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Article

# Research on biomechanics integrated Bayesian network mental health diagnosis system

**Shenghong Dong[1], Qing Chen[1,2,*], Pengming Wang[3]**

[1] School of Psychology, Jiangxi Normal University, Nanchang 330022, China
[2] School of Science, East China Jiaotong University, Nanchang 330013, China
[3] School of Data Science and Artificial Intelligence, Wenzhou University of Technology, Wenzhou 325035, China
*** Corresponding author:** Qing Chen, cq2024@jxnu.edu.cn

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**Abstract:** With the rapid economic development of various countries around the world and the acceleration of global networking, countries are striving to promote their own urbanization and industrialization progress. The side effect is that social pressure leads to the concentrated outbreak of various social contradictions. The main psychological health testing and evaluation method in society is still conducted through dialogue with psychologists. Doctors obtain information through dialogue and communication with patients, and diagnose their psychological status based on this information. Affected by factors such as communication style and the patient's own mental state. The information obtained may result in omissions and biases, leading to inaccurate diagnostic results. Bayesian network is a probabilistic graphical model that derives the results through information calculation. It can analyze and calculate the finite and incomplete conditions, carry out corresponding reasoning, and obtain more rigorous results. This article applied the naive Bayesian algorithm to the research of mental health diagnosis systems, and compared it with mental health diagnosis systems that do not use algorithms. According to the mental health index of contemporary people, the algorithm achievement test experiment of mental health diagnosis system was carried out. After research and comparison, it was found that for the collected data, the maximum accuracy of the Naive Bayesian algorithm within a hundred calculations reached 99%, with a mean of 96.5%. The traditional paper-based psychological diagnosis method had a maximum accuracy of 89%, a minimum of 70%, and an average accuracy of 80.5%. Therefore, the application of naive Bayesian network to the development and research of mental health diagnosis system can effectively improve the efficiency, accuracy and diagnostic effect of mental diagnosis.

**Keywords:** Bayesian network; mental health; diagnostic system; health diagnosis

## 1. Introduction

Psychological health has always been a problem that troubles people of all ages in today's society. Although society has been moving forward, it has also brought many problems along with its development. Various pressure factors are concentrated, and various types of social contradictions are concentrated and erupting. The enormous psychological pressure covers all age groups in society, and people are experiencing an increasing number of mental health problems. The psychological health testing of social groups has become an undeniable social issue. If psychological health issues are not taken seriously, their negative impact on society can become increasingly serious. However, the current mental health diagnosis system is still lacking. The traditional method of mental health assessment requires patients to communicate verbally with doctors and conduct online tests, whether in paper or

electronic form. However, during the diagnostic process, doctors may face various unexpected situations. The direct result is that doctors have insufficient understanding of the patient's condition, leading to misdiagnosis. Bayesian models have extremely high probability analysis ability, which can analyze and organize things through limited or even incomplete information. If it is combined with theories related to psychology, collecting information on patients' emotional status, personality traits, personal information, etc., and importing the data into algorithms for modeling and analysis, it can accurately determine the patient's mental health status and make the correct diagnosis of mental health. Therefore, this article has research significance.

The level of stability in social development is directly linked to the individual's mental health status. When the general population in society is in a relatively peaceful and stable psychological state, social stability would be relatively high. Therefore, many experts have conducted corresponding surveys on the factors and variables that affect mental health. Arango Celso pointed out during the research process that existing treatment methods have almost no effect on mental disorders. In order to ensure social stability, active intervention should be carried out on the psychological status of students during their sensitive developmental period [1]. Kumar Anant pointed out that new measures such as self-isolation have affected people's daily lives, leading to an increase in loneliness, anxiety, depression, insomnia, harmful alcohol and drug use, as well as self-harm or suicidal behavior. People have developed a strong sense of anxiety, leading to a decline in social stability [2]. Liu Jia Jia and his team found through research that children quarantined during the epidemic were more likely to suffer from psychological problems such as acute stress disorder, adaptation disorders, and sadness [3]. Evans Teresa M found through social surveys that an increasing number of graduate students were developing psychological disorders. The psychological health issues of patients exacerbate the barrier between obtaining a healthy body and obtaining economic income in society [4]. In order to increase the overall stability of society, the entire society and different individuals have made tremendous efforts.

