Correlation Analysis Between Student Psychological State and Grades Based on Data Mining Algorithms

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***Abstract*—As society has evolved and educational reform has become more profound, the psychological state and academic performance of vocational college students have become the focus of attention for educators. This study aims to construct a correlation model between the positive psychological state and academic performance of vocational college students based on data mining algorithms to offer a conceptual foundation and practical guidance for the optimization of vocational education. The relationship between positive psychological state and academic performance was analyzed through a literature review, as well as the application of data mining algorithms in the field of education. A certain amount of data on vocational college students was collected using questionnaire surveys and empirical research methods, including their basic information, positive psychological status indicators, and academic performance data. Subsequently, data mining algorithms were used to preprocess and analyze the collected data, and a correlation model between the positive psychological state and academic performance of vocational college students was constructed. Finally, through validation and evaluation of the model, it was found that there is a significant positive correlation between positive psychological state and academic performance, and the model has high predictive accuracy. The study's results suggest that the positive psychological state of vocational college students has a significant impact on their academic performance. Educators should consider students' mental health and take effective measures to enhance their positive psychological state, thereby improving their academic performance. This study provides a new research perspective and method for the field of vocational education, which helps to promote the development and reform of vocational education.**

Keywords*—Data mining algorithms; vocational students; positive psychological state; academic performance; correlation model

I. Introduction

In the context of modern education, the relationship between students' psychological state and academic performance is increasingly receiving attention. The psychological state of students, such as emotions, motivation, anxiety, and stress, can have a profound impact on their academic performance. Therefore, understanding and exploring the correlation between these two is of great significance for improving educational quality, optimizing student mental health support, and implementing personalized educational strategies [1]. With the rapid development of information technology, the application of data mining algorithms in the field of education is gradually becoming prominent. These algorithms can extract valuable information from large-scale and complex educational data, thereby providing decision support for educators. The correlation model between student psychological state and academic performance based on data mining utilizes these advanced algorithms to analyze the relationship between student psychological state and academic performance from multiple dimensions and perspectives, in order to provide scientific basis for educational practice [2].

In the context of the information society, vocational education, as an important way to cultivate applied talents, has received widespread attention in terms of its educational quality and training effectiveness [3]. The positive psychological state and academic performance of students are important indicators for measuring the quality of vocational education, and the application of data mining technology in the field of education provides new perspectives and methods for studying this issue. This study aims to provide theoretical support and practical guidance for the reform and development of vocational education by constructing a correlation model between the positive psychological state and academic performance of vocational students based on data mining algorithms [4]. Firstly, the development process of research on the positive psychological state and academic performance of vocational college students at home and abroad was reviewed, and research achievements and theoretical systems in related fields were summarized. On this basis, the challenges and problems faced by current vocational education, such as students' mental health issues, unreasonable allocation of educational resources, and imperfect teaching methods and evaluation systems, were analyzed. To address these issues, a research approach and method for constructing a correlation model between the positive psychological state and academic performance of vocational college students based on data mining algorithms has been proposed [5]. A detailed introduction was given to the application of data mining technology in the field of education, including the basic concepts, technical principles, and methods of data mining, as well as the current application status and development trends in education. Especially for the core technology of constructing a correlation model between the positive psychological state and academic performance of vocational college students, - data mining algorithms - in-depth exploration was conducted, and the advantages, disadvantages, and application scenarios of various algorithms were analyzed.

On this basis, this study proposes a method for constructing a correlation model between positive psychological state and academic performance of vocational college students based on data mining algorithms. By collecting and organizing data on the psychological state and academic performance of vocational college students, a dataset containing multi-

dimensional features was constructed. Then, appropriate data mining algorithms were used to analyze and mine the dataset, discovering the correlation between students' positive psychological state and academic performance. A correlation model between the positive psychological state and academic performance of vocational college students was constructed based on the mining results, and the effectiveness and reliability of the model were verified. By constructing a correlation model between the positive psychological state and academic performance of vocational college students based on data mining algorithms, this study provides useful theoretical support and practical guidance for the reform and development of vocational education. At the same time, this study also pointed out the shortcomings of current research and the issues that need further exploration, providing direction and ideas for subsequent research.

This article constructs a correlation model between student psychological state and academic performance based on data mining algorithms. The innovation contribution lies in:

1) By mining historical student performance data, discover the relationship between student academic performance and various factors, and provide targeted teaching suggestions for teachers. By mining teaching data, the effectiveness of teaching methods and strategies can be evaluated, providing a basis for teaching reform.

2) This article implements a closed-loop early warning system targeting college students. This structure effectively avoids the drawbacks of traditional systems centered around counselors or related institutions.

3) The student psychological state module uses the powerful non-linear approximation ability of artificial intelligence algorithms to fit the relationship between the two, achieving the conversion of psychological category data to student psychological state.

