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Research on the Direction Optimization of Professional Cluster in Higher Education Institutions Based on Industrial Demand

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Abstract: *Due to the rapid development of the economy and the continuous progress of social technology, the alignment between the professional settings of higher education institutions and industrial demands has become a hot research topic. In order to explore how to better meet the industrial demand for higher education in society, this paper conducted research through the analysis of industrial demand and the optimization of professional clusters in higher education institutions. This article first conducted an in-depth analysis of the development trend of the industry, then conducted optimization research on the direction of professional clusters in higher education institutions, and finally constructed a random forest model for optimization. Through experimental data, it has been proven that the optimized direction of professional clusters in higher education institutions can meet the current industrial needs and increase the employment rate by about 20.8%. This study provided useful references and suggestions for the development of universities and society, promoting social progress and development.*

Keywords: *Industrial Demand, Direction of Professional Clusters in Higher Education Institutions, Random Forest, Data Analysis*

1. Introduction

Nowadays, with the rapid development of the social economy and the continuous changes and adjustments of the industrial structure, the professional settings and directions of colleges and universities also need to be adapted to the needs of the industry, in order to cultivate talents that meet the current market demand of society, and promote the development of industries and the growth of economic levels. Due to the adjustment and continuous optimization of industrial structure, the demand for talent in different industries is also constantly changing. Traditional industries are gradually declining, while the rise of emerging industries and new technologies has led to earth shaking changes in the demand for talent in society. Therefore, colleges and universities need to continuously adjust and optimize the direction of professional clusters according to the current changes in industrial demand, in order to adapt to the current market demand.

This article studied the optimization of professional clusters in colleges and universities based on industry demand. Through the research and discussion in this article, colleges and universities can better optimize the direction of professional clusters according to current industry demand and improve talent cultivation, thus promoting the integration between industry, colleges and universities, and research institutions.

2. Related Works

Wang Changchun believed that professional clusters were an important breakthrough for the transformation and development of applied undergraduate universities, and a strategic choice for optimizing professional structure and adjusting professional layout. Professional clusters can better serve the development of local industries [1]. Jiang Mingfang pointed out that professional clusters are professional clusters that meet the needs of talent cultivation in the industrial chain and innovation chain. They are composed of several professions that serve the talent needs of specific links or levels of the industrial chain and have inherent correlations, and are gathered according to a certain structure or

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rules. He also believed that in the future, it is necessary to further optimize and deepen the construction of professional clusters according to school conditions, local conditions, and current circumstances [2]. Yuan Yu has shown through research that the construction of professional clusters in applied universities should aim to adapt to local industrial development and industry needs. He optimizes and integrates educational resources, breaks down disciplinary barriers between different majors, and achieves a deep fit between the talent supply side and the industry demand side [3]. Zhang Yang's research indicates that local application-oriented universities need to deepen the integration of industry and education, carry out professional cluster construction, enhance understanding, innovate, condense characteristics, and improve systems to provide assistance for the development of local regional economy and society. It can construct a talent cultivation model, optimize the curriculum system, build a high-level teaching team, and improve the quality of talent cultivation [4]. The above studies have provided some assistance for optimizing the direction of professional clusters in colleges and universities, but there is still a lack of corresponding data to support it. Therefore, this article can use the random forest algorithm to study the optimization of industrial clusters in colleges and universities based on industrial demand, providing corresponding data support.

3. Method

3.1 Industry Demand

To optimize the direction of professional clusters in higher education institutions, it is necessary to first conduct an analysis of industrial demand. The first step is to understand the development trends of different industries, that is, to understand the development of different industries in technology, market, demand, and policies. Through detailed analysis of industry development trends, it can help higher education institutions better grasp industry demand, and then make more appropriate professional adjustments, in order to cultivate talents more suitable for the development of different industries [5-6]. Secondly, it is necessary to understand the demand for talent in different industries, fully considering the current technological requirements, market demand, salary situation, and ability requirements of different industries. By analyzing the talent needs of industries, higher education institutions can optimize their departments and professional settings, thereby improving the pertinence and practicality of talent cultivation, making it easier for graduates to adapt to the industry needs of their majors, and providing talent support for the development of industries [7-8]. Finally, it is necessary for higher education institutions to maintain a close connection with industry demand when setting up majors. This can require higher education institutions to strengthen cooperation with industry and enterprises, adjust their majors in a timely manner through in-depth research on industry demand and dynamic changes, and enhance the practicality and adaptability of talent cultivation [9-10].