Bayesian network is an algorithm to calculate the event probability by establishing an image model. In the field of mental health, it is suitable for managing the association between control groups and patients, analyzing patient information, diagnosing mental health, and treating patients' psychological problems through this form. Jiang Wen built a z-network by studying the number of z, an effective model describing the uncertainty in reality, and proposed a reliability analysis dependency evaluation framework based on the z-network, which effectively proved the strong processing ability of Bayesian network under the condition of fuzzy and missing information [5]. Rouder Jeffrey N proposed that Bayesian algorithms are becoming increasingly popular in the field of psychology. Due to the processing ability of Bayesian algorithms for incomplete information, evidence describing the presence or absence of effects in the data can even be included in experiments [6]. Merkle Edgar C found that applying Bayesian algorithms to the field of psychological evaluation could simplify the process required for evaluation and improve efficiency [7]. Etz, Alexander pointed out that the use of Bayesian network could help many psychological researchers interested in inferences that cannot be answered with classical statistical data. Therefore, incorporating more research using Bayesian

methods into psychological literature should be beneficial for the entire field [8]. The application scope of Bayesian algorithm is extremely broad, and its application in the field of psychology can greatly help patients with psychological disorders that lead to social integration disorders.

Psychological health issues have always been a hot topic among the various problems facing society today. When it accumulates to a certain extent, it can cause a wide range of anxiety and have a certain impact on the stability of the whole society, such as the blockade and isolation in the COVID-19 period. The most widespread incidence population is concentrated among adolescents [9]. Therefore, an efficient and accurate mental health diagnosis system is particularly important. This article established a mental health diagnosis system using naive Bayesian algorithm, and compared it with the oral survey results of traditional psychologists and the evaluation of paper questionnaires. The numerical data of various psychological judgments of patients were analyzed to evaluate their mental health status. The results indicated that the mental health assessment system based on naive Bayesian algorithm had higher evaluation accuracy.

## 2. Methods for diagnosing mental health

As the foundation of people's social, production, and daily actions, mental health plays a crucial role in people's daily lives. Referring to data and cases from other countries, if the public's mental health index is low, it would cause huge social problems. Therefore, it is necessary to always pay attention to people's psychological conditions, and the importance of mental health diagnosis is self-evident.

There are various triggering factors for mental health problems. Generally speaking, an individual's mental health is influenced by genetics and the environment. In most cases, patients who experience mental health problems are influenced by the people and events they encounter in their living environment. The individual's ability to regulate mental health is closely related to the education and environment of their original family. At the same time, the relationship between mental health and physical health is also very close. Long term exposure to mental health conditions such as depression can trigger various types of physiological diseases, leading to the loss of labor for the affected.

Whether the poor psychological health of the public leads to poor social stability or the lack of labor force, it has a negative impact on the development of the entire society. Therefore, it is necessary to constantly pay attention to the mental health status of the public and provide appropriate attention and support when problems arise. Therefore, the choice in the psychological diagnosis system is very important.

In the process of evaluating mental health, it is necessary to collect as much information as possible to avoid diagnostic errors caused by incomplete information collection. The diagnosis of mental health is generally divided into two major steps, first conducting a preliminary diagnosis, and then collecting information, as shown in **Figure 1**.

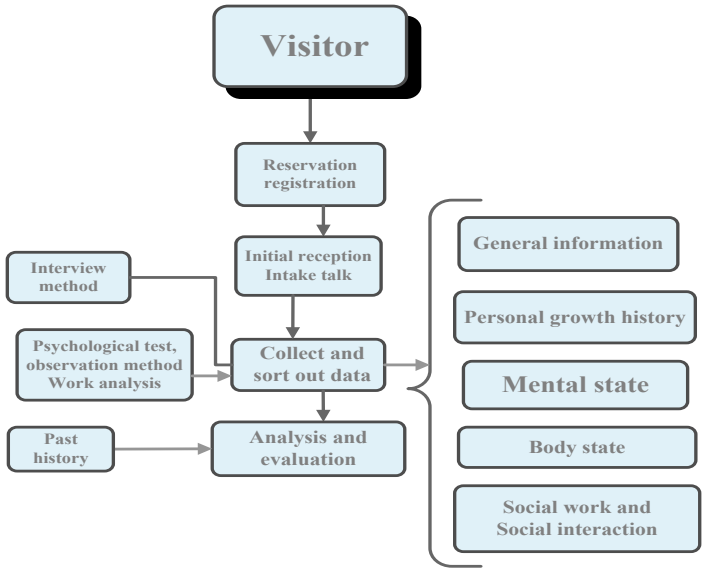


**Figure 1.** Preliminary judgment of psychological diagnosis and treatment.

As shown in **Figure 1**, after the visitor registration, the doctor receives the visitor, conducts interviews, and uses psychological tests and observation methods for work analysis. Patient data is organized and collected. Based on the patient's personal information, personal growth history, mental state, physical condition, and social experience, the patient's past illness history is analyzed to make corresponding analysis and evaluation.

