Research on Dongguan Party History in Political Education Using Big Data and Artificial Intelligent

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Abstract. The current research on ideological and political education has increasingly focused on the utilisation of contemporary technological resources to enhance the efficacy of pedagogical practices, particularly in the context of big data and artificial intelligence applications. However, the extant research is not without shortcomings. These include insufficient integration of resources, a lack of personalised education and an ineffective use of local resources with distinctive characteristics. In this work, the objective of this study is to investigate how the ideological and political education model can be innovated through the strategic integration of resources pertaining to the history of the Party in Dongguan. An AI-based intelligent teaching platform has been constructed, comprising the following stages: firstly, the platform automatically parses and organises text resources pertaining to the history of the Party in Dongguan through the utilisation of natural language processing technology; secondly, the machine learning algorithm is employed to conduct a comprehensive analysis and classification of the educational content, thus facilitating subsequent personalised recommendations and content optimisation. In order to enhance students' motivation to learn, the platform employs deep learning models to dynamically adjust pedagogical strategies and generate content that aligns with students' individual learning rhythms and preferences. Concurrently, through the utilisation of big data analysis, real-time monitoring and evaluation of students' learning behaviours and effects, data-driven precision education interventions are made available.

Keywords: Natural Language Processing, Artificial Intelligent, Educational Technology, Big Data.

1 Introduction

At present, ideological and political education faces the following challenges: first, the traditional teaching methods have a single content and cannot fully stimulate students' interest in learning. In particular, the rapid development of artificial intelligence (AI) and big data technology is driving a gradual transformation in educational models and teaching methods, with a shift towards greater intelligence, personalisation and data-driven approaches [1]. In China, ideological and political education (IPP) has historically

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been a crucial avenue for colleges and universities to instill the core values of socialism and patriotism. However, the conventional IPP model frequently encounters challenges, including a narrow scope of content, limited student engagement, and difficulty in capturing students' interest, which ultimately impairs the effectiveness of instruction and hinders students' active involvement [2].

Dongguan has a long history of involvement in the Chinese revolution, and as a result, has amassed a wealth of resources pertaining to the party. These resources hold significant value in terms of historical education, and also serve as a rich repository of material for ideological and political education. Nevertheless, the extant research on the deployment of party history resources in Dongguan for ideological and political education remains relatively circumscribed [3]. This is evidenced by the underutilisation of resources, incompatibility with teaching objectives and the absence of comprehensive integration of modern technical capabilities. It is imperative to determine the most effective methods for fully utilising the educational potential of Dongguan's party history resources, ensuring they are better aligned with the actual needs of ideological and political education [4].

The advent of big data and AI technology has opened up new avenues for the advancement of ideological and political education. The utilisation of big data technology enables the collection and analysis of a substantial quantity of data pertaining to students' learning behaviours, thereby facilitating the comprehension of students' learning habits and needs by educators [5], and the formulation of more targeted teaching strategies. Artificial intelligence technology employs natural language processing, machine learning, and deep learning to achieve intelligent analysis, personalised recommendation, and interactive enhancement of educational content. These technical means can not only improve the accuracy and effectiveness of ideological and political education, but also enhance students' learning experience and sense of participation [6]. Therefore, this study aims to develop an intelligent teaching platform through big data and artificial intelligence technology to solve the problems of insufficient resource integration and insufficient personalized education, and improve students' learning effectiveness.

2 Related Work

Initially, Boussouf [7] presents a comprehensive review of the current literature on the impact of artificial intelligence in education. It examines the ways in which AI technologies are being employed to personalise learning, assess student performance, and provide real-time feedback. The study elucidates both the potential benefits and the challenges of integrating AI into educational settings, including issues related to data privacy and the ethical use of AI in classrooms.

Tommy's [8] research focuses on the applications of AI in higher education, with a particular emphasis on the creation of personalised learning environments. The paper examines a range of AI-driven tools that are capable of adapting to the specific learning styles and paces of individual students, with the objective of enhancing the overall quality of the educational experience. Furthermore, the paper addresses the ethical considerations pertaining to the use of AI in education, including data privacy and the potential for algorithmic bias.

Nawaz [9] presents a case for utilising machine learning algorithms to analyse substantial datasets of student feedback and performance, with a view to informing curriculum development in the field of political science education. The research demonstrates the potential of AI to identify deficiencies in existing pedagogical resources and to propose new content that more closely aligns with student requirements and contemporary political contexts.