Section I of the study elaborates on vocational education as an important way to cultivate applied talents in the context of the information society. This article introduces the techniques for constructing a model related to the positive psychological state and academic performance of vocational college students. Section II provides an immediate overview of the proposed data algorithms and discusses the main application areas of data mining algorithms. By analyzing student behavior data on online learning platforms, we can discover their learning paths, understand their learning progress and difficulties, and provide personalized learning advice and assistance to students. Section III analyzed the correlation between the positive psychological state and academic performance of vocational college students. Section IV is about the uses of various dimensions of psychological capital as independent variables and SCL-90 total score as dependent variable. The analysis elaborates on the results of multiple regression analysis of variables. Section V conducted model construction based on data mining algorithms. According to the implementation process of the system, the design scheme was experimentally validated in vocational colleges. Section VI and Section VII summarizes the entire text by providing discussion and conclusion. This study provides a new research perspective and method for the field of vocational education, which helps to promote the development and reform of vocational education.

II. Related Work

In vocational education, there is a complex and subtle correlation between students' psychological state, academic performance, relative deprivation, and academic procrastination behavior. This association not only affects the academic performance of students, but also directly relates to their mental health and future career development. Therefore, Xu et al. conducted an in-depth conditional process analysis on this issue. Firstly, it clarifies the concept of "relative deprivation". Relative deprivation is a psychological state in which an individual feels inferior or insufficient in certain aspects after comparing themselves with others. In the context of vocational college students, this sense of deprivation can be attributed to various factors such as unsatisfactory academic performance, social pressure, and uncertainty in future career planning. When students feel this deprivation, their psychological state is often negatively affected, such as anxiety, depression, and inferiority [6]. In vocational education, the relationship between students' psychological state and academic performance is not only related to their academic achievement, but also closely related to the cultivation of their key abilities. Key abilities usually refer to the core skills and psychological qualities that students need when facing future career challenges. With the development of educational technology, data mining algorithms have provided powerful tools for exploring this relationship in depth [7]. With the development of preschool education in vocational colleges, the correlation between students' psychological state and academic performance is increasingly attracting the attention of educators. The stability and well-being of psychological state are particularly important for students majoring in preschool education, as it not only affects their individual learning outcomes, but also directly relates to their future professional qualities and abilities as educators. Therefore, Wu and Yan used data mining algorithms to deeply explore the correlation between the psychological state of vocational preschool education students and their academic performance, in order to provide scientific basis for educational practice [8]. Students majoring in preschool education in vocational colleges will bear an important responsibility in cultivating the next generation in the future, and their psychological state will directly affect their educational behavior and quality [9]. Meanwhile, academic performance, as an important indicator of student learning effectiveness, is also closely related to their psychological state. Therefore, studying the correlation between psychological state and academic performance is of great significance for improving the teaching quality of preschool education in vocational colleges, optimizing student mental health education, and cultivating students to become educators with good psychological literacy [10].

In the current field of education, the relationship between students' psychological state and their academic performance has become an important issue of concern for researchers and practitioners. Previous research literature has provided us with rich knowledge background and research foundation, revealing the multiple effects of psychological state on academic performance, including motivation, emotional regulation,

cognitive processing, and other aspects [11]. These studies not only emphasize the importance of psychological state in the learning process of students, but also point out the limitations and shortcomings of traditional assessment methods [12]. Although some research has achieved certain results, there are still some problems and challenges. For example, previous studies have mostly used traditional data collection methods such as questionnaire surveys and interviews, which are difficult to comprehensively and objectively reflect the psychological state of students. In addition, research methods are mostly descriptive statistics or simple correlation analysis, which makes it difficult to deeply reveal the complex relationship between psychological state and academic performance. Therefore, it is necessary to introduce advanced technologies such as data mining algorithms to analyze the correlation between the two in a more scientific and accurate way [13]. With the rapid development of information technology, the field of education is undergoing unprecedented changes. Education data mining, as an important technology, provides strong support for the analysis and prediction of student academic performance. Feng et al. aim to explore how to use educational data mining methods to effectively analyze and predict student academic performance, thereby providing valuable references for educational decision-making and practice [14]. The analysis and prediction of student academic performance based on educational data mining has broad application prospects in educational practice [15]. Firstly, it can provide scientific teaching decision-making support for teachers, helping them better understand students' learning situations and needs, and develop personalized teaching plans. Secondly, it can provide personalized learning advice and guidance to students, helping them identify their learning problems and improve their learning methods. In addition, it can also provide data support for education management departments to help them formulate more reasonable and effective education policies [16].

This study aims to construct a correlation model between student psychological state and academic performance based on large-scale educational data using data mining algorithms. We hope that through this model, we can further reveal the internal relationship between mental state and academic performance, and provide more accurate and personalized guidance for educational practice. Meanwhile, this study is also an important supplement and expansion to existing research, providing new ideas and methods for the future development of the education field.

In summary, the analysis of the correlation model between student psychological state and academic performance based on data mining algorithms has important theoretical and practical significance. Through this study, we hope to provide educators with more scientific and effective decision support, promote the comprehensive and healthy development of students, and also expand new ideas and methods for the application of data mining algorithms in the field of education.

