Micro-video Learning Resource Portrait and Its Application

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Abstract. The emergence of a large number of online learning platforms changes the learners’ demands and learning styles, thus the society puts forward higher requirements for the personalization, intelligentization and adaptability of learning resource platforms. For large-scale, multi-source and fragmented micro-video learning resources and personalized education problems, based on micro-video online learning resources data, the paper studies the accurate, comprehensive and usable micro-video learning resources portrait method. And through the application of deep learning technology, it studies the theory and method of micro-video learning resource data analysis and personalized learning resource recommendation. It explores and forms the basic theories and methods of data-driven micro-video learning resources analysis to support the research of personalized education theories and methods.

Keywords: Micro-video · Learning resources · Resource portrait · Personalized recommendation

1 Introduction

Micro-video learning resources have the characteristics of multi-source, multi-dimensional and fragmentation. It can meet learners’ ubiquitous, mobile and personalized learning characteristics and requirements in the age of intelligence. Especially because of the COVID-19 in 2020, micro-video learning resources online have attracted unprecedented attention. Massive micro-video learning resources promotes the teaching from “curriculum” to “knowledge point”, and at the same time, the knowledge transfer has changed from the linear structure to the networked structure, and the traditional teaching methods and the recommendation of learning resources cannot fully meet the learning needs of learners. In addition, people’s learning is based on knowledge points and its logical relationships, and learners’ previous knowledge and experience will greatly affect the learning effect [1]. So it has great research significance to organize the existing micro-videos to explore the accurate, comprehensive and usable micro-video learning resources portrait method and personalized learning resource recommendation.
2 Related Work

2.1 Learning Resource Portrait

In China, the study of resource portrait and its application is the research focus for both pedagogy and computer science researchers. Professor Yu Shengquan proposed the framework of international standards for learning meta-level from the perspective of basic education [2]. Professor Yu Ping and Zhu Zhiting put forward the content shareability standard of open education resources [3]. Professor Yang Jiumin studied various interaction designs in videos from the perspective of learning effects of video resources [4]. These studies focus on video learning resources portrait and its applications in the foundation education. There is a lack of research on fine-grained and fragmented micro-video learning resources in higher education.

2.2 Micro-video Learning Resource Portrait

Micro-video learning resource portrait refers to the use of consistent concepts, relationships and properties to describe micro-video learning resources under certain technical specifications. Jiang et al. [5] proposed a multi-modal LDA model to mine the content portrait of video learning resources. Minxin et al. [6] used the existing classification relationships in text mining and domain ontology to find candidate keywords that can represent semantic relationships. Yang et al. [7] proposed an attention mechanism based on relation representation to extract the directed relation information among elementary mathematical knowledge points. These existing researches focus on text, they only extract the low-level features, and They don’t extract the relationship between multi-source network knowledge.

2.3 Personalized Learning Resource Recommendation

At present, the existing personalized learning resources recommended method which can be roughly divided into the following types: based on collaborative filtering (CFB) [8], based on the content (CB) [9], based on sequence mining (SMB) [10], mixing method. These researches didn’t fully consider the semantic part of learning resources and paid little attention to the logical structure and the systematization of learning resources.

Therefore, based on unsolved problems in the above studies, this paper explores the portrait and application of micro-video learning resources, and proposes a method to carry out learning resources portrait and personalized recommendation.

3 Portrait and Application Analysis of Micro-video Learning Resources

The main system framework of this paper is shown in Fig. 1, which mainly includes the micro-video learning resources portrait of and the personalized recommendation.
3.1 Micro-video Learning Resource Portrait

Micro-video learning resource portrait mainly includes micro-video learning resource content portrait and micro-video learning resource relationship portrait.

1. Micro-video learning resource content portrait
Micro-video learning resource content portrait mainly includes the concept and properties of micro-video learning resources. When the content layer of micro-video learning resource is depicted, it is necessary to restore the source properties of the learning resource and label these properties. Specific as follows:
Firstly, we should extract the content feature of micro-video learning resource. Because of online learning resource covers all disciplines and fields and their content creators have different levels of knowledge, the same knowledge exist many different expressions, and it is not reality to determine the features of micro-video learning resources artificially. Therefore, we should study how to combine text, image and audio to mine the content features of micro-video learning resources. These features not only include low-level features such as keywords, but also contain a high-level feature, such as discipline, knowledge domain, knowledge unit, knowledge level, etc.
Secondly, we should aggregate micro-video learning resources. Different from basic education, which has standardized subject knowledge system, the knowledge system of higher education is open, the knowledge points are named according to their respective cultivation characteristics in higher education. Therefore, it is necessary to work out the domain knowledge point label system based on the above content features.

