Research on Evaluation of Teaching Quality of Marxist Theory in massive open online course Based on Artificial Intelligent

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Abstract. Machine learning (ML) is a scientific study of algorithms and statistical models used by computer systems in order to perform specific tasks effectively without using clear instructions and relying on patterns and reasoning. It is regarded as a subset of artificial intelligence. The base of machine learning is support vector regression. In contemporary China, with the in-depth development of the sinicization and popularization of Marxism, further strengthening the education of Marxist theory has become its inherent inevitable requirement. Teaching quality is the lifeline of colleges and universities. Effective management of teaching depends not only on the control of teaching process, but also on the establishment of a complete and standardized teaching quality monitoring and evaluation system. This paper puts forward an evaluation model of teaching quality of Marxist theory in massive open online course based on support vector regression, and establishes an evaluation index system of teaching quality of Marxist theory in massive open online course according to the specific needs and the construction principle of evaluation index system. Theoretical and experimental results show that the model has better evaluation effect. Compared with other methods, it has the characteristics of high evaluation accuracy, fast implementation and strong operability, and is suitable for evaluating the teaching quality of massive open online course Marxist theory in colleges and universities.

Keywords: Support Vector Regression, University Massive Open Online Course, Marxist Theory, Evaluation of Teaching Quality, AI

1. Introduction

With the deepening of China's educational reform, the evaluation of teaching quality, as an important link in China's educational operation mechanism in the future, has been paid more and more attention by educators, and developing and strengthening the evaluation of teaching quality has become an important and urgent problem in education [1]. With the continuous expansion of the scale of higher education, the problem of teaching quality has become extremely prominent. However, the teaching quality of colleges and universities in China is directly related to the future of the whole higher education. The teaching quality is not only the foundation of colleges and universities, but also the
lifeline of their survival and development [2]. The teaching quality based on support vector regression is mainly modeled according to the evaluation data of supervision group, student evaluation data and peer evaluation data, and then weighted, and finally the comprehensive evaluation results of teaching quality are obtained [3].

As a compulsory course of general education in China, the ideological and political theory course in colleges and universities is an important part of higher education, and it is also the main channel and front for propagating the Party's line, principles and policies in China. The development of massive open online course has created new conditions and environment for mixed teaching. Teachers use information technology to upload the relevant contents of courses to the Internet and open them free of charge, emphasizing the co-construction and sharing of resources. Value can only be generated, existed and developed in people's practical activities. As human practice is the historical practice of society, human beings have also become the historical people of society, which makes people's needs and the value relationship between people and objects branded with social history. This paper proposes a comprehensive evaluation model of the teaching quality of Marxist theory in massive open online course based on support vector regression. Based on the existing evaluation system of universities in the Ministry of Education, an evaluation index system of teaching quality of Marxist theory in massive open online course with Chinese characteristics is established.

2. The Influence of Blended Teaching Based on massive open online course on Modern Teaching

From traditional classroom to mixed teaching based on massive open online course, the teaching practice of "Basic Principles of Marxism" has also experienced a gradual process. At present, most online course tests are automatically evaluated and scored by machines according to procedures. Using the advantages of machine scoring can not only give students timely feedback, but also help students consolidate a certain knowledge module. When we assert that this or that has 'value', we are expressing our own feelings, not a fact that even though our personal feelings are different, they are still reliable. The content of the curriculum offered by massive open online course is open, dynamic and diverse, and the educational space formed by it is new and covers a wide range. Compared with the traditional "indoctrination" linear teaching method, this non-linear teaching method of dialogue and negotiation is more in line with the needs of the times.

In massive open online course, lecturers and thousands of learners who choose the same course communicate through the Internet. In the interactive community/platform, teachers actively participate in students' discussions and give feedback to students' discussions and questions. With the accelerating social rhythm and the characteristics of information explosion, people's demand for short-cycle and high-density learning is increasing, while massive open online course meets people's demand for simple, fast and efficient fast-food learning, so that learners can use as little time as possible to achieve more learning output [4]. Arouse students' attention and stimulate their learning motivation. After that, the students watched the video courses and reading materials uploaded by teachers, taught themselves the contents of each chapter of the massive open online course, activated the existing knowledge of ideological and political theory courses in middle schools, and preliminarily processed and absorbed new knowledge. Massive open online course provides the possibility for learners to choose their favorite learning contents and lecturers independently, which means that the learning process in massive open online course is interactive.