Secondly, through simple contact with patients through the process, after preliminary collection of information, further interviews are conducted to determine the cause and obtain diagnostic results. The secondary diagnostic steps are shown in **Figure 2**.

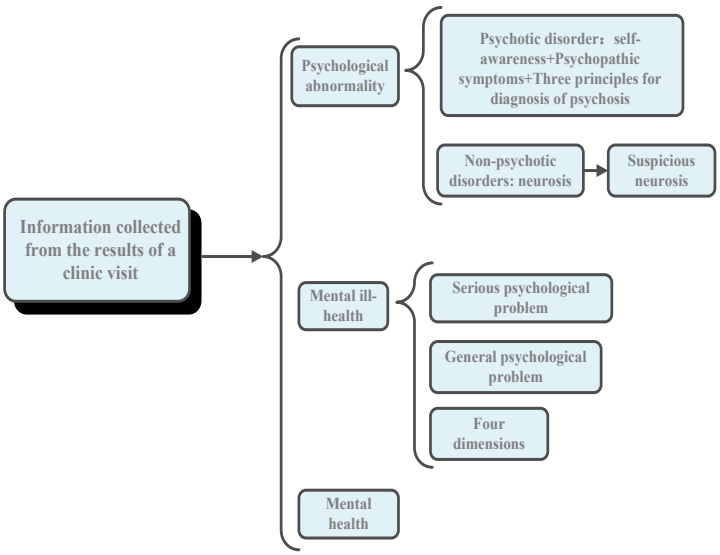


**Figure 2.** Analysis of test results after psychological secondary diagnosis.

As shown in **Figure 2**, after a simple initial contact detection and information collection in **Figure 1**, in the subsequent process of **Figure 2**, the patient's mental health status can be classified into three states. The two most important states are psychological abnormalities and unhealthy states. Psychological abnormalities are further divided into psychiatric disorders and non-psychiatric disorders. Unhealthy psychology can be divided into general psychological problems and serious psychological problems. The complete process is considered a complete psychological investigation.

Psychiatric diseases have become a common disease in high-pressure modern society, which can greatly affect people's daily lives. Therefore, the social and national levels should give sufficient attention to related diseases. In today's era of aging and fewer children, if people do not pay attention to the existence of psychological diseases, the already scarce labor force would be further lost, leading to other problems.

## 2.1. Psychological problems and mental health diagnosis

The process of mental health diagnosis is complex and requires a large amount of information collection, which requires a long time and human resources. The efficiency is relatively low, and it is more suitable for a small number of patients. Therefore, it is particularly important to establish appropriate diagnostic methods and develop an efficient and accurate mental health diagnosis system that can face the public on a large scale. At the same time, this diagnostic mode should have a certain degree of convenience and be able to cope with various types of unexpected situations. In today's highly developed internet, using social media to conduct psychological surveys and organization online has considerable reference value [10]. In addition, such diagnostic systems should also be able to specifically classify the degree of psychological illness in patients and reshape diagnostic and treatment methods based on dimensions [11].

At present, the widely used mental health assessment system still lacks various aspects, and resources and manpower are unable to cope with the diagnosis of large-scale psychological conditions, resulting in very limited assessment capabilities.

## 2.2. Naive Bayesian algorithm

Bayesian algorithm is a probabilistic image model. Applying it to the system allows for specific analysis of the obtained data and the establishment of associations between patients and control groups. Applying this model to the construction of a mental health diagnosis system requires a large amount of mental health related data. Building a diagnostic system based on feature data allows for accurate diagnosis by inputting the required data. The online psychological diagnosis system constructed through Bayesian model is shown in **Figure 3**.

As long as the patient's data is input into the software's data collection options, the Bayesian network can complete the data through the probability model, and analyze and learn through the collected psychological data. According to the patient's characteristic data, modeling is carried out to pre-show all possible conditions, then infer the possible mental health problems of the patient, and give the most appropriate treatment scheme.