3 Methodologies

The objective of this section is to innovate the ideological and political education model through the strategic integration of resources pertaining to history of Dongguan Party.

3.1 Natural Language Processing

The platform uses natural language processing technology (NLP) to automatically parse and organize the text resources of Dongguan Party history, including the identification and extraction of important historical events, people and places. This process helps students to understand complex historical content more intuitively during the learning process. Specifically, the named entity recognition and topic modeling are employed to extract pivotal historical events, individuals, locations, and themes from copious textual data. In the case of the text data of the Dongguan Party history, which can represent as $\{T_1, T_2, \dots, T_n\}$, the NLP model parses and extracts the key entities E_i and the subject Z_i through the following Equation 1.

$$E_i = NER(T_i),\ \ Z_i = LDA(T_i) \tag{1}$$

Where $NER(\cdot)$ is a named entity recognition algorithm, and $LDA(\cdot)$ is a topic modeling algorithm based on latent Dirichlet assignment. The results of these analyses will be further organized into structured data that can be used for subsequent educational content customization and optimization.

Topic modeling is used to identify hidden topics from a collection of texts. We use the Latent Dirichlet Allocation (LDA) model, which is a generative model that assumes that each document is a mixture of several topics, each of which is a distribution of several words. Given the dataset $\{D_1, D_2, \dots, D_n\}$, the goal of LDA is to find the topic distribution θ_i and the vocabulary distribution φk that best explain the data, where θ_i represents the distribution of document D_i on different topics and φ_k represents the distribution of words in topic k. Probabilistic model of LDA is expressed as Equation 2.

$$P(D|\alpha,\beta) = \prod_{i=1}^{n} \int_{\theta_i} P(\theta_i|\alpha) \left(\prod_{j=1}^{N_i} \sum_{z_{ij}} P(z_{ij}|\theta_i) P(w_{ij}|z_{ij},\beta)\right) \tag{2}$$

Where α and β are Dirichlet prior arguments, z_{ij} is the subject of the j-th word in the ith document, and w_{ij} is the actual word. By inferring the LDA model through methods such as Gibbs sampling, we can obtain the topic distribution of each document and the vocabulary distribution of each topic.

3.2 Real-time Monitoring and Evaluation of Big Data Analysis

In order to monitor students' learning behavior in real time, the platform needs to collect a large amount of learning behavior data. This data includes, but is not limited to, student login time, learning duration, learning path, frequency of interaction, test scores, discussion engagement, etc. Suppose the student's behavior data stream is a time series dataset $\{L_1, L_2, \dots, L_t\}$, and each data point L_i represents the student's behavior feature vector in time t_i, which is expressed as Equation 3.

$$f_j'(t_i) = \frac{f_j(t_i) - \min(f_j)}{\max(f_j) - \min(f_j)} \tag{3}$$

Students' learning behavior data is usually generated continuously, with real-time and high-dimensional characteristics. In order to efficiently process this large-scale data, we use a distributed computing framework for data stream processing. These frameworks allow us to perform real-time batch and stream processing of data, supporting parallel computing of large-scale data. In data stream processing, we define the behavior data of each student as a data stream $\{L_i^t\}$, where L_i^t represents the i-th student's behavior feature vector at time t. The distributed computing framework splits this data into microbatches and processes them in parallel. For each microbatch of data, calculate its statistical characteristics express as Equation 4.

$$\mu_t = \frac{1}{N}\sum_{i=1}^{N} L_i^t,\ \sigma_t^2 = \frac{1}{N}\sum_{i=1}^{N}(L_i^t - u_t)^2 \tag{4}$$

Note that μ_t is the mean of time t, σ_t^2 is the variance, and N is the number of students in the microbatch. With these statistical characteristics, we can monitor the overall learning status of students in real time.

4 Experiments

4.1 Experimental Setups

By constructing an intelligent teaching platform based on big data and artificial intelligence, this study explores how to effectively integrate Dongguan party history resources into ideological and political education. The experimental data were derived from the student learning behavior data of the online learning management system of colleges and universities, the text data of Dongguan Party history, and the feedback data of students. Through modules such as data collection, processing and analysis, content recommendation, feedback and optimization, the platform monitors students' learning status in real time and provides personalized teaching content. The experimental results verify the effectiveness of the platform in improving students' interest and understanding by comparing learning effects of experimental and control group.

