Construction of Reform Evaluation Model of Ideological and Political Education in Colleges and Universities Based on SVM

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Abstract. The evaluation model based on ideological and political education reform in SVM is essentially to optimize the level of ideological and political education reform, and to introduce the support vector machine multi-classification algorithm in the evaluation of ideological and political education reform. Through orthogonal design and output training samples, the evaluation model of ideological and political education reform in universities can be constructed. Simulation results also prove that this can effectively simplify the nonlinear classification problem and obtain more accurate evaluation results.

Keywords: Support Vector Machine · Evaluation Model · Multi-Classification Algorithm · Orthogonal Design

1 Introduction

Higher education is developing rapidly, while ideological and political education has received greater attention from the education community and society. Therefore, in order to promote the development of higher education, while improving the quality of higher education reform, it is necessary to carry out the evaluation work of education reform. As a complex systematic project, ideological and political education in colleges and universities and a number of factors influence each other. It is necessary to take network teaching and research as the center, build multi-dimensional evaluation models, and analyze the development of ideological and political education in colleges and universities from the evaluation data [5]. The evaluation model of the college ideological and political education reform based on SVM (Support Vector Machine, SVM) can effectively help the universities to realize the purpose of the education reform evaluation work [12].

2 Evaluation Model of Ideological and Political Education Reform Under 1 SVM

2.1 SVM Operation Analysis

Compared with conventional learning algorithms, SVM has more advantages, such as excellent learning performance and low dimensionality sensitivity, and the results also

C. F. Peng et al. (Eds.): EIMT 2022, AHSSEH 3, pp. 507–514, 2023.
https://doi.org/10.2991/978-94-6463-012-1_57

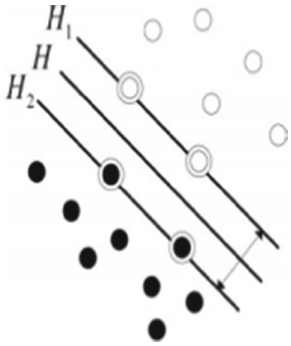

Fig. 1. Optimal classification line based on linear separability

show that SVM is more conducive to the processing of high-dimensional small sample data, with higher accuracy compared with neural networks [1]. However, the SVM is mainly presented in the linear separable state, with two types of linear separable states shown in Fig. 1, and the solid and hollow points represent two different training samples [15]. The two training samples were divided into optimal classification lines by H, where H1 and H2 are the points closest to the classification line in both categories and parallel to the classification line, thus, the spacing is the distance from H1 to H2 [16].

When these two classification problems are taken as analysis objectives, we find all functions in the index function set, and the odds relationship between empirical risk R*emp*(w) and real risk $R(w)$ is at least $1 - \eta$:

$$R(w) \leq \mathrm{R}_{emp}(w) + \sqrt{\left| \frac{h(1n(2n/h + 1) - 1n(\eta/4))}{n} \right|} \tag{1}$$

h represents the VC dimension of the set of functions, which can effectively measure the function class complexity and assess the bending of the functions in the function class. Because the VC dimension can also show the function set learning ability, the larger the VC dimension, the greater the capacity of the learning machine. n represents the number of samples, and η is the reference variable meeting $0 \leq \eta \leq 1$. According to the above formula, the $R(w)$ of the learning machine is mainly composed by $\mathrm{R}_{emp}(w)$ and confidence range, and the formula (1) can be simplified as:

$$R(W) \leq \mathrm{R}_{emp}(w) + \Phi(h/n) \tag{2}$$

In dealing with multi-class classification problems, SVM needs to transform the multi-class classification problem into two-class problems and set the training set:

$$T = \{(x_1, y_1) \cdots, (x_1, y_1)\} \in (X \times Y)^1 \tag{3}$$

among:

$$x_1 \in X = R^n \tag{4}$$

$$y_1 \in Y = \{1, \cdots, M\} \tag{5}$$

The sample subsets $Ti - j$ of $y = a$ and $y = b$ were found within the training set, solving the support vector machine in $(i, j) \in \{(i, j)|i \leq j, i, j = 1, \cdots, M\}$, obtaining the classifier to judge the category of the $x \in X$ affiliate and the real value function $g^{i-j}(x)$, and obtained:

$$f^{a-b}(x) = \begin{cases} a, g^{a-b}(x) > 0 \\ b, otherwise \end{cases} \tag{6}$$

In the test input to judge its category, the most supported is its category [11].

2.2 Evaluation Model Weight Calculation

To calculate the support vector machine weight results, we first need to input and output the training samples, calculate the input data of the SVM training sample, and calculate the weight of the training sample, and then take the results as the training sample, and determine the weight value of the index after the output [10].

The elements that will affect the training sample are the practicality of the teaching material, learning ability, scientific assessment method and teaching ability [4]. These four influence elements were divided into three grades by orthogonal design, ideal, not ideal, and mean. These three levels can represent the current development level of ideological and political education reform in colleges and universities, and in order to get a more reasonable evaluation data, we need to input the above elements in them [9].

According to the intercorrelation and affiliation between different elements, a multi-layer analysis architecture model can be constructed and obtain sequence weights to ensure that each layer can correspond to the total target layer [3] (Fig. 2).

3 Simulation Experiments

In order to ensure the corresponding reliability of the model and obtain accurate evaluation results, it is necessary to carry out a questionnaire survey for ideological and political teachers in colleges and universities [13]. In this paper, data from three hundred questionnaires were collected as classification data, and a model network was constructed using the MATLAB SVM toolbox, set to a learning accuracy of 10-6, and through 100 iterations, the network reached the requirement of experimental accuracy. The procedure is shown in the Fig. 3 [8].