III. Overview of Data Mining Algorithms

With the increasing development of data mining technology, various data mining tools have sprung up like mushrooms after rain. How to choose the most suitable data mining tool for needs has become a question worth pondering. Generally speaking, data mining tools are mainly divided into two categories: one is domain-specific data mining tools and the other is general data mining tools. Domain-specific data mining tools are customized and developed for specific domains or requirements. When designing algorithms for such tools, the specificity of data and requirements can be fully considered for optimization. These tools typically use special algorithms to process specific data to achieve specific goals. Due to its high degree of customization, the reliability of the discovered knowledge is usually high. However, universal data mining tools do not target specific data meanings but instead use universal mining algorithms to handle common data types. The advantage of such a tool lies in its wide applicability. For example, the Mine Set system developed by SGI, the QUEST system developed by IBM Almaden Research Center, and the DB Miner system developed by Simon Fraser University in Canada are typical representatives of universal data mining tools.

A. Main Application Fields of Data Mining Algorithms

The application of data mining algorithms in vocational education has achieved significant results. As big data technology develops, the collection and analysis of educational data have become increasingly important, and the application of data mining algorithms in vocational education is also becoming increasingly widespread. This article will elaborate on the main application fields of data mining algorithms in vocational education.

Student academic performance prediction: By mining historical student performance data, the relationship between student academic performance and various factors can be discovered, providing targeted teaching suggestions for teachers. Data mining algorithms can help teachers predict students' academic performance, identify their learning difficulties in advance, develop personalized teaching plans, and improve teaching quality.

Student turnover warning: The issue of student turnover in vocational education has always been a focus of attention for education managers. By analyzing students' behavioral data through data mining algorithms, it is possible to predict whether there is a risk of student turnover and take corresponding intervention measures to reduce the rate of student turnover. For example, by mining data on students' online behavior, course participation, and grades, it is possible to identify risk factors such as psychological problems and learning difficulties that students may have and provide targeted intervention suggestions for education managers.

Course recommendation: Data mining algorithms can recommend suitable courses for students based on their interests, background knowledge, and learning abilities. By analyzing students' course selection records, grades, and other data, students' interests and potential needs can be identified, providing personalized course recommendations to improve their learning interests and satisfaction.

Teaching quality evaluation: Data mining algorithms can help educational managers objectively and scientifically evaluate teaching quality. By analyzing data such as teachers'

teaching records, students' academic performance, and course evaluations, problems and deficiencies in the teaching process can be identified, providing a basis for educational managers to improve teaching quality.

Optimization of educational resources: Data mining algorithms can help educational managers optimize the allocation of educational resources. By analyzing students' course selection records, course satisfaction, and other data, it is possible to discover the popularity of courses and students' needs, thereby providing educational managers with a basis for reasonable adjustment of course settings, teacher allocation, and other resources. There are many tools for data mining, but it is a process that only closely integrates the technology provided by data mining tools with the needs of enterprises. Only by constantly running in during the implementation process can success be achieved. When choosing data mining tools in vocational colleges, multiple factors should be comprehensively considered, such as the capability to resolve difficult issues, operational performance, and data access ability.

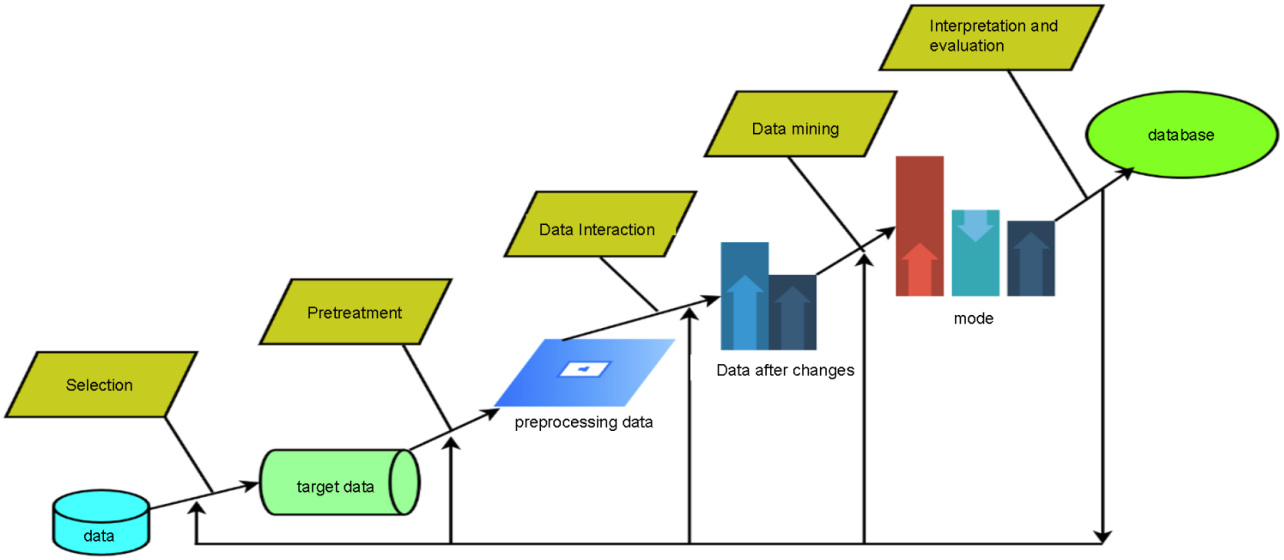

Fig. 1. Data mining process model.