3.2 Importance of Optimizing the Direction of Professional Clusters in Higher Education Institutions

The direction of professional clusters in higher education institutions mainly refers to the rational organization and integration of relevant majors, so as to facilitate the better adaptation of universities to social needs and development trends. There are many advantages to optimizing the direction of professional clusters. Firstly, optimizing the direction of professional clusters in higher education institutions can improve the quality of education in the college [11-12]. By properly organizing the intersection and integration between relevant majors and different professional disciplines, such as computer science, artificial intelligence, and blockchain, the problems of duplicate construction of colleges and waste of teaching resources can be fully avoided. These similar majors can improve teaching efficiency by sharing teacher resources and experimental equipment. Secondly, it can enhance the employment competitiveness of the college [13-14]. Due to the continuous changes in industrial demand, higher education institutions can optimize the direction of professional clusters to cultivate talents suitable for the needs of the industry, thereby improving employment rates. Finally, optimizing the direction of professional clusters in higher education institutions can promote the intersection and melting of industries [15-16]. Through the intersection and integration of different disciplines, higher education institutions cultivate comprehensive talents with diverse disciplinary knowledge, which can provide more innovative thinking solutions for the development of industries. Based on the importance of optimizing the direction of professional clusters in higher education institutions for industrial demand, this article can adopt a scientific model to study the optimization direction.

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3.3 Establishment of Optimization Model for Professional Cluster Direction in Higher Education Institutions

It is crucial to establish a suitable optimization model in the research of optimizing the direction of professional clusters in higher education institutions. Therefore, the random forest algorithm can be used for model construction. Random Forest (RF), as a powerful machine learning algorithm, is characterized by its ability to handle complex nonlinear relationships, strong robustness, strong feature importance analysis, and predictive ability [17-18]. Therefore, it can be applied to the optimization research of higher education professional clusters based on industrial demand, and the model implementation code is shown in Figure 1.

```
import numpy as np
from sklearn.tree import DecisionTreeClassifier
class rfc:
    def __init__(self, n_estimators = 100, random_state = 0):
        self.n_estimators = n_estimators
        self.random_state = random_state
    def fit(self, X, y):
        self.y_classes = np.unique(y)
        dts = []
        n = X.shape[0]
        rs = np.random.RandomState(self.random_state)
        for i in range(self.n_estimators):
            dt = DecisionTreeClassifier(random_state=rs.randint(np.iinfo(np.int32).max), max_features = "auto")
            dt.fit(X, y, sample_weight=np.bincount(rs.randint(0, n, n), minlength = n))
            dts.append(dt)
        self.trees = dts
    def predict(self, X):
        probas = np.zeros((X.shape[0], len(self.y_classes)))
        for i in range(self.n_estimators):
            dt = self.trees[i]
            probas += dt.predict_proba(X)
        probas /= self.n_estimators
        return self.y_classes.take(np.argmax(probas, axis = 1), axis = 0)
```

Figure 1: Model Establishment Diagram

It constructs multiple decision tree models by randomly sampling the sample data with replacement, and integrates the results of these decision trees for prediction, allowing higher education institutions to optimize the direction of professional clusters based on the prediction results of industrial demand [19-20]. The parameter settings are shown in Table 1.