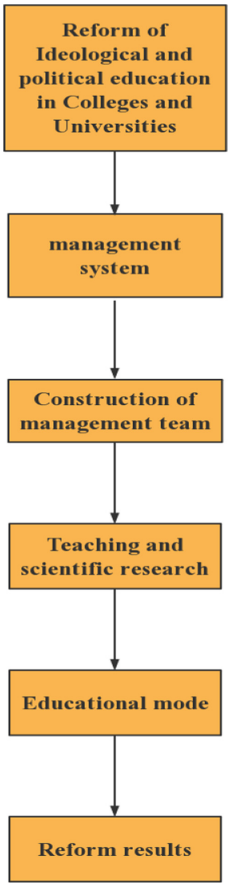

Fig. 2. Schematic diagram of the first-level guidelines of ideological and political education reform in colleges and universities

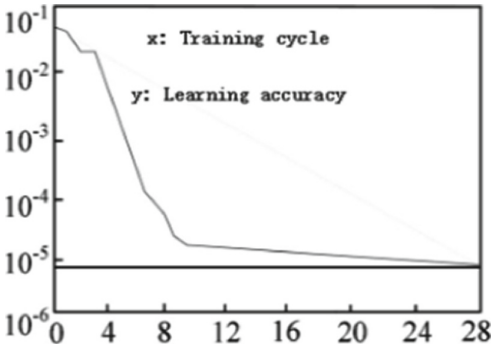

Fig. 3. SVM network iteration process diagram

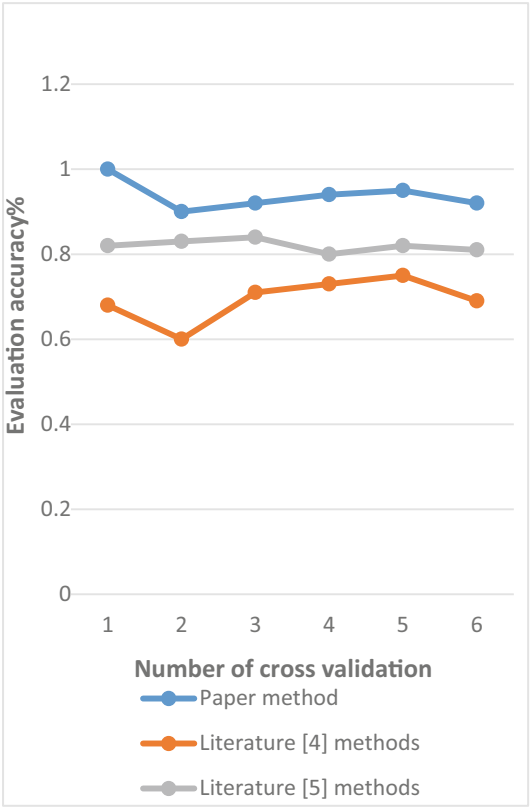

Fig. 4. Evaluation of the accuracy comparison of the model fitting

In order to demonstrate the practicability of the network iterative method, the education reform evaluation was completed by using cross-validation. The experimental results are shown in the Fig. 4 (the experimental methods used are literature [4], literature [5] and the proposed methods).The x-axis in Fig. 4 is the cross-validation times, and the y-axis is the evaluation accuracy (1).

As can be seen from the Fig. 5, the literature method has the lowest evaluation accuracy, followed by the literature method, and the highest evaluation result accuracy is the method of this paper. All six cross-validation guaranteed ultra-high accuracy [6]. It can be proved that the one most in line with the evaluation of the ideological and political education reform in universities is the method of this paper, and the evaluation results are the most representative and accurate [14].

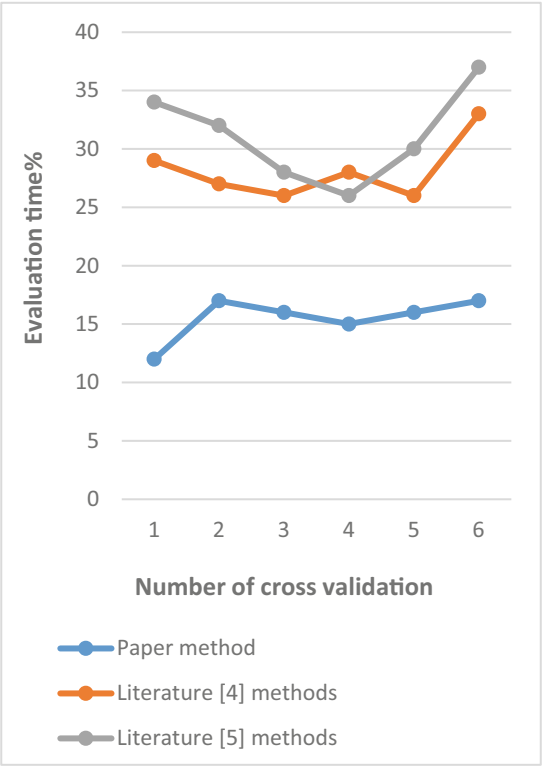

Fig. 5. Evaluation of the model fitting time contrast

4 Conclusion

In order to realize the evaluation of ideological and political education reform in colleges and universities, it is necessary to design relevant evaluation models, based on SVM, extract samples, obtain accurate evaluation data, and present the connection between the reform objectives and the evaluation results. The evaluation model, for its low cost and high practicability because of its value, has been widely used. However, it should also be noted that the factors considered in the evaluation model of ideological and political education reform based on SVM and universities are not perfect, and the number of indicators needs to be increased.

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