Research on Intelligent Recommendation Model Based on Knowledge Map

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Abstract. The integration of knowledge mapping tech and recommendation tech helps to better mine the knowledge of user preferences, better coordinate the similarity of recommended products, and enhance the user experience. Based on this, this paper first analyzes the concept and connotation of knowledge map and recommendation system, then studies the understanding tech based on knowledge map, and finally gives the utilization of intelligent recommendation data based on knowledge picture.

Keywords: Intelligent Recommendation, Knowledge Map, Information

1. Introduction

With the iterative maturity and progress of computer tech, it has been widely and deeply studied and popularized in many fields, especially in the field of recommendation, which has greatly ameliorated the humanization, intelligence and accuracy of recommendation. On the other hand, as an important prerequisite for the progress and development of AI tech, knowledge mapping can provide structured knowledge retrieval represented by semantic search. Knowledge mapping also has high utilization value in info filtering and semantic analysis. With the help of the entity and entity relationship data and info contained in it, it can carry out collaborative filtering and other related practical utilizations [1]. The hybrid recommendation model of knowledge map uses entity info and the relationship between entities to ensure the accuracy of the recommendation model. Through the relationship between entities in the knowledge map to spread the user's preferences, so as to better build its entity and relationship recommendation model.

The current recommendation models mainly propagate users' preferences along the path in the graph through rules, but the existing intelligent recommendation models have many shortcomings, mainly in that these recommendation models cannot make full use of the relationship between entities, resulting in the recommendation preference mainly focusing on entities and items. The knowledge
The map is used to construct the integrated self-encoder, which can decompose the image matrix and make full use of the attribute info between entities. At the level of intelligent recommendation algorithm, it mainly includes two types: collaborative filtering algorithm and potential factor model. The former realizes the recommendation of items through the calculation of the neighborhood relationship between items or users; the latter carries out the recommendation activities based on the historical behavior of users. This model is more flexible, so it is more widely used.

In addition, with the continuous amelioration and maturity of deep learning tech, it shows more significant advantages in speech recognition and language processing. Coding unstructured info in text based on deep learning tech can mine a large amount of info in item attributes, and extract high-quality features from them, so as to ameliorate the performance and accuracy of the recommendation model [2]. The integration of knowledge mapping tech and recommendation tech helps to better mine the knowledge of user preferences, better coordinate the similarity of recommended products, and enhance the user experience.

In a word, the intelligent recommendation model based on knowledge map can better solve the practical difficulties faced by users, such as info maze and info overload, and bring users better recommendation, search and interactive experience [3]. On the one hand, recommender system can provide users with effective info services; on the other hand, it can also use users' behavior info to mine users' personalized needs and provide users with info that can meet their actual needs. Therefore, the research of intelligent recommendation model based on knowledge map has important practical value.

2. The concept and connotation of knowledge map and recommendation system

2.1. The connotation of knowledge map

Knowledge graph is composed of a large number of nodes and edges between nodes, in which nodes represent entities and edges represent relationships between nodes, so it can be regarded as a collection of many triples. The purpose of network embedding for knowledge graph is to use low dimensional and dense vector to represent nodes, and ensure that the vector contains the similarity between nodes and the structure info of network [4]. The knowledge extraction in the knowledge map modeling model is to identify the knowledge questions in the text and use the entity link tech to associate with the knowledge map. The entity and relationship in the text are used to form the sub-graph of the original knowledge map. Secondly, the vector of each entity is obtained by knowledge map embedding tech. Finally, the word vector of the corresponding word is obtained according to the entity vector.

2.2. The concept of info recommendation system

As an intelligent agent system designed to solve the problem of massive info overload in the network, the recommendation system can automatically recommend the info that meets the personal interests or needs of specific users from the massive info in the network, so as to realize personalized recommendation service [5]. Info recommendation based on domain knowledge base is to recommend the info that users are interested in according to the relevance between knowledge points and the user's characteristics. The framework of info recommendation system is shown in Figure 1 below.
Figure 1. The framework of info recommendation system

Through the establishment of user interest model, the user interested practice is abstracted into attribute concept, and the user's interest is expressed in a certain form. In this process, user characteristics, preferences or activity related info need to be mined and extracted.

2.3. The relationship between recommendation system and knowledge map

The knowledge map on the item side greatly expands the info of items, strengthens the practice between items, provides rich reference value for recommendation, and brings additional diversity and interpretability for recommendation results [6]. Compared with social networks, knowledge map is a heterogeneous network, and the design of recommendation algorithm for knowledge map has higher complexity and sophistication. For the feature-based knowledge map assistant recommendation, the feature learning of knowledge map is used to process it, so as to obtain the low dimensional dense vector representation of entities and relationships. In addition, for the structure based recommendation model, it could directly use the structural features of the knowledge map. For each entity in the knowledge map, it could conduct width first search to obtain its multi hop associated entities in the knowledge map and get the recommendation results.

