Research on Personalized Resource Recommendation of Artificial Intelligence Specialty Based on Big Data

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Abstract. With the advent of the era of big data, the application of big data technology in the cultivation of artificial intelligence professionals has accelerated the integration of industry and education, which is of great significance to the cultivation of applied talents. With the rapid development of big data technology, the deep integration of big data and education has become an inevitable trend. We comb the shortcomings of the current undergraduate talent training mode of artificial intelligence. Based on the big data thinking mode, we collected student behaviour data, constructed data collection model and student learning behaviour portrait, and constructed personalized resource recommendation model based on multi-dimensional resource pool. Here, an effective learning resource recommendation algorithm based on ant colony algorithm is designed to realize accurate resource integration and push. Through the application verification, it can be seen that the resource recommendation path based on the current method coincides with the actual use path of learners, which has certain practicability and can meet the actual needs of students at different learning levels, so as to improve the efficacy of students' autonomous learning.

Keywords: Big data · artificial intelligence major · personalized resource recommendation · learning behaviour portrait · ant colony algorithm

1 Introduction

The continuous improvement of computing power, massive data and algorithm improvement have jointly brought the third development wave of artificial intelligence. Artificial intelligence has become the center of a new round of industrial transformation and the core and key technology leading the development of cutting-edge science and technology [11]. Human society and industrial society have gradually entered the era of intelligence. Artificial intelligence is a major set up by the talent plan of Chinese colleges and universities [8]. It aims to cultivate applied talents in China's artificial intelligence industry and promote the construction of first-class disciplines of artificial intelligence. Due to the scarcity of artificial intelligence talents, the competitiveness is enhanced. Most high-end talents are still in schools or scientific research institutes, and there are very few talents

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who can really invest in the industry. It is understood that at present, the gap of artificial intelligence talents in China exceeds 5 million, and the development of artificial intelligence technology has become an important national development strategy.

At present, artificial intelligence majors have a wide range of employment and fast knowledge updating. With the progress of science and technology and the rapid development of artificial intelligence, the employment of graduates is facing the current situation of knowledge renewal [3]. How to maintain the long-term and effectiveness of talent training is an urgent problem to be solved [5]. Under the current situation of accelerating the upgrading and transformation of traditional industries and the development of new industries, artificial intelligence has become a major involving a wide range of knowledge in modern industrial industries [7]. A series of educational reform and innovation programs, such as how to consolidate the broad professional foundation while strengthening the talent training with professional characteristics, how to build a new curriculum system, practice system and knowledge system, pay attention to ability training, and cultivate high-end applied talents in line with social needs, have become a problem that must be solved [4].

2 Problems Faced in the Artificial Intelligence Professionals

2.1 Inaccurate Positioning of Professional Talent Training

In the traditional education mode, teachers pay more attention to follow the principle of professional discipline orientation - curriculum orientation, and implement the teaching mode of solving clear problems, with the goal of enhancing the completeness and systematicness of students' professional knowledge [2]. Under the traditional education mode, teaching design starts from teaching materials, focuses on teaching, designs teaching contents, teaching methods and other links according to the syllabus, and lacks consideration of the cutting-edge nature of the teaching contents and the social demand for relevant professionals [6]. Artificial intelligence technology has the characteristics of real-time and transient, and the speed of technology iteration is very fast. On the one hand, students' professional knowledge is relatively backward after graduation, so they need to learn knowledge again. On the other hand, under the teacher centered teaching mode, students' thinking is solidified, they habitually work according to the job requirements, and they lack the sense of innovation. Students cannot get sound development, leading to decline in career development or unemployment [12].

Using big data technology can accurately understand the demand for talent training within the industry. By screening the behaviour characteristics of students, we build a multi-level apprenticeship information resource database. We use the information data extracted from different angles and labels to rebuild the curriculum resource database and obtain diversified knowledge point information. By constantly optimizing the curriculum system of colleges and universities and strengthening the matching degree of curriculum content and skills, we help students constantly supplement weak knowledge and guide students to study targeted.

