Research on the Evaluation Model of Higher Education Quality Based on AI Large Models

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Abstract: With the rapid development of artificial intelligence (AI) technology, especially the application of large models in various fields, the education sector has begun to explore how to use this technology to improve traditional educational quality evaluation models. Traditional education quality evaluation has many limitations, such as strong subjectivity and a single evaluation dimension, while AI large models, by processing massive data, can provide more comprehensive and accurate evaluation results. This paper proposes a new higher education quality evaluation model based on AI large models, builds a multi-dimensional and multi-level evaluation framework, and suggests specific methods for model training, data collection, and processing. Through theoretical analysis and model design, this paper provides a new evaluation tool and approach for educational managers, promoting the intelligence and scientific development of educational quality evaluation.

Keywords: AI large model; Educational quality; Evaluation model; Higher education; Intelligence

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1. Introduction

Educational quality evaluation is a key aspect of educational management, which influences the direction and quality of higher education development. Traditional evaluation methods mainly rely on indicators such as students' academic performance and teachers' teaching quality. However, these methods often suffer from partiality, subjectivity, and difficulties in data processing. With the rise of artificial intelligence, especially the widespread application of large models, AI technology provides a new solution for educational quality evaluation. Based on AI large models, educational quality evaluation not only overcomes the limitations of traditional methods but also achieves comprehensive and precise monitoring and analysis of the educational process. This paper aims to propose a new evaluation model for higher education quality based on AI large models and discuss its application scenarios and implementation paths.

2. Limitations of Traditional Higher Education Quality Evaluation Models

(1) Single evaluation dimension

Traditional educational quality evaluation often focuses on quantitative data, such as students' exam scores and teachers' teaching quality. However, these indicators often overlook the multi-dimensionality of educational quality and fail to comprehensively reflect aspects such as students' overall qualities, the rationality of course design, and the innovativeness of teaching methods.

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(2) Difficulties in data collection and processing

Traditional evaluation methods rely on surveys, interviews, classroom observations, etc. The data collection process often suffers from sample bias and missing information. Moreover, when the data volume is large, traditional methods struggle to effectively integrate and analyze the data, leading to the inability to draw comprehensive and scientific conclusions.

(3) Strong subjectivity and lack of unified standards

Due to differences in evaluators' experience and perceptions, traditional educational quality evaluation is highly subjective. Furthermore, the lack of unified evaluation standards and methods makes it difficult to compare and deeply analyze educational quality evaluation results across different schools and disciplines.

3. Higher Education Quality Evaluation Model Based on AI Large Models

(1) Basic principles and advantages of AI large models

AI large models are based on deep learning technologies, capable of processing and analyzing massive multi-dimensional data. Unlike traditional models, AI large models can automatically identify and learn complex patterns and rules within data. Through natural language processing (NLP), computer vision (CV), image recognition, and other technologies, AI can extract valuable information from multi-modal data (such as students' online learning records, classroom interactions, teaching videos, etc.) and perform intelligent analysis and prediction. The advantages of AI large models lie in their powerful data processing ability, automated analysis capacity, and deep understanding of the educational process.

(2) Design of the educational quality evaluation model based on AI large models

The proposed higher education quality evaluation model based on AI large models includes several key elements:

1) Multi-Dimensional evaluation system

AI large models can integrate data from various aspects such as teaching content, teaching methods, student learning behavior, and academic performance to achieve comprehensive educational quality evaluation. Specific evaluation dimensions include:

Quality and Innovation of Teaching Content: Evaluate whether the course content and design align with academic development trends and student needs through analysis of textbooks and course designs.

Effectiveness and Adaptability of Teaching Methods: Assess the impact of different teaching methods on student learning outcomes through analysis of student learning interaction data and teachers' teaching approaches.

Students' Academic Performance and Comprehensive Qualities: Evaluate students' overall development by analyzing their academic performance, extracurricular activities, emotional attitudes, etc.

Teaching Quality of Teachers: Assess teachers' teaching effectiveness and professional competence through data analysis of classroom interactions, online teaching, and student feedback.

2) Data collection and integration

Educational quality evaluation relies on a large amount of multi-source data, including students' online learning data, classroom behavior data, academic performance, teachers' teaching videos, and students' extracurricular activity data. AI large models can effectively integrate data from these different sources, efficiently cleaning and merging them to ensure data completeness and accuracy.