4.2 Experimental Analysis

The initial step involved descriptive statistical analysis of the learning behaviour data of students in the experimental and control groups. This process facilitated the extraction of key feature indicators, including learning duration, login frequency, video viewing time, number of interactions, and test participation rate. By analysing these indicators, we can gain preliminary insights into students' learning habits and behavioural patterns. Figure 1 depicts the outcomes of a cluster analysis of students' learning behaviours. The left-hand figure depicts the true cluster distribution following the application of principal component analysis (PCA) to reduce the dimensionality of the data. The right-hand figure illustrates the results of the K-Means clustering algorithm, with the red mark representing the cluster centre. The visualisation allows for a more intuitive observation and understanding of the commonalities and differences between the learning behaviours of different groups of students.

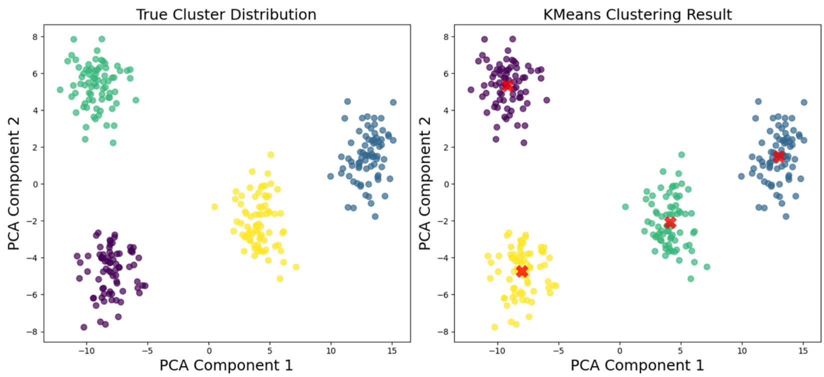

Fig. 1. KMeans Clustering Analysis of Student Learning Behaviors.

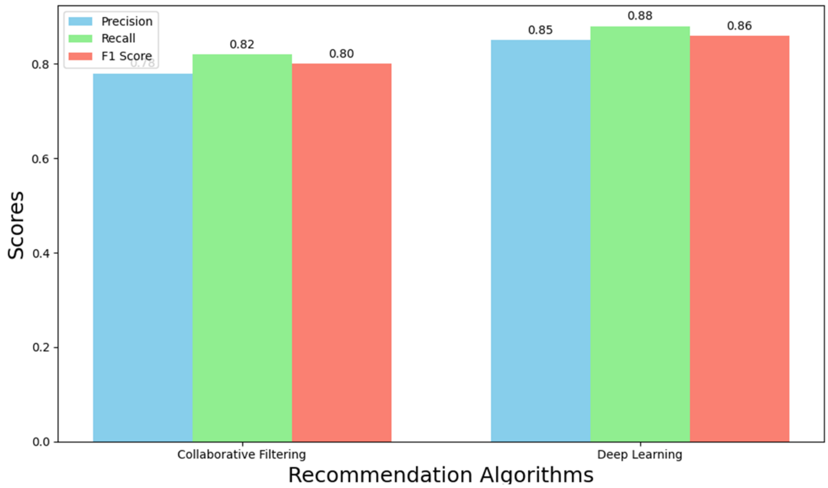

Fig. 2. Personalized Recommendation Performance Comparison.

In order to evaluate the personalized recommendation effect of the intelligent teaching platform, we adopted an A/B testing method, and randomly assigned students in the experimental group to subgroups using different recommendation algorithms. Figure 2 illustrates the results of the experiment for the evaluation of the effectiveness of personalized recommendations. In this figure, the performance of collaborative filtering algorithm and deep learning algorithm in the recommendation system is compared, and their accuracy, recall and comprehensive effect are evaluated by three indicators: Precision, Recall, and F1 Score.

5 Conclusion

In conclusion, this study successfully constructed an AI-based teaching platform, effectively integrated Dongguan Party history resources into ideological and political education, and significantly improved students' learning interest and performance through the implementation of personalised content recommendation and real-time feedback. The findings demonstrate that the utilisation of big data analysis and machine learning algorithms can effectively tailor the educational experience in accordance with individual learning behaviours. Further research should investigate the introduction of additional diverse datasets and sophisticated natural language processing techniques to enhance content personalisation.

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