3. Support vector machine regression method

Support vector regression machine initially studied the linear function fitting problem for linear sample points, that is, the function to be fitted appeared as a linear function. Its biggest feature is to improve generalization ability according to the principle of structural risk minimization. The first condition required for optimal classification of hyperplanes is to separate the two types of data without errors, that is, to ensure the minimum empirical risk; This kind of sample points with noise or isolated
points are given a smaller degree of action, so as to reduce the influence of noise and isolated sample points on the construction of optimal classification hyperplane.

In support vector machine theory, the number of sample training sets is expressed by \( n \), so the training set can be expressed as: \( \{X(i), y(i)\}_{i=1}^{n-1}, X(i) \in \mathbb{R}^m, y_i \in \mathbb{R} \). We use nonlinear mapping function \( \varphi(X) \) to map the input samples of SVM training set into high-dimensional feature space \( F \), and then estimate the mapping results linearly in high-dimensional feature space, and the estimation function corresponding to the mapping function is expressed by \( f(x) \) [5]

\[
f(x) = w \cdot \varphi(x) + b
\]

In the formula, \( w \) represents the weight vector and \( b \) represents the offset. To determine the parameters of the model in optimization formula (1), the following optimization formula is constructed:

\[
W(a, a^*) = -\frac{1}{2} \sum_{i=1}^{n} (a_i - a_i^*) (a_j - a_j^*) \varphi(x_i) \varphi(x_j) + \sum_{i=1}^{n} (a_i - a_i^*) y_i - \sum_{i=1}^{n} (a_i - a_i^*)
\]

In which:

\[
W = \sum_{i,j=1}^{n} (a_i - a_i^*) y_i, \sum_{i=1}^{n} (a_i - a_i^*) = 0, 0 \leq a_i, a_i^* \leq C
\]

\( W \) is a normalized function, which is used to control the influence of training set noise or isolated points on the model.

In order to avoid dimension disaster, the kernel function \( K(x, x) \) is used to replace the vector inner product \( \varphi(x_i) \varphi(x_j) \) in high-dimensional space, and the estimation function \( f(x) \) of SVM becomes the decision function, as shown in formula (4)

\[
f(x) = \sum_{i=1}^{n} (a_i - a_i^*) K(x_i, x) + b
\]

When constructing the classifier of class and class, mark the data belonging to class as, mark the data belonging to class as, select the sample data of class and class as training sample data, and mark the sample data of other classes as 0, and participate in the training process. A series of two-class classifiers are constructed, so that the multi-classification problem can be decomposed into multiple two-class problems [6]. In addition, in each classifier, the number of negative samples far exceeds the number of positive samples, which easily leads to data set deviation; At the same time, there will be some inseparable areas in the process of classification. In order to overcome artificial subjective randomness and make the evaluation more accurate and effective. It will be of great significance to the evaluation of teaching quality.

4. Evaluation model of teaching quality of massive open online course Marxist theory in colleges and universities based on SVM

4.1. Evaluation system of teaching quality of massive open online course Marxist theory in colleges and universities

Traditional teaching mode, from teachers' classroom teaching to students' after-school learning, is mainly carried out through entity teaching. massive open online course has brought us a new mode, that is, on the basis of the original teaching mode, making full use of online teaching and combining
entity teaching with online teaching. There are many factors that affect the teaching quality, and the degree of influence of each factor is different. It is difficult to express the evaluation results with proper mathematical analytical expressions. Nine indicators are determined to reflect teachers' teaching quality of massive open online course Marxist theory in colleges and universities. The evaluation grades of each indicator are divided into good, good, fair and poor, accounting for 10 points, 8 points, 6 points and 4 points respectively. According to the weight of each indicator, the scores of each indicator are set between [7]. Considering that everyone has a certain degree of subjective arbitrariness when scoring; Therefore, it is more authoritative and reliable to adopt the method of scoring by many people and taking the average value.

How to make a reasonable evaluation index is a complicated and difficult subject. Based on the existing evaluation system of the Ministry of Education and the previous research results, this paper adopts the index system as shown in Table 1.