Fig. 1 shows the data mining process model. In the entire data mining process, the most significant aspect is data preparation. This stage can be further divided into three sub-steps: data selection, data preprocessing, and data transformation. Data collection mainly involves finding all internal and external data information related to business objects and selecting data suitable for data mining applications. Data preprocessing involves deep processing of the extracted data to meet the needs of data mining, laying the foundation for subsequent analysis, and determining the type of mining operation to be carried out. The main job responsibilities include checking spelling errors, eliminating duplicate records, completing incomplete records, deriving missing data, completing data type conversions, and more. The data conversion process is to convert the data into an analytical model, which is established for mining algorithms. The main goal is to identify truly useful features from the initial features in order to reduce the number of features or variables that need to be considered in data mining.

B. Research on the Application of Data Mining Algorithms in the Field of Education

The application of data mining in the field of education has become an important direction of educational research. Through data mining technology, valuable information and knowledge can be extracted from a large amount of educational data, providing an important basis for educational decision-making. The learning behavior of students can be examined through data mining. By mining students' learning behavior data, it is possible to discover their learning patterns, understand their learning habits and preferences, and provide support for personalized teaching. For example, by analyzing students' behavior data on online learning platforms, it is feasible to discover their learning paths, understand their learning progress and difficulties, and provide personalized learning suggestions and assistance to students. Data mining can be used for evaluating teaching effectiveness. By mining teaching data, the efficacy of teaching methods and strategies can be evaluated, providing a basis for teaching reform. For example, the effectiveness of teaching methods can be evaluated by analyzing student performance data.

C. K-Means Algorithm

The K-means algorithm is a traditional unsupervised clustering algorithm based on distance. Finding the number of clusters and the centers of each cluster is the first step in the main concept. Then, each data point is assigned to the nearest cluster center. When all of the data points are assigned, it is the step to recalculate the center of each cluster and perform iterative calculations until the change in the cluster center is small or no longer changes. Excellent clustering results should meet the requirement that data points within the same cluster have high similarity in various attributes. In contrast, data points between different clusters have low similarity in various attributes. Definition 1 Sample Set X: Assuming there is a sample set X in a certain space, which contains m attributes and a total of n samples,

A sample can be represented by Xi, and an attribute of a sample can be represented by Xit, with i ranging from 1 to n and t ranging from 1 to m. Definition 2 center point set C: Assuming there are K center points $\{c_1, c_2, \ldots c_k\}$. The range of K is 1 to n, and a certain center point is represented by Cj, where the range of j is 1 to k. Definition 3: Euclidean distance: Euclidean distance is the linear distance between points in space. For example, the calculation formula from a sample point Xi to a center point Cj is shown in Eq. (1):

$$dis(x_i, c_j) = \sqrt{\sum_{t=1}^{m} (xit - cjt)^2} \quad (1)$$

Definition of MeanShift algorithm-related knowledge:

Definition 1 Sample Set X: Assuming there is a sample set X in the space, a certain sample point can be represented by Xi, and there are k such sample points. Definition 2: Region set S_h: Region set S_h represents a multi-dimensional spherical space formed by taking a point x in space as the center of a circle and then drawing a multi-dimensional circle with h as the radius. Sample set X is a collection of all data points in a region set. S_h can be represented by Eq. (2):

$$S_h = (xi|(xi - x)(xi - x)^T) \quad (2)$$

The definition form of the MeanShift vector is shown in Eq. (3):

$$M_h(x) = \frac{\sum_{xi \in Sh}(xi - x)}{k} \quad (3)$$

In Eq. (3), xi is a sample in sample set X, x is the center of the region set, and k is the number of sample points. However, in Eq. (3), the MeanShift vector has shortcomings: within the S_h region, each point plays a different role in the sub-center point. The role it plays is related to the distance between each point and the sub-center point, so improvements can be made to address this drawback.

IV. Research on the Correlation between Positive Psychological State and Academic Performance of Vocational College Students

A. Basic Situation of Psychological Health Level of Vocational College Students

To understand the mental health level of adolescent students, descriptive statistics were used to analyze the scores of ten factors in SCL-90. The results are shown in Table I. Secondly, screening was conducted on single factor scores $\geq 2, \geq 3, and \geq 4$ to obtain the rate at which mental health issues is detected (see Table II).

Firstly, according to Table I, among the SCL-90 factors, the mean of obsessive-compulsive symptoms is the highest, at 2.15 points. Rank the scores in descending order: obsessive-compulsive symptoms (2.15)>interpersonal sensitivity (1.87)>depression (1.73)>hostility=paranoia (1.72)>anxiety (1.67), terror (1.44)>somatization (1.43). The average total score of SCL-90 is 1.69, indicating that most of the student's mental health levels are normal, but they should not be underestimated for students who measure their psychological status.