3) Model training and optimization

AI large models need to be trained and optimized using a large volume of historical data to ensure that the model accurately predicts all aspects of educational quality. During the training process, the model continuously adjusts its parameters, learns patterns from the data, and optimizes the model's accuracy using techniques like cross-validation.

4) Real-Time monitoring and feedback

AI large models can enable real-time monitoring and feedback of educational quality, allowing educational managers to understand issues and shortcomings in the teaching process and adjust teaching strategies promptly. The model can also dynamically adjust based on new data input, ensuring the timeliness and accuracy of the evaluation results.

4. Model Implementation Path and Strategy

Based on the theoretical framework and model design, the next step is to implement this model in the actual higher education quality evaluation process. To ensure that the AI large model-based educational quality evaluation model can be effectively implemented and provide practical value, systematic implementation paths and strategies need to be adopted. This section will discuss the implementation path, data collection and processing, platform construction, algorithm selection, evaluation, and optimization in detail.

(1) Data Collection and Platform Construction

1) Data collection and integration

Implementing the AI large model-based educational quality evaluation requires building a comprehensive data collection system. Data soures primarily include the following categories:

Academic Performance Data: Students' final grades, regular grades, exam data, and subject performance distribution.

Student Learning Behavior Data: Student online learning behaviors, classroom interaction records, homework submission status, learning time, etc.

Teacher Teaching Data: Teacher teaching methods, teaching content, classroom interactions, student evaluations, teaching videos, etc.

Student Comprehensive Quality Data: Participation in extracurricular activities, social practice, innovation activities, mental health, etc.

Internal and External Evaluation Data: Feedback and survey results from students, peers, and parents, as well as societal evaluations of the school and courses.

The data collection platform needs to support the integration of multi-source heterogeneous data, ensuring that various data types can be effectively aggregated and analyzed. The platform should have the following characteristics:

Diversity and Completeness of Data: It should collect all multi-dimensional data related to educational quality.

Efficient Data Cleaning and Integration: Ensure data quality by removing redundant information and filling missing data.

Data Privacy Protection and Security: Ensure the security of data, especially students' personal information and academic performance, in compliance with relevant laws and regulations.

2) Platform architecture design

The design of an intelligent educational quality evaluation platform should consider the following aspects:

Front-End User Interface: Provide an interface for educational managers, teachers, and students, simple and user-friendly, capable of quickly displaying evaluation results and analysis.

Back-End Data Processing and Analysis Module: Use AI large models to process, analyze, and predict the collected data to generate accurate evaluation results.

Report Generation and Feedback Mechanism: The system should generate multi-dimensional reports and provide real-time feedback on potential issues in the teaching process, assisting teachers and managers in adjusting teaching strategies.

(2) Model training and optimization

1) Data preprocessing and feature extraction

Before model training, the collected raw data must undergo preprocessing. This includes data cleaning, missing value imputation, anomaly detection, standardization, and normalization. Additionally, feature extraction must be conducted to identify key features relevant to educational quality evaluation:

Academic Performance Features: Students' subject grades, class rankings, subject mastery levels, etc.

Learning Behavior Features: Online learning time, homework completion status, classroom participation, learning progress, etc.

Teaching Interaction Features: Classroom interaction frequency, quality of teacher-student interaction, teacher attitudes, student feedback, etc.

Student Comprehensive Quality Features: Participation in extracurricular activities, social practice, innovation activity participation, mental health, etc.

2) Model selection and construction

Based on the educational quality evaluation objectives and data characteristics, theappropriate AI large model should be selected. Common algorithms include:

Deep Neural Networks (DNN): Used to capture complex relationships between students' learning outcomes and other factors, suitable for handling high-dimensional data.

Convolutional Neural Networks (CNN): Used for image data processing, for example, in cases where classroom videos or image data need to be analyzed.

Recurrent Neural Networks (RNN) and Long Short-Term Memory Networks (LSTM): Suitable for processing time-series data such as student learning behavior and course learning processes.

Ensemble Learning Methods (e.g., Random Forest, XGBoost): Used for feature selection and classification, improving model robustness and accuracy.

AI large models are usually trained with a large amount of historical data using a combination of batch learning and incremental learning to continuously optimize model performance. Cross-validation techniques are used to evaluate the model and select the optimal one.