Table 1. Evaluation index system of teachers' teaching quality

| The first level | The second level | The third level |
|----------------|-----------------|----------------|
| Teaching content | The teaching objectives are clear, the ideas are clear, the teaching system is organized, and the contents meet the requirements of the outline | Concepts, principles and knowledge points are clearly explained, with outstanding emphasis and thorough analysis of difficulties |
| | | Grasp the frontier of science and introduce the latest trends and academic ideas |
| Teaching attitude | Obey teaching discipline, attend classes on time, do not miss classes or suspend classes frequently | Students are strictly required to answer questions patiently and correct homework carefully and in time |
| | | Read and educate people, be a teacher by example, and care for students |
| Teaching method | Implement heuristic, discussion and research teaching methods to teach students learning methods | The course schedule is reasonable and the classroom time is used effectively |
| | | Teaching is natural, the language is concise and vivid, and Mandarin is used |
| | | Effective use of modern teaching methods such as multimedia has good auxiliary teaching effect |
| Teaching effect | Achieve learning goals, students master basic knowledge and basic skills | Through study, students' ability to analyze and solve problems is improved |

In this paper, the general 5-grade scoring standard in teaching evaluation is adopted, and the evaluation results are divided into 5 grades, and the corresponding value range of each grade is shown in the following Table 2:

Table 2. Corresponding table of evaluation grade standard of Marxist theory teaching quality in massive open online course of colleges and universities

| Evaluation grade | Value range |
|-----------------|-------------|
| Excellent       | 90~100 points |
| Good            | 80~90 points |
| Moderate        | 70~80 points |
Education is to cultivate people. Education in modern society is not only to teach knowledge, but also to let students know how to study, how to deal with problems and how to face difficulties. As far as possible, consider the factors and evaluation process that affect the teaching quality evaluation of massive open online course Marxist theory in colleges and universities, including teaching design factors, teaching preparation factors, teaching implementation and teaching management factors, etc. All development requires the development of educators, educatees and society, with emphasis on the development of educatees. At the same time, the new curriculum advocates the implementation of multiple evaluations, so that the evaluated teachers can get feedback information from multiple channels, and better reflect and improve the education and teaching work.

4.2. Evaluation model of teaching quality of Marxist theory in massive open online course based on support vector regression

Taking the teaching effect as the output of the model, reflecting the objective of evaluation. The main contents include students' test scores, classroom discipline, understanding and mastery, ability to analyze and solve problems, etc. Realize the division of teachers' teaching quality grades. Support vector classifiers are constructed for three types of data, and each classifier only classifies two types. The model is simple and has good classification ability [8]. This principle is analyzed in detail, which is set according to the different majors of the students in the class. The problems should be closely related to the students, and can examine the students' knowledge transfer and application ability. A teaching quality evaluation system model based on DBT-SVM multi-class classification method is established. The model uses the generation strategy of approximate complete binary tree and several definitions of class distance in clustering, and combines multiple binary tree support vector machine classifiers. The flow chart of DBT-SVM model for evaluating the teaching quality of Marxist theory in massive open online course is shown in Figure 1.

![Flow chart of teaching quality evaluation model](image)

**Figure 1.** Flow chart of teaching quality evaluation model

According to the principle of AHP, combined with the requirements of decision makers for teaching quality evaluation, the evaluation system is divided into four levels. Online courses are the
basic content of "the basic principles of Marxism", while offline courses are characteristic classrooms set up by teachers in different research directions; Online content paves the way for learning offline courses, which has a sequence. Massive open online course makes the traditional ideological and political theory class smaller, but makes the online ideological and political theory class bigger. Whether it is teaching evaluation or scientific research evaluation, it is necessary to highlight people's subjectivity, that is, to regard the value subject as a person with subjectivity. In massive open online course's teaching philosophy, teachers can answer questions for students through digital cyberspace, and learners can also exchange their learning experiences and share their own views through cyberspace[9].

The main purpose of applying the mixed massive open online course teaching model pointing to deep learning in the massive open online course of "Basic Principles of Marxism" is to cultivate students' core ability of deep learning. At the same time, a discussion community can be set up on this interactive platform, where students can see their own learning progress and the learning progress of other students and the completion of homework. According to the score range of [0~100], the corresponding evaluation scores are given, and the evaluation scores directly reflect the performance of a certain item in the classroom teaching process. After grading the hierarchical structure, the importance of elements in the criterion layer and the index layer is compared in pairs, and the judgment matrix of this layer is constructed according to the comparison results, insisting on the two-way interaction between the evaluation subject and the value subject, and giving full play to people's initiative, creativity and initiative; The fuzzy function membership degree determined in this paper reflects the effect of different sample points on support vector machine, which greatly reduces the effect of noise and outliers on support vector machine, but does not reduce the influence of sample points at the edge of training set on support vector machine.