Table 1: Random Forest Parameter Table

Parameter	Value
n_estimators	10
criterion	gini, entropy
max_depth	6
min_samples_split	2
min_samples_leaf	2
max_features	85%

3.4 Data Collection and Model Training

This article can focus on the needs of the computer industry. This article collects data on the demand for the computer industry and the direction of professional clusters in higher education institutions, including employment market demand data, professional demand data, industry development trend data, industrial talent structure demand data, and professional evaluation data. When collecting data, it should ensure the quality and accuracy of the data, and carry out data cleaning and preprocessing work to handle any abnormal data. This article utilizes the professional knowledge and experience of computer experts to extract characteristic information about industry demand and the direction of higher education professional clusters from the processed dataset. The dataset can be divided into a training set (85%) and a testing set (15%), and the training set can be used to train the random forest model. Each decision tree is constructed based on different subsets of data and features. Through extensive training, this article enables the random forest model to better fit data and improve its predictive ability for different industry demands, in order to optimize the direction of professional clusters in higher education institutions. The trained model can be evaluated using a test set to assess its performance and whether it meets expectations.

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4. Results and Discussion

4.1 Experimental Design

Based on the goal of optimizing the direction of professional clusters in higher education institutions according to industrial demand, this article can conduct comparative experiments to verify whether the professional clusters optimized through the model can meet industrial demand. The specific evaluation includes assessing the accuracy of the model, etc. This experiment can be divided into a control group and an experimental group, with the optimized professional cluster direction being the experimental group, while the control group can maintain its original professional settings. At the same time, it can ensure that the students in both groups of experiments can receive education in the same educational environment, avoiding errors caused by different educational environments.

4.2 Accuracy

When conducting the experimental experiment in this article, the prediction of industrial demand by the random forest model is related to the subsequent setting of professional clusters by higher education institutions. Therefore, the prediction accuracy of the random forest model is an important indicator for evaluating the experiment.

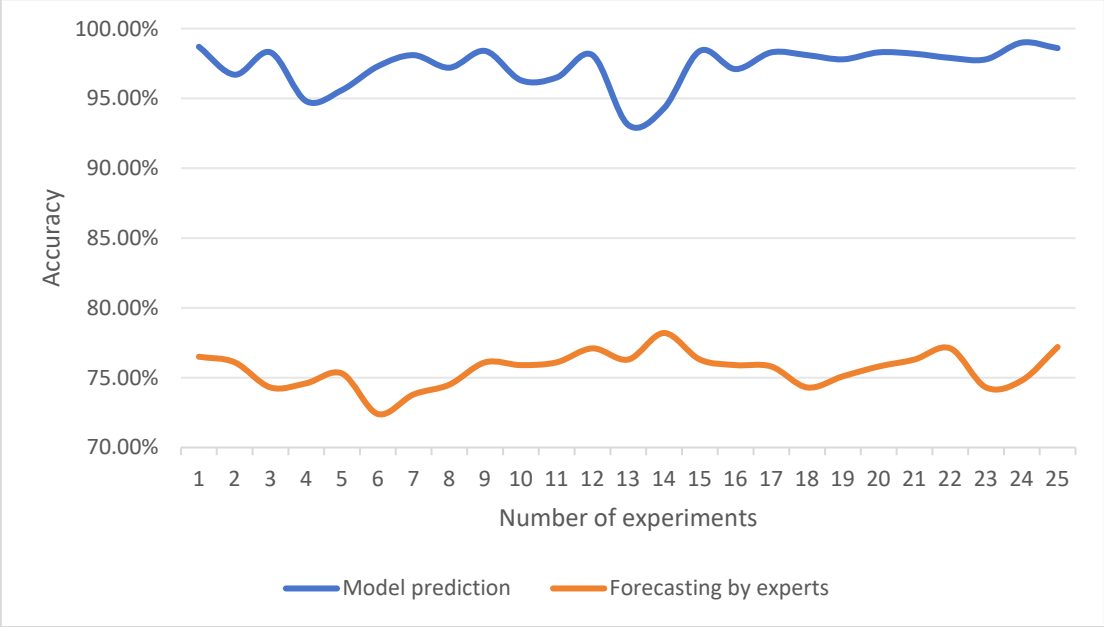

Figure 2: Accuracy Chart

In Figure 2, 25 prediction experiments were conducted. From the data in the figure, it can be seen that the average accuracy of using the random forest model to predict industrial demand is 97.31%, which is much higher than the expert's accuracy of predicting industrial demand of 75.6%. This is due to the ability of the random forest to process multi-dimensional data, predict industrial demand from multiple aspects such as economy, technology, market, and policy, and predict the subsequent development of the industry, laying a foundation for the optimization of professional clusters in higher education institutions.