3) Model optimization and hyperparameter tuning

The performance of AI large models depends on hyperparameter tuning. Optimization involves adjusting algorithms, learning rates, iteration numbers, hidden layer counts, etc. Methods like grid search and random search

can be used to fine-tune hyperparameters and further improve model accuracy. Techniques such as ensemble learning can also be used to enhance prediction precision.

(3) Real-Time monitoring and feedback mechanism

1) Real-Time monitoring and data updates

Educational quality evaluation is a dynamic process, so real-time monitoring of changes in the teaching process is necessary. For example, tracking students' online learning behavior, classroom interaction data, etc. Once new data is entered, the AI model should immediately update and generate new evaluation results, providing timely feedback to educational managers.

2) Result feedback and adjustment mechanismAI

The results from the AI large model's educational quality evaluation should not only be static numbers or reports but also provide actionable insights. The feedback mechanism should include:

Teaching Strategy Adjustment Suggestions: Based on model feedback, suggest improvements for teachers and managers in teaching content, methods, course design, etc.

Personalized Feedback for Students: Based on students' learning behavior and performance, provide individualized learning suggestions, helping students identify strengths and weaknesses and adjust learning strategies accordingly.

Course Improvement Suggestions: Based on evaluation results, identify potential issues within courses, such as content updates and teaching method optimization.

(4) Model evaluation and continuous optimization

1) Continuous model evaluation

To ensure the long-term effectiveness and accuracy of the model, periodic evaluation and optimization are needed. Evaluation indicators include:

Accuracy and Precision: Measures the model's prediction accuracy in educational quality evaluation.

Model Interpretability: AI large models should not only be accurate but also interpretable so that educational managers can understand the conclusions drawn by the model.

User Feedback: Evaluate the model's operability and practical effectiveness based on feedback from teachers and students.

2) Continuous optimization of the model

As more data accumulates and technology progresses, AI large models need continuous updates and optimization. This includes:

Introducing New Data Sources: Increase data from different disciplines and regions to improve the model's adaptability.

Algorithm Updates: Optimize existing models with new algorithms and incorporate advanced technologies.

Through continuous optimization, AI large models can gradually adapt to the ever-changing educational environment, ensuring the timeliness and accuracy of educational quality evaluations.

(5) Data privacy protection

To ensure effective protection of data privacy in educational quality evaluations, a series of technical measures

must be implemented. These include:

1) Data anonymization and de-sensitization

Data anonymization involves removing or encrypting sensitive information, making data unidentifiable to specific individuals. Common techniques include:

Data Encryption: Encrypting sensitive student information for storage and transmission to ensure data remains secure even if breached.

Data De-sensitization: Removing personal identifiers such as students' names and IDs while retaining statistical data like grade distributions and learning time, ensuring anonymity in data use.

2) Access control and identity verification

To further ensure data security, strict access control and identity verification systems can be implemented. Measures include:

User Authentication: Requiring multi-factor authentication for all users accessing the data to ensure only authorized personnel can access sensitive information.

Fine-Grained Access Control: Implementing a permissions system that assigns varying access levels to different users. For example, educational managers may access all data, while teachers may only access their own teaching data.

3) Data minimization principle

According to the principle of data minimization, data collection should be limited to the minimum necessary for educational quality evaluation. Specific measures include:

Necessary Data Collection: Collect only the data directly relevant to educational quality evaluation, such as grades, learning time, and classroom participation.

Data Retention Period: Set a clear data retention period, after which the data will be deleted or anonymized.

4) Data privacy protection compliance

During data privacy protection implementation, it is crucial to comply with relevant laws and regulations. Common compliance requirements include:

Data Protection Audits: Regular audits to ensure compliance with data protection laws.

User Consent Mechanism: Obtain explicit user consent for data collection and inform users about the data's usage and storage.

Data Access Logs: Maintain records of all data access activities to ensure traceability and prevent data breaches.

5. Conclusion

The AI large model-based higher education quality evaluation model can overcome the limitations of traditional evaluation methods, providing more comprehensive, objective, and precise evaluation results. By constructing a multi-dimensional evaluation system, AI large models can conduct thorough analyses of various aspects of the educational process and provide data support for educational managers. However, the application of AI large models still faces challenges such as data privacy and algorithm transparency, which require ongoing improvement and adjustment in practice. With continuous technological advancement, the AI large model-based educational quality evaluation model is expected to become the mainstream tool in future educational management.

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