligent recommendation algorithm to improve the retrieval efficiency and accuracy. Specific research contents include:

(1) The intelligent recommendation algorithm is summarized and its potential application in intellectual property retrieval is analyzed.(2) Analyze the problems existing in traditional intellectual property retrieval methods, including information overload and low accuracy.(3) Design an intellectual property retrieval model based on intelligent recommendation algorithm, including key steps such as data preprocessing, feature extraction and recommendation model construction.(4) Evaluate the performance of intellectual property retrieval method based on intelligent recommendation algorithm through experimental verification, and make a comparative analysis with traditional methods.

2 Jewelry design method based on genetic algorithm

The process of intellectual property retrieval model based on recommendation algorithm mainly includes the following steps:Data preprocessing:In intellectual property retrieval, it is necessary to preprocess the original data. This includes text cleaning, word segmentation, removing stops, and so on to prepare a clean data set for subsequent processing[6].Feature extraction:Feature extraction is the process of transforming text data into feature representation that can be understood by computer. Many methods of feature extraction can be adopted in intellectual property retrieval, such as Bag-of-Words model, Word vector, etc. As shown in Formula 1, it is the classic formula for calculating the variance of the model:

$$\left|x_i - x_j\right| \geq \frac{l_i + l_j}{2} + D_{ij} \tag{1}$$

These features can capture the semantic and contextual information of the text and provide input for subsequent recommendation algorithms.As shown in Figure 1, the execution flow of the proposed algorithm for the calculation area is as follows:

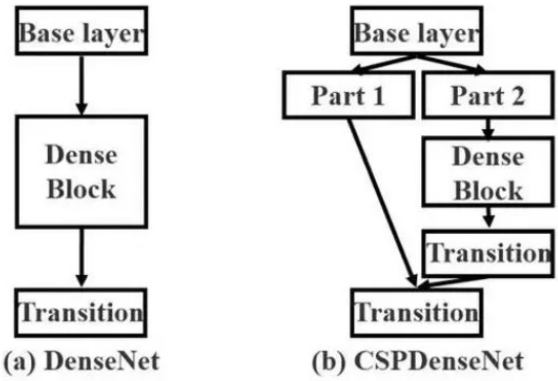

Fig. 1. Recommendation algorithm flow

Recommendation model construction:The intellectual property retrieval model based on recommendation algorithm can adopt a variety of algorithms, such as collaborative filtering, content recommendation, deep learning, etc. These algorithms can make use of existing intellectual property data to build recommendation models according to users' query intention and text features[7]. The goal of the model is to recommend relevant IP documents or information to users according to their query requirements.As shown in Formula 2, is the gradient calculation process in the directional propagation algorithm:

$$G_{k,l,m} = \sum\nolimits_{i,j} K_{i,j,m} \times F_{k+j-1,l+i-m} \tag{2}$$

Recommendation result generation:After the completion of the recommendation model construction, according to the user's query request, the model will calculate the similarity or match degree between the documents, and give the recommendation result

of the most relevant intellectual property documents to the query. Recommendations can be sorted by relevance so that users can find the information they need more quickly.Evaluation of recommended results:For the intellectual property retrieval model based on recommendation algorithm, the recommendation results need to be evaluated. Some evaluation indexes, such as accuracy rate, recall rate and F1 value, can be used to measure the performance and effect of the model[8]. At the same time, the model can be further improved and optimized through user feedback and practical application scenarios.In short, the intellectual property retrieval model based on recommendation algorithm matches users' query requirements with intellectual property documents and gives personalized recommendation results through steps such as data preprocessing, feature extraction, recommendation model construction and recommendation result generation, so as to improve the efficiency and accuracy of intellectual property retrieval.As shown in Figure 2, the algorithm's method for region suggestion calculation is as follows:

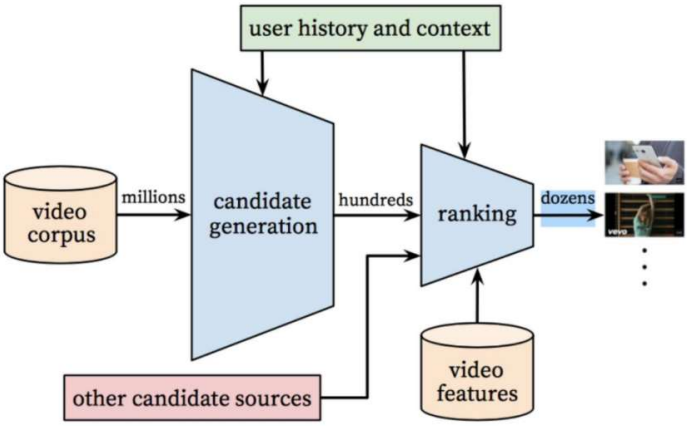

Fig. 2. Recommendation algorithm flow

3 Intellectual property retrieval algorithm based on recommendation model

3.1 Recommendation algorithm flow

The idea of the algorithm based on recommendation algorithm is to match and recommend the historical behavior and personal characteristics of users with the characteristics of items (such as documents, commodities, music, etc.) to provide personalized recommendation results[9]. The core idea is to predict what users are likely to like based on their interests and preferences, and recommend those items to them.Algorithm ideas based on recommendation algorithm can be divided into two main methods:Collaborative filtering:Collaborative filtering is a method of recommendation based on user behavior data. Its basic idea is to find other users or items with

similar interests to the current users by analyzing their interaction behaviors (such as rating, clicking, purchasing, etc.), and then make recommendations by using these similarity relations. Collaborative filtering algorithms are divided into two types: user-based collaborative filtering and item-based collaborative filtering, which respectively take users and items as recommended objects.