TABLE I. The Overall State of Students' Mental Health in Vocational Colleges

Factor	Minimum value	Maximum value	Mean	Standard Deviation
Somatization	1	4.33	1.4	0.52
Obsessive-compulsive disorder	1	4.60	2.0	0.69
Sensitivity to interpersonal relationships	1	4.78	1.8	0.76
Depressed	1	4.62	1.7	0.67
Anxious	1	4.40	1.6	0.62
Hostile	1	5.00	1.7	0.78
Terror	1	4.43	1.4	0.52
Scl-90 total score	1	4.41	1.6	0.54

TABLE II. Detection Rate of Mental Health Problems among Vocational College Students

Factor Somatization	Factor Score≥2		Factor Score≥3		Factor Score≥4	
	Number of people	*Percentage*	*Number of people*	*Percentage*	*Number of people*	*Percentage*
Compulsive symptoms	40	13.25 %	5	1.66 %	2	0.66 %
Sensitivity to interpersonal relationships	169	55.96 %	34	11.26 %	7	2.32 %
Depressed	112	37.09 %	25	8.28 %	9	2.98 %
Anxious	82	27.15 %	17	5.63 %	4	1.32 %
Hostile	72	23.84 %	14	4.64 %	3	0.99 %
Terror	92	30.46 %	25	8.28 %	8	2.65 %
Factor	45	14.90 %	5	1.66 %	1	0.33 %
SCL-90 Total score	69	22.85 %	12	3.97 %	1	0.33 %

B. Regression Analysis of Positive Psychological Capital of Vocational College Students on their Mental Health Level

Regression analysis can reveal the quantitative relationship between positive psychological capital (such as confidence, hope, resilience, optimism, etc.) of vocational college students and their mental health level. This analysis not only helps to understand which psychological capital factors are more important, but also predicts what range a student's mental health level may be in given levels of psychological capital. Confidence refers to an individual's affirmation of their abilities and values. Regression analysis can help us understand how hope affects mental health, such as whether students with stronger feelings of hope exhibit fewer symptoms of anxiety or depression. The method of gradually entering variables is used, with each dimension of psychological capital as the independent variable and the total score of SCL-90 as the dependent variable. Table IV represents the results of the multiple regression analysis that was performed on the variables.

TABLE III. REGRESSION ANALYSIS RESULTS OF POSITIVE PSYCHOLOGICAL CAPITAL ON MENTAL HEALTH LEVEL

Order	Entering variables	R2	F	B	SE	β	T
1	Toughness	0.208	78.679	-0.255	0.029	-0.456	-8.870***
2	Toughness	0.259	52.269	-0.179	0.033	-0.319	-5.495***
	Optimistic			-0.118	0.026	-0.264	-4.549***

***P＜0.001

From Table III, it can be seen that psychological resilience and optimism enter the regression equation, with resilience entering first, indicating that psychological resilience has the greatest predictive effect on mental health levels by predicting 20.8% of variables. The combined predictive power of psychological resilience and optimism is 25.9 percent. Hope and self-efficacy did not enter the regression equation. For mental health, the total score is 1.69, indicating that there are little or no psychological symptoms, but their occurrence is not frequent. The most prominent symptom among various factors is obsessive-compulsive disorder, with a mean score of 2.15, indicating that students attending vocational colleges experience mild to moderate degrees of this symptom. Impulses and thoughts are examples of compulsive symptoms that repeatedly invade an individual's daily life, and they are able to experience that they, themselves, are the source of these impulses and thoughts despite being aware of their meaninglessness. Although they resist vigorously, they are still unable to control them. The first reason for this is that students have high demands on themselves. They have been facing overly strict education from their families and schools since birth and must comply with regulations and orders. Otherwise, they will be denied, belittled, or even scolded by parents and teachers, as well as ridiculed by peers. Over time, these rules will be internalized into their strict standards. Secondly, students face negative emotions such as grievances, fears, anxiety, and depression that they experience in their emotions, learning, and interpersonal relationships, coupled with a lack of skills to express themselves directly through language or obtain satisfaction through appropriate behavior, making it difficult for them to rely on their own demands and external environment.