**Figure 3.** Mental health assessment management system.

The Naive Bayes algorithm is a modified version of the Bayesian algorithm, also known as the NBM (Naive Bayes Model), which simplifies the Bayesian algorithm by assuming that attributes are conditionally independent of each other when given a target value. That is to say, no attribute variable holds a significant proportion to the decision result, and no attribute variable holds a small proportion to the decision result. On the basis of the advantages of simplifying operational attributes and reducing operational difficulty, the naive Bayesian algorithm also has strong data classification ability [12], which is extremely strong in processing different types of data.

Compared with traditional mental health assessment methods such as verbal interviews and paper questionnaires, the Naive Bayes algorithm, with its efficient probabilistic analysis capabilities, performs well in processing large-scale data and uncertain information, and is particularly suitable for rapid screening and preliminary diagnosis of mental health problems, which is particularly important in situations where resources are limited or a large number of people need to be assessed quickly. However, the "black box" nature of the algorithm may limit the interpretability of its results, especially in clinical settings where a deep understanding of the patient's background and psychological state is required. In contrast, traditional methods such as verbal interviews and paper questionnaires can provide more in-depth personal information and complex emotional responses, which are suitable for individualized assessment and the formulation of personalized treatment plans. Although these methods are less efficient in processing large amounts of data and are susceptible to human factors and subjectivity, they are still indispensable tools in situations where detailed medical histories and personalized treatment plans are required. Therefore, these two methods can complement each other in practical applications: the Naive Bayes algorithm can be used for preliminary screening, while traditional methods are used for subsequent in-depth assessment and treatment to achieve a comprehensive

understanding of the patient's mental health status and effective intervention. Through this comprehensive approach, we can improve the accuracy and efficiency of mental health diagnosis while ensuring the implementation of personalized treatment.

Furthermore, since Naive Bayes has high compatibility with different types of data sets, simple logic, stable algorithm, and good robustness, even if the psychological data sets input for learning belong to a large number of different individuals, the required parameters are very few. Even for different types of data with independent characteristics, the Naive Bayes algorithm can process the data well based on the given variables [13]. Applying it to the mental health diagnosis system can greatly reduce the probability of misdiagnosis.

Through online test questions, patient related data is collected and imported for training and modeling using naive Bayesian algorithms, followed by calculations.

There is a sample dataset $A = \{a_1, a_2 \ldots a_n\}$, and the corresponding feature attribute set of the sample data is $J = \{j_1 j a_2 \ldots j_a\}$. The class variable is $K = \{k_1 k_2 \ldots k_b\}$, which means that A can be divided into $K_b$ class. Among them, $j_1 j a_2 \ldots j_a$ are mutually independent and random. Then, the prior probability of $K$ is $B_{prior} = B(K)$, and the posterior probability of K is $B_{post} = B(K|J)$. From the naive Bayesian algorithm, the posterior probability can be calculated from the prior probability $B_{prior} = B(K)$, quasi conditional probability $B(J|K)$:

$$B(J|K) = \frac{B(K)B(J|K)}{B(J)} \tag{1}$$

Naive Bayes is based on the independence of each feature. When a given category is $K$, the above formula can be further expressed as follows:

$$B(J|K = k) = \prod_{c=1} a\, B(j_c|K = k) \tag{2}$$

From the above two formulas, the posterior probability can be calculated as:

$$B_{post} = B(K|J) = \frac{B(K) \prod_{c=1} a\, B(j_c|K)}{B(J)} \tag{3}$$

Since the size of $B(J)$ is fixed, only the molecular part of the above formula can be compared when comparing the posterior probability. Therefore, a naive Bayesian calculation with sample data belonging to category $k_c$ can be obtained:

$$K_c|j_1 j_2 \ldots j_a \tag{4}$$

The mental health related data is brought in, and the index formulas for determining whether a patient is healthy are:

$$B\ (\text{Health } = \text{Yes}) = \frac{S}{U} \tag{5}$$

$$B\ (\text{Health } = \text{No}) = \frac{D}{U} \tag{6}$$

Assuming that the index measured is the anxiety index $R$, then the calculation formulas of conditional probability are as follows:

$$B(R) = Z_1|\text{Yes} = B(R = H_1 \left|\text{Health} = \text{Yes}\right) = \frac{1}{\sqrt{2\pi} * x}\exp(\frac{r-i}{2*x^2})^2 \quad (7)$$

$$B(R) = Z_1|\text{No} = B(R = H_1 \left|\text{Health} = \text{No}\right) = \frac{1}{\sqrt{2\pi} * y}\exp(\frac{r-t}{2*y^2})^2 \quad (8)$$

Then, the values calculated by the two probability formulas are compared to determine the psychological state.

