Evaluation system of innovation and entrepreneurship education based on the GA-SVM method

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Abstract. The demand for innovative and entrepreneurial talents in today's society is becoming more and more urgent. As the main position for the country to cultivate innovative and entrepreneurial talents, universities need to pay more attention to the cultivation of innovative and entrepreneurial talents. This paper reasonably constructs the evaluation index system of innovation and entrepreneurship education, then uses the analytic hierarchy process to determine the weight of each index, and optimizes the use of GA-SVM to construct the evaluation model of innovation and entrepreneurship education, so as to obtain a reasonable and effective evaluation system of innovation and entrepreneurship education in universities, and provide a reference basis for the cultivation of innovation and entrepreneurship talents in universities.

Keywords: innovation and entrepreneurship education; evaluation system, Analytic Hierarchy Process; GA-SVM.

1. Introduction

In September 2014, Premier Li Keqiang put forward the slogan of "Mass Innovation, Mass Entrepreneurship", marking that innovation and entrepreneurship have officially become a national strategy, which means that more high-quality innovative and entrepreneurial talents are needed to contribute to the country and society. Therefore, universities should attach importance to innovation and entrepreneurship education for college students, and need a reasonable innovation and entrepreneurship education evaluation system.

2. Construction of the evaluation index system of innovation and entrepreneurship education

The innovation and entrepreneurship education evaluation system is the reference basis for measuring the level of innovation and entrepreneurship education. The following principles should be followed when constructing: comprehensive principle, scientific principle, characteristic principle, practical principle [1].

Analytic Hierarchy Process (AHP) was proposed by American operations researcher Sati. The main steps are: determining the research problems, constructing the hierarchical structure system, constructing the judgment matrix, calculating the corresponding weights of the elements of each layer, checking the consistency and drawing a conclusion [2].

By referring to relevant literature and research, this paper constructs the index system .According to the evaluation index constructed above, this paper designs a questionnaire and uses it as the data to calculate the index weight by AHP.As shown in Table 1.

3. GA-SVM model

3.1 Basic principles

Support Vector Machine (SVM) is an artificial intelligence method for pattern classification of data [3]. Genetic Algorithm (GA) is an optimization search method using the biological principle of "survival of the fittest and survival of the fittest". This paper will reasonably analyze the flow of GA-SVM algorithm and optimize its use [4].

3.2 Structural design of the model

This paper establishes the evaluation model of innovation and entrepreneurship education, and the specific structure is shown in Figure 1 [5].

4. Empirical Analysis

4.1 Determination of input feature vector and output response vector

According to the innovation and entrepreneurship education evaluation system established above, the 34 three-level indicators constitute the input feature vector of the innovation and entrepreneurship education evaluation model. Because this article divides the talents obtained through innovation and entrepreneurship education into five categories, namely "best", "good", "average", "bad", and "worst", and the data of comprehensive evaluation is classified into five categories. The assignment interval is "90-100" points, "75-90" points, "60-75" points, "45-60" points, and "below 45 points". Therefore, according to the "one class to other" SVM classification method proposed above, the output response variable can be set as follows: for the first time, the samples of the "best" category are used as positive samples, "good", "average", "bad", and "worst" categories are used as positive samples, and the resulting model classifier is still a binary classification. For the first time in this setting, the model classifier can indicate whether innovative and entrepreneurial talents are in the "best" category. For the second time, the samples of the "good" category are used as positive samples, and by analogy, five pattern classifiers can be obtained to classify talents of five categories.

4.2 Selection of train set and test set

The training samples in this paper come from the sample data of 150 innovative and entrepreneurial talents in major universities in Hubei Province. 120 data is randomly selected as train set, 30 data is selected as the test set.

Table 1 Weights of evaluation indicators

Primary index	Weight	Secondary index	Weight	Tertiary index	Weight
Resource Indicators	0.39	Teacher input	0.38	Proportion of entrepreneurship tutors	0.22
				Off-campus tutor	0.16
				Guidance for people in the business field	0.19
				Full-time counselor	0.2
				Experienced bi-innovation mentors	0.23
		Platform construction	0.32	Mass entrepreneurship and Innovation Association	0.17
				Mass entrepreneurship and innovation platform	0.31
				Innovation Laboratory	0.24
				Innovation and entrepreneurship consulting center	0.28
		Parenting system	0.30	Entrepreneurship and innovation courses	0.23
				Innovation and entrepreneurship teaching model	0.2
				Student achievement assessment	0.21
				Teacher incentive system	0.19
				Construction of teaching system	0.17
	0.28		0.58	Proportion of core courses	0.22