Environmental review. So, it transforms into symptoms of thought, emotion, and behavior and becomes compulsive symptoms through self-suppression. There were no significant differences in the analysis of psychological health factors among vocational college students from four aspects: gender, place of origin, and whether they are only children or are in single-parent families. However, the research results show that girls score significantly higher than boys in the dimension of terror, indicating that girls are more susceptible to psychological distress caused by terror. Psychological development is related to the education provided by family, school, and society. In many people's minds, there is a stereotype of girls, believing that they are not as good as boys in higher vocational education, especially in subjects such as mathematics, physics, and chemistry. Simultaneously, girls tend to experience tension, anxiety, and unease due to the mounting pressure of appearing for college entrance exams, and their fear will become apparent. Given that girls are more delicate and sensitive than boys, from the standpoint of evolutionary psychology, it is especially crucial to pay attention to their inner experiences and offer guidance on girls' mental health. The positive orientation of students' psychological capital in all dimensions $dimension\ score \geq 4$), $hope\ (57.95\%) > optimism\ (53.64\%) > resilience\ (35.43\%) > self-efficacy\ (28.48\%)$, indicates that more than half of students have more optimistic positive psychological capital. The highest scores for resilience and self-efficacy were in the range of 3 to 4, with resilience scoring 57.62 percent and self-efficacy scoring 63.58%. This indicates that vocational college students are in a general state in these two dimensions. Many students in traditional teaching methods have poor learning and personality development and need more successful experiences, which may affect their self-efficacy. Other contributing factors include the single assessment and evaluation system, low teacher-student ratio, and other issues. Social support levels, academic stress, and interpersonal relationships all have an impact on how resilient students become psychologically. No significant differences were seen in the psychological capital dimensions of vocational college students from four aspects: gender, place of origin, whether they are only children and single parent families. However, in terms of self-efficacy, boys are significantly higher than girls, and the gender differences in self-efficacy are closely related to factors such as social expectations, gender role concepts, and social reality. In addition, students from non-single-parent families are more optimistic than students from single-parent families for the following two reasons. Firstly, there is a lack of emotions, as teenagers have not only material needs during their growth process but also indispensable emotional experiences from their families. Some divorced parents do not care enough about

their children and do not have their children's emotional needs. Some parents, although accepting their children, do not truly take responsibility, which leads to abandonment or neglect, affecting the personality development of teenagers. Secondly, there is a bias in social evaluation, where children from single-parent families often become the focus of discussion and are criticized or even distorted, leading to students developing a sense of inferiority.

V. Model Construction Based on Data Mining Algorithms

Fig. 2 indicates the system's overall architecture, which mainly consists of five parts: control center, warning object, data acquisition, psychological analysis, and psychological warning. For college psychological warnings, the control center mainly refers to college counselors or psychological counseling institutions, who are the executors of the plan and are mainly responsible for the operation and maintenance of the intelligent warning system and the processing of student psychological abnormal warning information. The warning targets are college students. The data acquisition mainly includes a depth-of-field data acquisition module and a data preprocessing module. The former obtains and records three-dimensional data of warning objects by reading the depth of field camera port. The latter processes the obtained raw data through data mining methods and transforms the data into standard data that can be directly input into intelligent algorithms through normalization methods. The psychological analysis section mainly includes an intelligent classification module and a psychological state module. The intelligent classification module takes standardized data as input and the psychological category of the warning object as output. By fitting the relationship between the two through the powerful nonlinear approximation ability of artificial intelligence algorithms, the psychological state module achieves the conversion of psychological category data to students' psychological state. The psychological warning section is composed of an abnormal warning module, which detects students' psychological status based on the output results of psychological status data. When an abnormal state occurs, an alarm is sent to the control center for processing. Then, the control center handles the abnormal students, thus achieving a closed-loop early warning system with university students as the warning object. This structure effectively avoids the drawbacks of traditional systems centered around counselors or related institutions. It improves the initiative and timeliness of psychological early warning work in universities by focusing on students.