3. Understanding tech based on knowledge map

3.1. Knowledge understanding tech needs understanding

Knowledge map is rich in entities, concepts, attributes, relationships and other info, which makes knowledge-based understanding, interpretation and reasoning possible. The understanding tech based on knowledge map is to establish the mapping from data to entity, concept, relationship and attribute in knowledge map [7]. Based on this mapping, the machine can calculate and infer directly. The requirement understanding of knowledge understanding tech maps user's query to knowledge graph, and describes semantics at different levels. Secondly, at the level of entity annotation, the context info is not rich, the requirement of semantic modeling is high, and there are many challenges such as ambiguity, colloquialism and open domain annotation. At the conceptual level, open domain, strong dependence on knowledge data, sparse concept data and lack of info further strengthen the challenge of requirement understanding. The entity level technical framework of knowledge requirement understanding is shown in Figure 2.
3.2. Knowledge embedding and semantic prediction based on knowledge map

Knowledge embedding based on knowledge mapping has many advantages, such as large-scale sample automatic construction, entity semantic description, entity independent training, simple and efficient, and can optimize the measurement scene of text and entity [8]. Combined with knowledge base data and Querylog, co-occurrence mining, massive samples are generated and supervised training is provided. In addition, each entity is trained and iterated independently. For scene optimization, knowledge text semantics and structural semantics are described to solve the ambiguity description problem of polysemous entities.

At the level of semantic prediction, key signal words are mined by knowledge base, new number words and entity type training set are created automatically, and uses bootstrapping context matching sample mining in Querylog, and uses NN tech to better describe semantics dynamically.

3.3. Resource and user understanding of knowledge understanding tech

Resource understanding is to analyze resources from the perspective of semantic knowledge, and describe semantic info from different dimensions [9]. Compared with the collaborative algorithm, the utilization of knowledge-based search and recommendation solves the problem of cold start, and can meet the needs of more products for resource classification. Secondly, it supports more humanized and intelligent recommendation strategies, such as scene recommendation, which can better depict users' interests and provide users with richer service recommendation. In addition, at the level of diversity control based on knowledge system, it includes rule-based and model-based diversity control.

4. Intelligent recommendation data utilization based on knowledge image

4.1. Intelligent recommendation based on knowledge map

Intelligent recommendation is to effectively and reasonably screen and filter massive info, so as to recommend the info that users are concerned about and interested in, and ameliorate the user's interactive experience. With the help of knowledge mapping tech, the attribute info of items is filtered and screened to form intelligent recommendation [10]. The business process logic of intelligent recommendation is shown in Figure 3 below. In the level of building knowledge map of goods, through the knowledge extraction and fusion of goods info data, the constructed knowledge map is
used as the basic data for subsequent utilization. Secondly, in the construction level of user info knowledge map, the user info knowledge map is established through the extraction and fusion of user's basic attribute data, basic info and behavior data.

![Diagram](image_url)

**Figure 3.** The business process logic of intelligent recommendation

4.2. **Intelligent recommendation model based on knowledge map**

Knowledge map mining info recommendation module model is a generalized framework based on recommendation algorithm, which can effectively meet most of the recommendation needs. As a multi task learning model, the recommendation module of KG-RS intelligent recommendation model based on knowledge map is connected by cross regions, so as to learn the interaction between the items in the recommendation module and the entities in the knowledge map. The model consists of three modules: recommendation, knowledge embedding and linking. Among them, the recommendation module can extract its features from the related entity collection of the project; the connection module can realize the interaction between the project and the entity. In the knowledge map embedding module, entities and relationships are embedded in continuous vector space, and their structures are maintained.

5. **Conclusion**

In summary, intelligent recommendation model based on knowledge map can bring users better recommendation, search and interactive experience, and provide users with effective info services; and it can use users' behavior info to mine users' personalized needs, and actively provide users with info that can meet their actual needs. Through the analysis of the concept and connotation of knowledge map and recommendation system, this paper studies the understanding tech based on knowledge map. Through the research of intelligent recommendation data utilization based on knowledge picture, the intelligent recommendation model and recommendation strategy based on knowledge graph are analyzed.

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References

[1] Chang Liang, Zhang Weitao, Gu Tianlong. Summary of recommender system of knowledge map [J]. Journal of intelligent systems, 2019, 14 (02): 207-216.

[2] Guo Jiarui, Wei Jinwu, Zhang Yunyong. Strategies for big data to help operators ameliorate the core strength of large-scale operation [J]. Telecom Science, 2018, 34 (1): 120-125.

[3] Huang Liwei, Jiang Bitao. Review of recommendation system based on deep learning [J]. Acta computer Sinica, 2018, 41 (07): 1619-1647.

[4] Jia Yan, Qi Yulu, Shang Huaijun. A practical method for constructing network security knowledge map [J]. Engineering, 2018, 4 (01): 117-133.

[5] Li Wenpeng, Wang Jianbin, Lin Zeqi, Zhao Junfeng. Software knowledge mapping method for open source software projects [J]. Computer science and exploration, 2017, 11 (06): 851-862.

[6] Wang Baokui, Wu Lin, Hu Xiaofeng, he Xiaoyuan. Joint combat situation knowledge representation method based on knowledge map [J]. Journal of system simulation, 2019, 31 (11): 2228-2237.

[7] Wang Guoxia, Liu Heping. Summary of personalized recommendation system [J]. Computer engineering and utilization, 2012, 48 (7): 66-76.

[8] Wang Jiaqing, Yang Weidong, he Yizheng. Research on extraction method of entity relationship in relational database [J]. Computer utilizations and software, 2019, 36 (10): 10-16 + 38.

[9] Wang Yaqiang, Zang Genlin, Wu Qingrong, Zhan Chunli. Design of ontology root type for domain knowledge mapping [J]. Computer engineering and science, 2019, 41 (10): 1861-1867.

[10] Zhang Jianqiang, Zhang Gaoyu. Utilization analysis of blockchain tech in Internet of things [J]. Telecom Science, 2018, 34 (z1): 104-110.