2.2 Difficulties in Personalized Training

In recent years, artificial intelligence technology is used more and more frequently in life, and more and more people apply for this major. As a result, the students enrolled have different backgrounds and living environments, so their cultural literacy is mixed [9]. With the rapid increase of the number of students, professional teachers may be biased when paying attention to learning, and ignore the students with medium grades. If teachers are required to understand the learning situation of each student, they need to make great efforts and take more actions [1]. In teaching, the school has a fixed and unified teaching mode, which cannot accurately evaluate students' points of interest, and there is a lack of personalized guidance, which makes students' enthusiasm not high [10].

Based on the above problems, colleges can independently build various data platforms. By collecting student behaviour data, teachers can have a clearer understanding of students' interest orientation, help students improve their learning interest and realize autonomous learning, and lay a solid foundation for cultivating personalized talents.

3 Personalized Resource Recommendation Method

Based on the research status of artificial intelligence specialty, we have integrated artificial intelligence technology, big data technology, personalized recommendation, intelligent decision-making and other technical solutions to promote the implementation of emotional perception and interactive teaching strategies, and built an intelligent curriculum system integrating learner model, knowledge system model and practical interaction model. Students learn through recommended resources, collect learning behaviour data, perceive learners' emotions, construct students' learning behaviour portraits, and further recommend personalized learning resources to learners through knowledge map. The overall research framework is shown in Fig. 1.

3.1 Build Big Data Acquisition Model

In the traditional student information collection, it generally only emphasizes the extraction of static features, lacks the ability to perceive dynamic student behaviour, and cannot recommend personalized educational resources according to learning needs. We use big data and artificial intelligence technology to organically integrate static features and real-time perceptual data, collect and extract perceptual data in learning methods, processes, attitudes and effects, including pre course scores, resource access, attendance homework, missed supplementary examination and other data related to course teaching, and supplement other required data in the form of questionnaire. The collected learner data comes from different systems such as teaching management system and online platform, and the data format is inconsistent. After eliminating some useless data, it is necessary to clean, merge and integrate the data information.

It is also necessary to analyze learners' mastery of "knowledge points/abilities" from multimodal information such as voice, video and text, and synchronously and dynamically fine tune students' cognitive level, learning style and learning motivation.

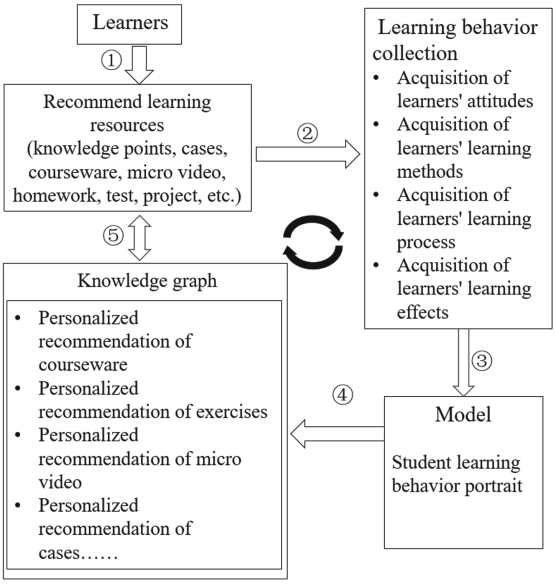

Fig. 1. Framework of curriculum design

3.2 Constructing the Portrait of Students' Learning Behaviour

Traditional online education does not fully study individual characteristics, and the analysis of learning interest, learning emotion and preference is not deep enough. We use multimodal perceptual data and integrate data mining technology to design learning behaviour portrait (model), and analyze, process and mine learning state information through dual-channel model. In addition, it also improves the reasoning representation of the dimensions of learners' basic attributes, knowledge points and interests, learners' types and learning style preferences, provides a model basis for knowledge recommendation in line with personal cognitive styles, and presents learners with personalized and visual learning paths, learning resources, peer information and other tools. The specific process is shown in Fig. 2.