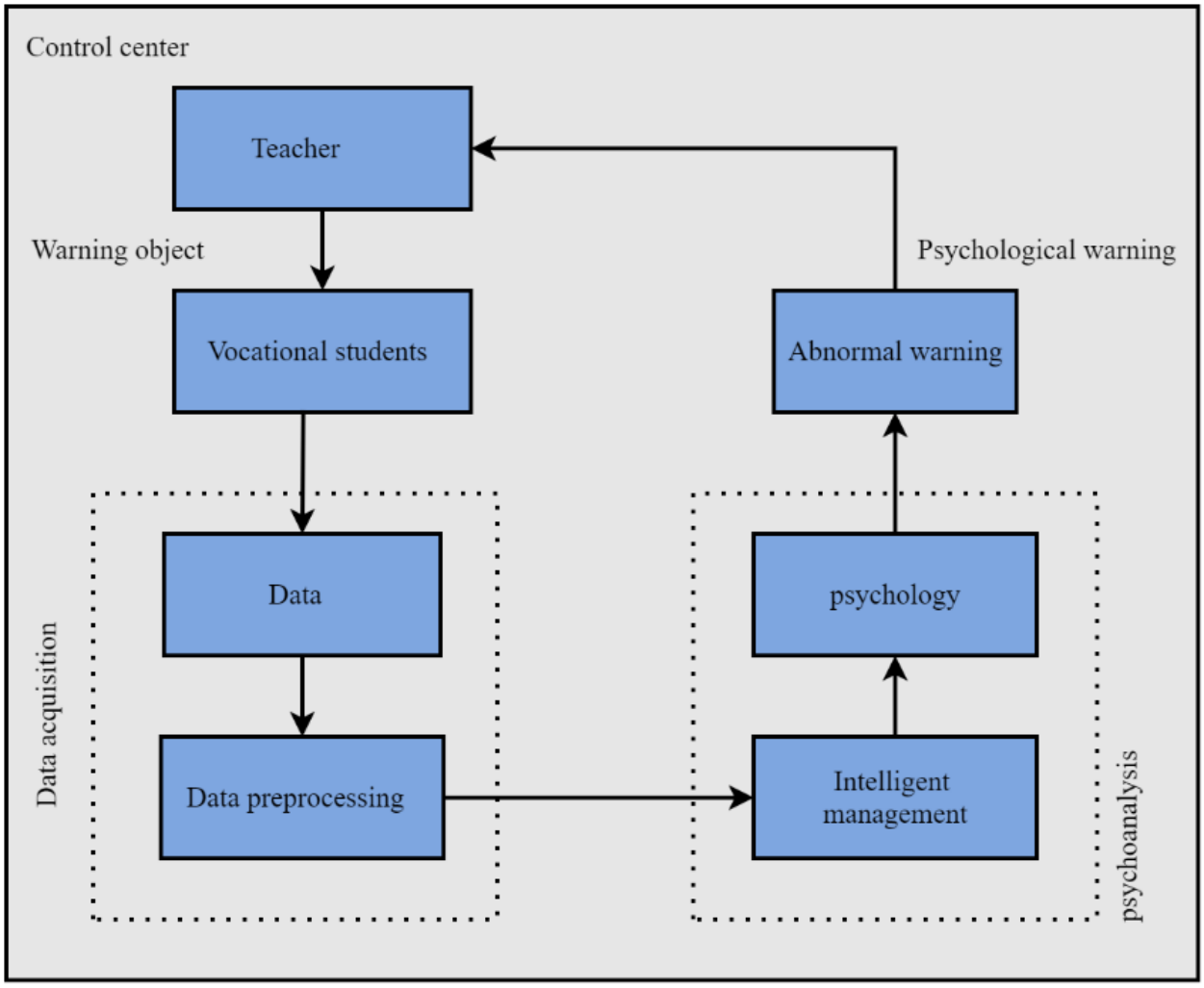

Fig. 2. Overall architecture.

A. Data Collection and Preprocessing

Due to the complexity of psychological warning problems, it is necessary to accurately extract the psychological feature data of the warning object while minimizing interference with the warning object as much as possible while considering the timeliness of data acquisition. This design uses a depth-of-field camera as the data collection device. It uses the 3D image data of the warning object in a specific area as the raw data for extracting the psychological characteristics of the warning object. In addition, in order to reduce the difficulty of data processing, this design selects the Kinect V2, a new generation somatosensory camera launched by Microsoft that currently has a relatively complete API as the data collection device. It has a high accuracy of about 2mm and has an infrared camera, making data collection possible in the case of gray and dark algorithms. By utilizing TOF technology to collect deep data, the accuracy is sufficient to identify human hand posture and even heart rate, fully meeting the requirements of psychological data extraction in this system. This article uses the official development toolkit Kinect for Windows SDK v2.0 to extract relevant data easily. The following describes the specific data acquisition and preprocessing process, as shown in Fig. 3.

B. Analysis and Interpretation of Model Results

According to the implementation process of this system, experimental verification of this design scheme was conducted in vocational colleges. Due to the particularity of the psychological abnormality warning, the recognition results of facial expression categories for the warning object in this design were verified. The validation process and results are as follows: 500 college student volunteers were selected as samples for the validation of this system. 300 of them served as the training set for the BP neural network, with each volunteer creating six types of facial expressions and using Kinect V2 to obtain training after data preprocessing, data is inputted into the neural network for training, and the remaining 200 volunteers are the test set of the scheme. The classification results of the trained BP neural network for six facial expressions in the test set are presented in Table IV.

From Table IV, it can be seen that the BP neural network designed in this article has a recognition rate of 79% for complex expressions such as expressions 4 and 6 in the recognition of facial expression states of warning objects. The overall average recognition rate is 88.6%, and the error rate is 2.3%. It can meet the needs of psychological warning and also verify the effectiveness of this system.