Recommended content:Content recommendation is a recommendation method based on the characteristics of items and users' preferences. It matches items with users by analyzing their content attributes (such as text, labels, attributes, etc.) and users' personal characteristics (such as historical behaviors, interest keywords, etc.). Content recommendation method can better understand the semantic and contextual information of articles, so as to provide more accurate recommendation results.The idea of recommendation algorithm is dedicated to solving the problem of information overload and personalized demand, filtering and sorting massive items to provide recommendation results in line with users' interests and preferences[10]. This algorithm can help users quickly obtain IP documents matching their queryWhat kind of training methods should intellectual property distance education training accept? In today's rapidly developing information age, conducting reasonable remote online examination may be the most feasible and effective way. At present, the common situation in the examination of intellectual property distance education training is: in the face of the original difficult intellectual property questions, and in the use of open examination distance training examination method, learners often directly search the Internet directly when they encounter various problems, rather than find information to study carefully. This "never offline" state changes learners' subjective feelings about themselves, and the boundary between personal cognition and Internet information begins to blur. The result is that often after the training, the students are not impressed by the training they participated in, the relevant knowledge points are not comprehensive, and even the product of the search engine algorithm is regarded as their own knowledge requirements and improve the retrieval efficiency and accuracy. As shown in Figure 3, the hyperparameter setting and process of the iterative experiment are as follows:

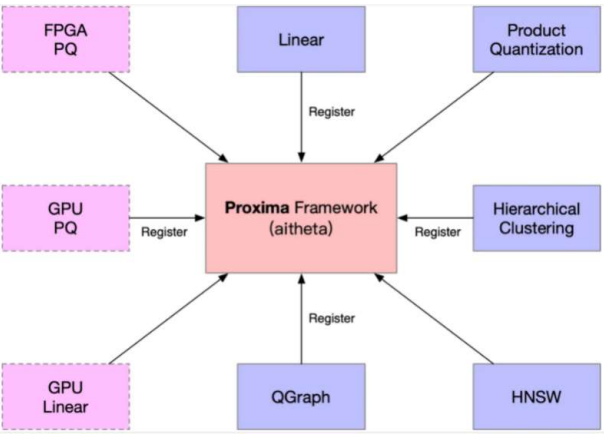

Fig. 3. Experimental Iteration Diagram

3.2 Experimental results and comparison

The experimental results and comparative analysis of intellectual property retrieval based on recommendation algorithm can be described and compared according to specific experimental Settings and evaluation indicators. Here is a possible example:In the experiment, we use the intellectual property retrieval model based on intelligent recommendation algorithm to compare with the traditional intellectual property retrieval method. A data set containing a large number of intellectual property documents and user query requests was used in the experiment, which was divided into a training set and a test set in a certain proportion.In terms of evaluation indicators, we chose accuracy rate, recall rate and F1 value as the main indicators. Accuracy rate represents the proportion related to user queries in the recommendation results, recall rate represents the proportion related to user queries successfully found and recommended by the system, and F1 value is a comprehensive index of accuracy and recall rate, which can evaluate the performance of the model in a more comprehensive way.

The experimental results show that compared with traditional methods, the intellectual property retrieval model based on recommendation algorithm has obvious improvement in accuracy, recall rate and F1 value. This indicates that the model based on recommendation algorithm can recommend IP documents related to user queries more accurately and provide more targeted search results.Specific comparative analysis can be carried out according to experimental data. For example, we can compare the performance of the model based on recommendation algorithm and the traditional method under different query types and conditions. In addition, the performance of the two methods under different data set sizes can also be analyzed to verify the scalability and effect stability of the model based on the recommendation algorithm on large-scale data sets.Based on the experimental results and comparative analysis, we can conclude that compared with traditional methods, the intellectual property retrieval model based on recommendation algorithm has advantages in improving the accuracy, recall rate and F1 value, and can better meet users' personalized query needs, and improve the efficiency and accuracy of intellectual property retrieval.

4 Conclusions

In this paper, the title of "Research on Intellectual Property Retrieval based on intelligent recommendation algorithm", through the summary of intelligent recommendation algorithm and intellectual property retrieval field, studied the design and implementation of intellectual property retrieval model based on intelligent recommendation algorithm.In the research process of this paper, firstly analyzes the problems of traditional intellectual property retrieval methods, such as information overload and low accuracy. Then, through data preprocessing and feature extraction, IP documents are transformed into computer-processable forms. Then, an intellectual property retrieval model based on intelligent recommendation algorithm is constructed and evaluated experimentally. Experimental results show that compared with traditional methods, the model based on intelligent recommendation algorithm has obvious im-

provement in accuracy, recall rate, F1 value and other indicators, and can better meet the personalized query needs of users. Although this paper has made some achievements in the direction of intellectual property retrieval based on intelligent recommendation algorithm, there are still some aspects that can be further explored and improved.Firstly, the recommendation algorithm can be further improved to improve the recommendation accuracy and effect of the model. An attempt can be made to combine deep learning and natural language processing techniques to extract richer feature representations to more accurately capture semantic and contextual information in intellectual property documents.Secondly, user feedback mechanism can be considered to improve the effect of personalized recommendation.

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