3.3 Build Personalized Resource Recommendation Model

In the digital structure of modern online education, professional three-dimensional teaching resource pool emphasizes the diversity and unstructured of resources. It gives resources new semantics: providing personalized and heuristic learning resources for students in real time.

The professional three-dimensional teaching resource pool takes "knowledge points/abilities" as the basic element, takes "multiple three-dimensional teaching mode" as the operation mechanism, takes the hierarchical integration of resources, the diversification of curriculum teaching and the three-dimensional learning support as the means, and relies on the education platform with independent property rights, runs the curriculum group resources through the curriculum knowledge and practice system to form

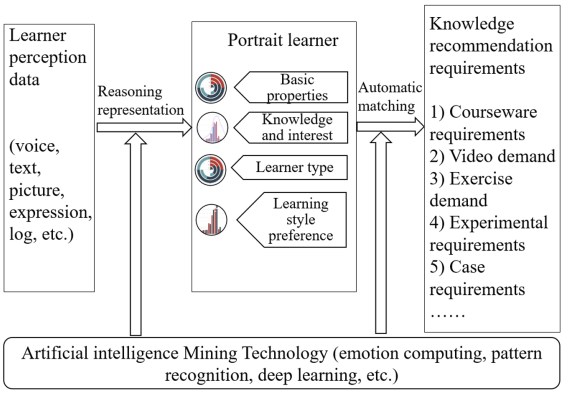

Fig. 2. Student demand prediction model

the knowledge map of teaching resources. In addition, it is supplemented by sequential pattern mining algorithm and collaborative filtering recommendation technology to automatically push personalized learning resources based on knowledge points/capabilities to improve the self-learning efficacy.

The recommendation algorithm layer selects ant colony algorithm as the learning resource recommendation algorithm, combined with content-based and label-based recommendation. Here, we use the directed graph of M knowledge points, $G = (M, A)$, $M \in \{1, 2, 3, \ldots N\}$ is used to represent the Learning Resource Recommendation problem. The evaluation function E_{ij} represents the evaluation information that learners learn according to the learning path $i- > j$. The objective function is $f(W) = \sum E^{ij}$. W is a learning path containing knowledge points *1, 2, 3... N*. The number of selected populations is N, $L = \{l_1, l_2, \cdots l_n\}$ is the set of learners' knowledge levels who have completed the learning task.

Based on the difficulty of learning content, learners' knowledge level, learning style and learning preference, the heuristic formula of recommended path is as follows:

$$\eta_{l_0,m_j} = \left(1 - \left|l_0 - d_j\right|\right) * \left(1 - \left|s_0 - c_j\right|\right) * \left(1 - \left|h_0 - q_j\right|\right) \tag{1}$$

where d_j is the difficulty of learning object m_j, l_0 is the learner's knowledge level, s_0 is learning style, c_j is the characteristic of knowledge expression, h_0 is learning preference, q_j is the media type of the learning object. The whole algorithm flow chart is shown in Fig. 3.

3.4 Application Verification

The personalized learning resource recommendation model in this paper has been applied to the course teaching of operating system. Figure 4 is the directed graph of learning resource recommendation of "classic process synchronization problem case". Each node represents the learning resource, the number represents the resource serial number, the text after the number represents the name of the learning resource, the connecting line represents the connectivity of the learning resource, and the arrow represents the learning