4.3 Employment Rate

When conducting research experiments on optimizing the direction of professional clusters in higher education institutions based on industrial demand, the employment situation of students after optimizing the direction of professional clusters in higher education institutions is an important indicator for evaluating the effectiveness of the research. It reflects the design of professional clusters in higher education institutions after changes in industrial demand. Among them, I is the experimental group and II is the control group.

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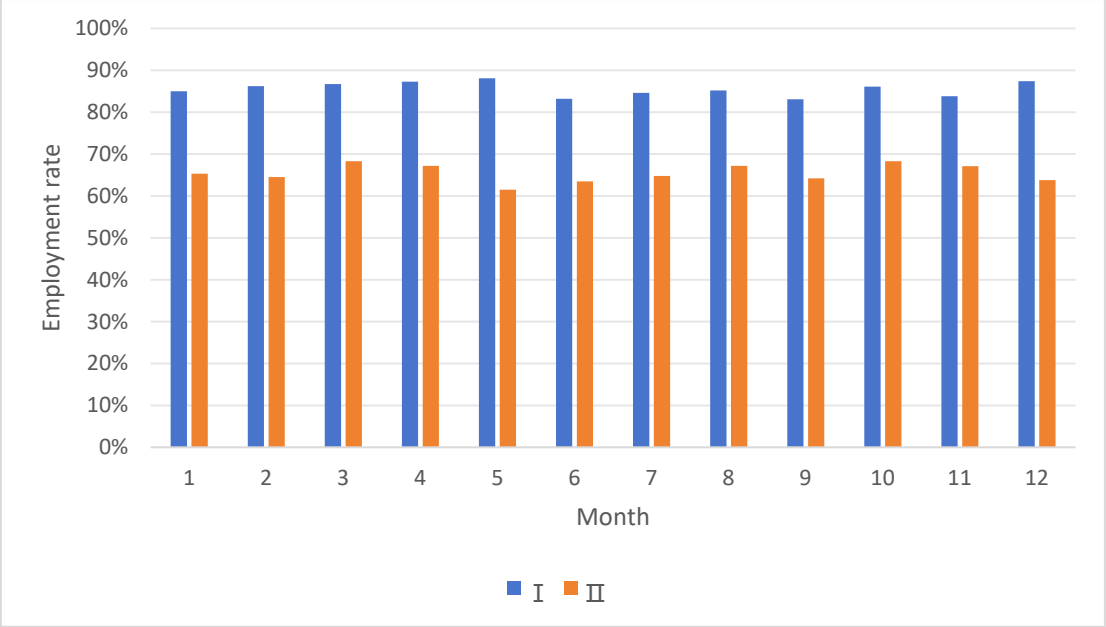

Figure 3: Employment rate chart

In Figure 3, the employment situation of students under the optimized and pre optimized professional clusters within 12 months was calculated. Through the analysis of the data in the graph, it is found that the optimization of the professional cluster direction in higher education institutions has significantly improved the employment situation of students, with an increase of about 20.8%, providing more talents for different industries and meeting the industry's demand for talents.

5. Conclusions

In summary, the research on optimizing the direction of higher education professional clusters based on industrial demand in this article is aimed at adapting to the continuous changes in industrial demand, improving the adaptability of higher education professional education, and the degree of integration with industrial demand. This article establishes a professional cluster optimization model through random forest and collects relevant data for model training. The experimental results show that the accuracy of the model in predicting industrial demand is much higher than that of expert predictions, and the optimized direction of professional clusters can improve the employment situation of students. Therefore, research on optimizing the direction of professional clusters in higher education institutions based on industrial demand is of great significance for talent cultivation and industrial development in higher education institutions.

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