5. Experimental results and analysis
Artificial neural network (ANN) is a widely used modeling method, and its application research depth and breadth far exceed that of SVM. By analyzing the indicators of the evaluation system and the evaluation data, it can be seen that there is an obvious nonlinear relationship between the indicators and the evaluation results, and the evaluation results show that the data is multi-classified. In order to evaluate the advantages and disadvantages of DBT-SVM model, compared with DS-BP neural network (DS-BPNN) model and traditional weighted combination model, the evaluation performance of each model is shown in Table 3.

Table 3. Compare the performance of each model evaluation

| Evaluation model                  | Evaluation accuracy (%) | Correlation coefficient |
|----------------------------------|-------------------------|-------------------------|
| Traditional weighted combination model | 92.34                  | 0.7012                  |
| DS—BPNN                          | 93.91                  | 0.9613                  |
| DBT-SVM                          | 96.05                  | 0.9741                  |

The evaluation result of DBT-SVM is better than that of ds-BPNN, which is mainly due to the fact that support vector machine, based on the principle of structural risk minimization, overcomes the shortcomings of neural network such as poor fitting and slow convergence speed, and can better describe the complex nonlinear relationship between teaching quality evaluation indicators and evaluation results, so it can obtain more ideal teaching quality evaluation results.

A prominent feature of blended teaching based on massive open online course is that students' learning autonomy is greatly enhanced, but improving students' learning autonomy is not to weaken teachers' role, nor is it equal to laissez-faire. Teachers, as the imparting of knowledge and the designers and organizers of teaching, play a leading role in guiding students to participate in the teaching process to the maximum extent. Persist in giving full play to the comprehensive function of Marxist theory education evaluation in colleges and universities, while highlighting the function of encouraging development. The evaluation of Marxist theory education in colleges and universities has
the functions of standardization and innovation, control and regulation, maintenance and criticism, which helps to prevent deviation and singleness in the process of exerting these functions[10].

It can be seen from fig. 2 that the SVM model has high prediction accuracy, the average error is less than 2%, and the CPU time is very small, only 0.36 s, because the SVM model is based on structural risk minimization, and the learning accuracy and model complexity are compromised, which makes the model have better generalization ability and improves the prediction accuracy of unknown samples.

![Figure 2: DBT-SVM model](image)

Using three two-class SVM classifiers, there will be three hyperplane decision functions. According to the different classes of classification samples, the parameter values and support vectors corresponding to the decision functions will be different. All the test samples are tested as a whole and a single test sample is tested respectively. The obtained sample points are not support vectors in the true sense, which eventually leads to the obtained classification hyperplane deviating from the optimal classification hyperplane required by practice. In the operation of massive open online course, every subtle variable will be forced to trace. Every operation performed by students, including clicking on videos, finishing an assignment or writing comments in a discussion class, will be captured by the database. This is mainly because the DBT-SVM algorithm in this paper makes use of the strategy of generating complete binary tree and the distance-related definition of classes in clustering, which makes easy-to-partition classes be separated first, and avoids the error accumulation caused by partial binary tree structure, thus improving the partition accuracy.

6. Conclusion

The establishment of the teaching quality evaluation system of massive open online course Marxist theory in colleges and universities makes it possible to evaluate teachers. To evaluate the quality of classroom teaching, we should not only evaluate teachers' teaching ability, methods, attitudes and teaching content, but also evaluate teachers' teaching effect through students' learning effect. In this paper, a teaching quality evaluation method of massive open online course Marxist theory based on support vector regression is proposed. Experiments show that the output value of the teaching quality evaluation model constructed in this paper is in good agreement with the real value, and the error of the evaluation result is small, which can meet the requirements of teaching quality evaluation. The evaluation model can provide a tool to objectively evaluate the teaching quality, which is beneficial to objectively measure teachers' teaching process and improve teachers' teaching activities based on it.

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