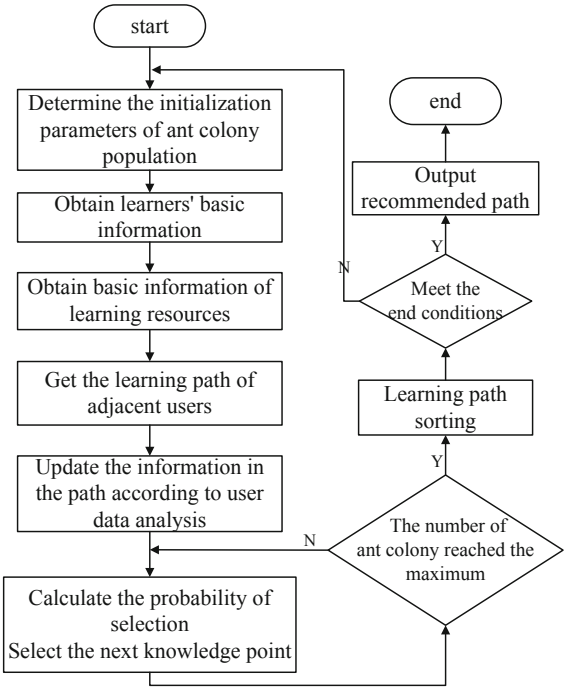

Fig. 3. Flow chart of Learning Resource Recommendation Algorithm Based on ant colony algorithm

unidirectionality under the influence of the knowledge support relationship. In the "classic process synchronization problem case", "python basic syntax", "process concept" and other resources are the basis for learning other resources. The subsequent "process status", "PCB", "mutual exclusion", "synchronization" and "semaphore" are all based on them, and the learning order can be freely determined by the previous knowledge. There are also many expansion cases and directions in the cases of follow-up process synchronization, including producer consumer problems, reader writer problems, philosopher dining problems, etc., which are common expansion cases. Learners can make their own choices according to their own interests and learning objectives. Therefore, starting from learning resource 2, the learning path of each group can be personalized adjusted on the basis of the recommended path.

The learning process of 56 students in two classes of grade 20 data science and big data technology is tracked and analyzed, and the actual learning path of each student is obtained by using the existing learning platform of Dalian Neusoft Information Institute. We compare the learning resource path recommended by the model with the actual path to analyze the practicability of the model. Note that the number of times the recommended path is the same as the actual path is N1, and the number of times is N2, then the frequency of the recommended path is $P = N1/(N1 + N2)$.

From the experimental data analysis and calculation results, it can be seen that the frequency of using the recommended path in the classic process synchronization

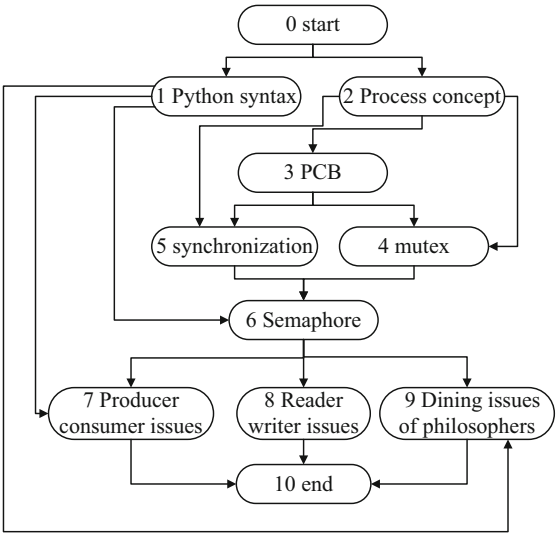

Fig. 4. directed graph of Learning Resource Recommendation

problem case is $P = 79.25$. It shows that the actual learning resources adopted by students coincide with the resources recommended by the system, especially in the initial route of resource recommendation. The nodes inconsistent with the recommended path are mainly concentrated in the resources closer to the end point, because the students with strong ability have more expansion of their own, while the students with weak foundation do not choose to expand resources.

4 Conclusions

This paper discusses and analyzes the current situation of the talent training mode of artificial intelligence undergraduate specialty in Colleges and universities, and analyzes the shortcomings of the current talent training mode. We design resource recommendation methods based on big data technology, use big data technology to collect student behaviour data, and build student learning behaviour portraits and personalized Resource Recommendation models. This paper focuses on the Learning Resource Recommendation Algorithm Based on ant colony algorithm, which is used to realize accurate resource integration and push. Through the application verification, it can be seen that the coincidence degree between the content of resource recommendation and students' learning route is high, which proves that the resource recommendation based on the current method is highly effective, can meet the actual needs of students at different learning levels, and promote the improvement and innovation of talent training mode.

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