## 3. Experiment on patient mental health diagnosis

### 3.1. Establishing a mental health diagnosis system

The fundamental purpose of establishing a mental health diagnosis system is to facilitate self-management and testing of mental health among the public. Therefore, when conducting testing, it is necessary to quantitatively collect data on relevant indicators for the system to make analysis and judgments. The test indicators are divided into four observation directions, as shown in **Table 1**.

**Table 1.** Index system for psychological health evaluation and audition.

| Feature Layer | Foundation Layer | Feature Layer | Foundation Layer |
|---|---|---|---|
| Social Cultivation | Understanding Of Core Values | Family Upbringing | Relationship With Family Member |
| | Economic Level | | Family Attitude |
| | Viewpoint Of Social Conduct | | Family Education Mode |
| | Social Environment Fitness | | Whether They Are The Only Child |
| | Social Climate Fitness | | Family Structure |
| | Relationships With Leaders | | Family Condition |
| | Relationships With Colleagues | | Family Atmosphere |
| | Social Status | | Family Concern |
| Campus cultivation | Study And Life Time Allocation | Personal Development | Body State |
| | The Relationship With Teachers | | Interpersonal Communication Situation |
| | Community Activities | | Character Orientation |
| | Degree Level | | Hobbies And Interests |
| | Degree Type | | Self-Awareness |
| | School Environment Fitness | | Competency Motivation |
| | School Climate Fitness | | Psychological Specialty |

**Table 1** shows the evaluation indicators of mental health, mainly analyzing the psychological status of patients from four characteristic levels: society, family, campus, and individual. There was a total of 30 indicator items, of which there were many at the social and family level, totaling 16. The indicators that appeared more frequently were the atmosphere and environment of the individual's daily activities in different environments, as well as the level of friendliness with the objects in contact with them. By importing and analyzing these data, a feature probability distribution model can be established for normal psychological states. Based on these data, the psychological status of patients was analyzed and evaluated. In order to accurately

evaluate the mental health status of contemporary people and enrich the database of the mental health system, a mental health indicator table was constructed by collecting the mental health status of 100 patients from the hospital's psychiatric and psychological departments.

**Table 2** shows the psychological health status of 100 cardiology patients collected, divided into five levels. Among them, the mental health status accounted for the highest proportion of mental sub health status, with a total of 31 people, accounting for 31%. The minimum number of people with excellent mental health status was 8, accounting for 8%. From the table, it can be seen that the majority of people in modern society have poor mental health status and are below the qualified line. Therefore, the development of a mental health diagnosis system allows people to regularly self-test and monitor their mental health status in real-time, which has a positive impact.

**Table 2.** Table of mental health status indicators.

| Classification Number | Mental Health Rating | Meaning | Number | Proportion |
|---|---|---|---|---|
| 1 | Level 1 | Mental Health Status: Excellent | 8 | 8% |
| 2 | Level 2 | Mental Health Status: Good | 24 | 24% |
| 3 | Level 3 | Mental Health Status: Qualified | 19 | 19% |
| 4 | Level 4 | Mental Health Status: Sub-health | 31 | 31% |
| 5 | Level 5 | Mental Health Status: Failure | 18 | 18% |

## 3.2. Specialized diseases in mental health diagnosis system

Psychological disorders have various characteristics. In order to enrich the types of system data features and test the accuracy of the model in detecting different types of features, 6 features were selected by analyzing the data of 300 patients with different types of psychological disorders and integrating them into the analysis model. The accuracy was compared with the contribution of the features. The accuracy calculation formula is as follows:

$$\text{Accuracy} = \frac{(\text{TP} + \text{TN})}{\text{Total Number}} \tag{9}$$

Wherein, TP is the number of samples predicted by the model as positive and actually positive. TN is the number of samples predicted by the model as negative and actually negative. The model constructed in this study was tested, and the experimental results are shown in **Table 3**.