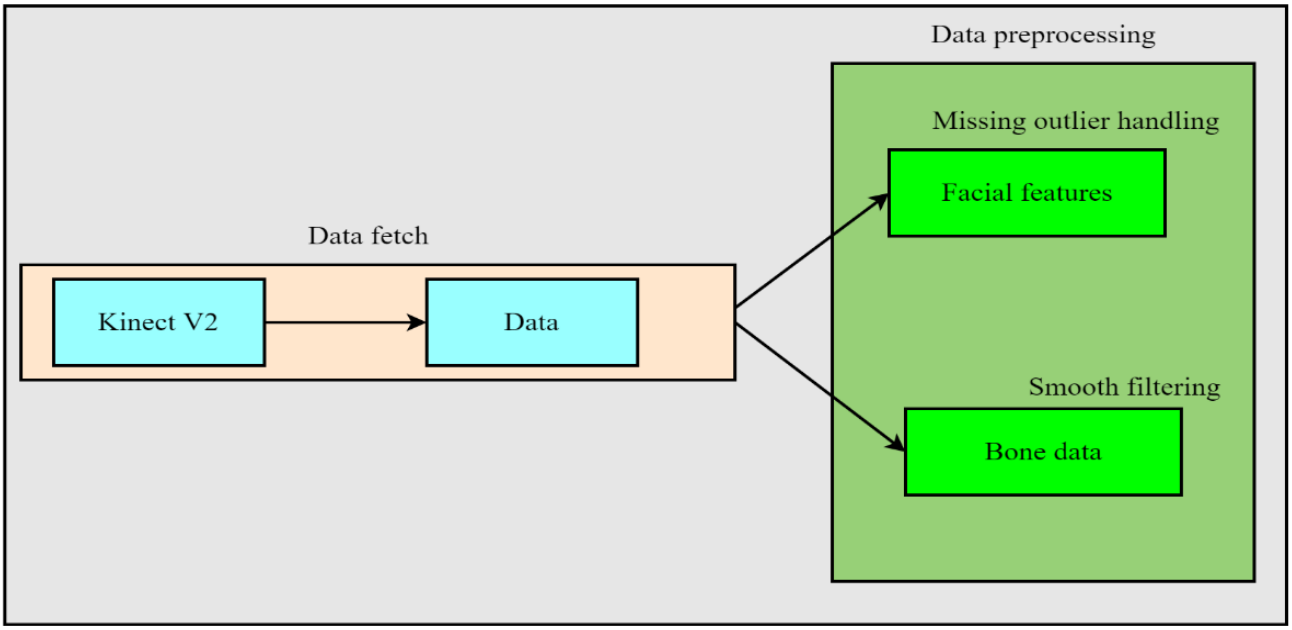

Fig. 3. Data acquisition and processing framework diagram.

TABLE IV. BP NEURAL NETWORK RECOGNITION RESULTS

Number	1	2	3	4	5	6
Recognition frequency	200	200	200	200	200	200
Successfully identified	192	195	180	168	173	159
Unrecognized	8	4	18	27	22	31
Misidentification	0	1	2	5	5	10
Recognition rate	96%	97%	90%	84%	86%	79%

VI. Discussion

This study explores in depth, the correlation between student psychological state and academic performance through the application of data mining algorithms. The results reveal a significant correlation between the two, providing a new perspective for us to understand the learning process and psychological development of students. The stability and positivity of psychological state have a significant positive impact on the improvement of academic performance, and vice versa. This discovery emphasizes the importance of mental health in the learning process of students.

Comparing the results of this study with existing theories, we found that they have some extent support relevant theories in cognitive psychology and educational psychology. For example, according to the theory of emotional regulation, the psychological state of students can affect their learning strategies and effort levels, thereby affecting their academic performance. The results of this study are consistent, indicating that psychological state is indeed one of the important factors affecting student academic performance.

Understanding the correlation between student psychological state and academic performance is of great guiding significance for educational practice. Educators can provide personalized support and intervention based on the psychological state of students, helping them adjust their mentality, enhance their learning motivation, and thus improve their academic performance. In addition, this also helps us to evaluate students' academic performance more comprehensively, not limited to a single performance indicator.

VII. Conclusion

This article explores the construction of a correlation model between the positive psychological state and academic performance of vocational college students based on data mining algorithms. An effective method suitable for the field of education has been discovered through analysis of existing data mining tools and algorithms. In the data preparation stage, data was collected, preprocessed, and transformed to meet the needs of data mining better. In the algorithm application stage, a detailed discussion was conducted on the application research of data mining algorithms in the field of education in order to find an effective method to predict the relationship between students' positive psychological state and academic performance. Through in-depth research on data mining algorithms in the field of education, vocational colleges have discovered some interesting results. A significant correlation was found between students' positive psychological state and academic performance. This means that students' psychological state during the learning process has a significant impact on their academic performance. Therefore, educators should pay attention to students' mental health in order to improve their academic performance. Data mining algorithms have broad application prospects in the field of education. By mining students' learning data, educators can better understand their learning needs and difficulties and thus develop more effective teaching strategies. In addition, data mining algorithms can also help school managers identify potential problems, such as students' mental health issues, academic misconduct, etc., and take corresponding measures to intervene. How to combine data mining algorithms with other educational technologies to enhance education quality, way of using data mining algorithms to predict students' future academic performance, and provide personalized learning suggestions for students. The resolution of these issues will bring more innovation and development to the field of education. By constructing a correlation model between the positive psychological state and academic performance of vocational college students based on data mining algorithms, a new research method is provided for the field of education. With the continuous development and improvement of data mining technology, it will become more and more significant in the field of education, making greater contributions to enhancing the quality of education and promoting educational equity.

However, there are certain limitations to the research. When collecting data, we may rely on self-report methods such as questionnaire surveys and online tests, which may lead to subjectivity and bias in the data. In addition, some important psychological state indicators may be difficult to quantify or accurately measure, thereby affecting the accuracy and reliability of the model. In future research, we need to fully consider these limitations and take corresponding measures to improve and perfect research methods, in order to more accurately reveal the relationship between psychological state and academic performance, and provide more scientific and effective decision support for educational practice.

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