2. Micro-video learning resource relationship portrait.
It contains structural relationship and content relationship.

Firstly, we need to extract the structure relationship. The logical relationship between knowledge points may be different for different fields. A knowledge point may belong to a number of knowledge fields, and each knowledge field corresponds to a number of micro-videos. So the extraction of the micro-video learning resource relationship is a
multi-dimensional problem. Therefore, we need to study how to combine text, image and voice data to mine relationship features. These features should not only include low-level features such as hierarchical relationship and association relationship, but also include high-level features such as co-reference and preorder.

Secondly, we need to extract the content relationship. Micro-video learning resources are based on the knowledge point granularity, it includes concept, principle, test questions and other types of content relations. Therefore, we need to study how to carry out transfer learning based on small sample data such as expert knowledge to accurately predict content relations.

3.2 Personalized Recommendation of Micro-video Learning Resources

It is implemented based on the above portrait and learner needs.

Firstly, the similarity of micro-video portraits is the basis of the recommendation algorithm. It has multi-dimensional characteristics, and the dimensions are not the same. Therefore, we need to study the measurement of the similarity of micro-video portraits.

Secondly, personalized recommend is based on micro-video portraits, and it is necessary to fully consider students’ personalized learning needs and other constraints, such as the learner’s professional background, previous knowledge, field experience, learning needs, learning objectives, and so on, so we need to study personalized micro-video recommendation under multiple constraints.

4 The Implementation of Micro-video Learning Resource Portrait and Application

Based on the problems that need to be solved, combined with the application analysis of current artificial intelligence and other technologies, this paper proposes the method of micro-video learning resource portrait and personalized recommendation system.

4.1 Micro-Video Learning Resource Portrait

The purpose of this paper is to study the iterative discovery method of the concepts of content layer and hidden properties in multiple fusion of text, image and audio. In this method, subjects, fields, knowledge level and relationships are taken as semantic annotation factors. This technology is an important technology to solve the problem of feature extraction of data-driven micro-video learning resources, and it is the basis of personalized guidance. According to the technical characteristics of deep learning, we think that a Convolutional Neural Networks (CNNs) data processing model can be adopted to solve this problem. As shown in Fig. 2, during the construction of a federation classifier for implicit properties, the system extracts the content features of multivariate learning resources data (such as text, image, audio, etc.), and combined with multivariate data fusion, the system extracts the common features of multivariate data as the important features of the classifier.
4.2 Personalized Recommendation System

This paper designed a micro-video learning resource portrait similarity method based on small sample. According to cognitive load theory, it provides appropriate methods to support the selection of micro-video learning resources. The collaborative filtering method can also be used to achieve the recommendation of micro-video learning resources, so it is necessary to calculate the portrait similarity of micro-video learning resources. In the definition of computational portrait similarity, we not only consider the content feature and structure feature, but also consider the timing factor of micro-video learning resources, and we use the latest change part of micro-video increment to calculate the result similarity. Different from other research similarities, in the field of education, whether the similarity of learning resources is accurate or not requires expert knowledge for final verification. Therefore, the sample micro-video data set needs to be reviewed online by corresponding experts and labeled as similar or not. Then, these labeled data are used as training sets to make accurate similarity prediction for micro-video learning resources. Multi-constraint personalized micro-video learning resource recommendation needs to consider the matching degree of students’ personalized needs and micro-video learning resource portrait. According to the principle of homogeneity, we can match students who have similar personalized needs with micro-video learning resources which have similar portraits. Graph Convolutional Neural Network (GCN) is a neural network of learning graph structure, whose learning goal is to obtain the hidden state of graph perception of each node. We can take micro-video learning resources as nodes, and take their portrait as its characteristic value, then we can input this feature graph into graph convolution network for training and obtain corresponding similarity results.
5 Conclusion

This paper takes into account the disciplinary logic, domain and knowledge level of micro-video learning resource data, and proposes to use deep learning method to integrate multiple data such as text, image and audio to depict micro-video learning resources accurately. And it proposes a personalized recommendation method to calculate the similarity of micro-video learning resources by GCN. This paper explores and forms the basic theories and methods of data-driven micro-video learning resources analysis. In this paper, artificial intelligence technology is integrated into education, it provides a feasible way for micro-video learning resource portrait and its application.

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