Process indicators		Teaching process		Practice class hours	0.17
				Integration degree of innovation and entrepreneurship	0.25
				Number of entrepreneur Symposium speeches	0.16
				Teachers' teaching and research achievements	0.2
		School Management	0.42	Proportion of courses	0.35
				Organization and participation	0.33
				Lectures and training	0.32
Outcome indicators	0.33	Student Evaluation	0.61	Assessment results	0.22
				Increase rate of innovation achievements	0.14
				Increase rate of entrepreneurial intention	0.14
				Innovation and entrepreneurship practical skills	0.18
				Participation rate	0.20
				Students' satisfaction	0.12
		Social Impact	0.39	Student entrepreneurship success rate	0.18
				Release rate of students' innovative achievements	0.16
				Publication	0.21
				Awards in various competitions	0.2
				Outstanding contributions	0.11
				Honors received by the school	0.14

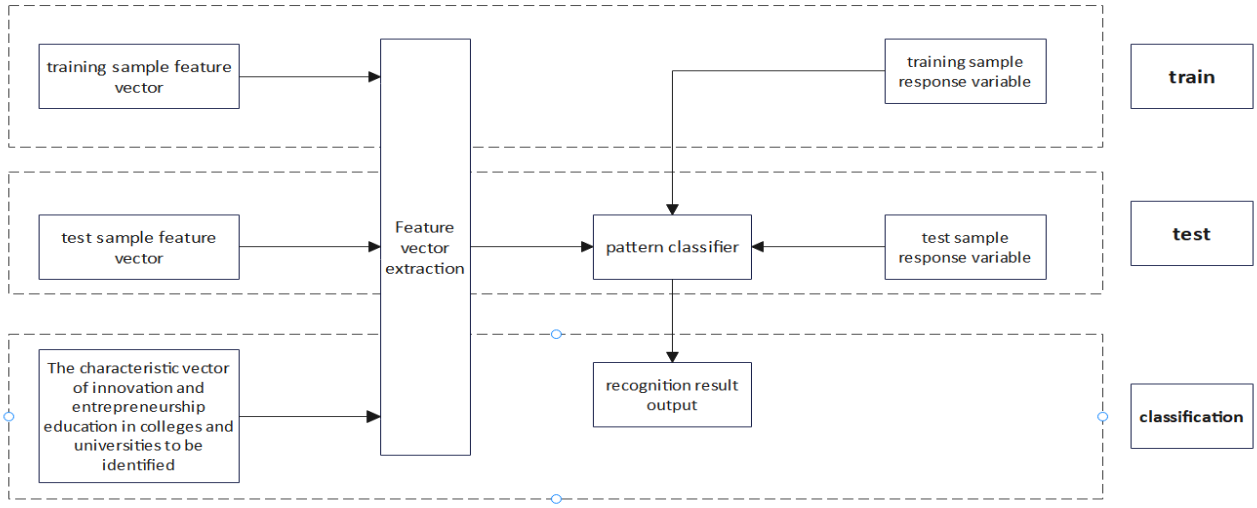

Figure 1 Innovation and Entrepreneurship Education Evaluation Model

4.3 training and testing

GA-SVM innovation and entrepreneurship education evaluation model in colleges and universities are all implemented on Matlab software. According to the data selected above, the GA-SVM innovation and entrepreneurship education evaluation model is trained, and then tested, and the test results are calculated and compared with the actual data [6]. The results are shown in Table 2.

Table 2 Comparison of talent test results

Talent level classification	The real value	Test value
Best	4	3
Good	9	10
Average	14	13
Bad	2	3
Worst	1	1
Total	30	30

Through the classification of the GA-SVM model , the accuracy, precision, recall and F1-score of the model are calculated, as shown in Table 3.

Table 3 Classification of test samples (unit: %)

Method	Relative error	Accuracy	Precision	Recall Ratio	F1-score
GA-SVM	6.67%	93.3%	99.5%	100%	96.3%

It can be seen from the above table that the relative error of 6.67% of the GA-SVM innovation and entrepreneurship education evaluation model constructed in this paper is within the acceptable range. Therefore, this model has a certain reference value for talent evaluation through innovation and entrepreneurship education, and can provide certain data support for the development of innovation and entrepreneurship education in colleges and universities.

5. Conclusion

The evaluation index system of innovation and entrepreneurship education constructed in this paper provides a theoretical basis for universities to formulate unified evaluation standards . However, the indicators of the evaluation system are not very targeted. Therefore, in future research, we should consider from multiple angles and establish a more reasonable and perfect evaluation system of innovation and entrepreneurship education.

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