**Table 3.** Accuracy of testing for different types of psychological disorders.

| Serial Number | Single Feature | Number | Detect Correct Quantity | Model Accuracy |
|---|---|---|---|---|
| 1 | Somatization | 33 | 28 | 85% |
| 2 | Paranoia | 24 | 21 | 88% |
| 3 | Mania | 39 | 31 | 79% |
| 4 | Obsession | 65 | 62 | 95% |
| 5 | Anxiety Disorder | 72 | 72 | 100% |
| 6 | Depression | 67 | 67 | 100% |

**Table 3** shows the proportion of the number of different types of diseases and the detection accuracy after testing in the input model. From the data in the table, it can be seen that among these 300 patients, the largest proportion was the population with anxiety disorder, reaching 72 people, while the total number of people with paranoia was relatively small, at 24 people. Among them, the population with depression and anxiety disorder had the highest accuracy in model detection, with a detection accuracy of up to 100%. The reason for the high accuracy of analysis may be due to the large number of anxiety disorders and depression in the population with psychological disorders, the large amount of data, and the relatively complete analysis of patterns and features.

The main functional area of the psychological diagnosis system is aimed at the general public, so it is necessary to pay attention to the differences between different characteristics of psychological diseases and improve the breadth of its effects. The naive Bayesian algorithm can balance the differences between different features and distinguish feature categories of different categories [14]. The possibility of errors occurring during the analysis process is reduced. The mental health diagnosis system based on Bayesian network has high predictability to the independent characteristics existing in the process of mental diagnosis [15]. It is also possible to design personal treatment plans for patients based on their own conditions, detect their personal data in real-time, record changes in indicator related data, and make corresponding adjustments to the treatment plan to achieve the best treatment effect.

## 4. Results of mental health diagnosis

### 4.1. Accuracy of diagnostic results

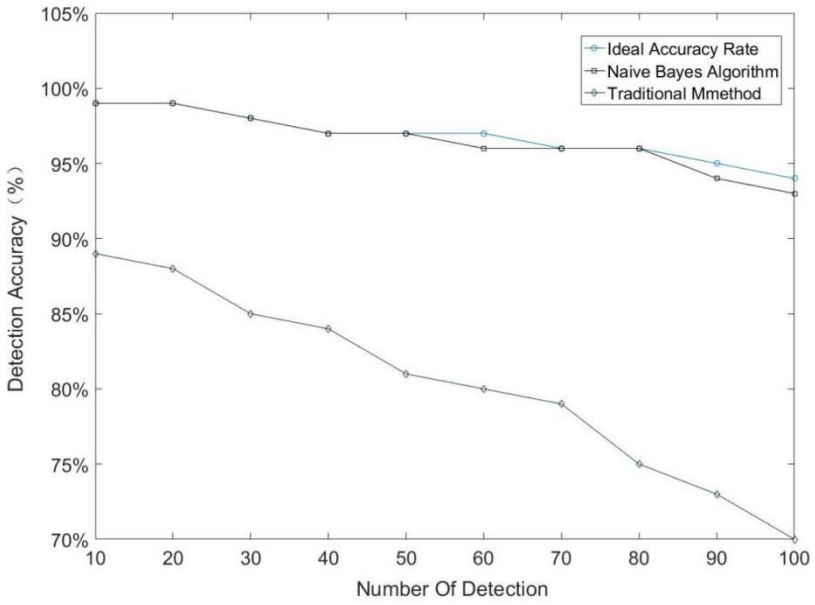


**Figure 4.** Comparison of accuracy of mental health diagnosis systems.

The diagnosis of mental health status is based on the analysis of patients' personal information, as well as relevant data on emotional and physiological values, to obtain

diagnostic results. However, currently, collecting relevant data through traditional paper-based testing can lead to errors in manually verifying large amounts of data, leading to misdiagnosis. Secondly, updating and iterating paper-based data is very cumbersome, and manual manipulation can easily lead to secondary errors, leading to greater deviations in the diagnosis and treatment results. This article compared the accuracy of a mental health diagnosis system based on naive Bayesian algorithm with a mental health diagnosis system based on traditional paper-based information collection methods [16]. The comparison results are shown in **Figure 4**.

In **Figure 4**, the comparison of the accuracy of two health diagnosis systems in detecting psychological disease patients' data for classification diagnosis in 100 patient mental health accuracy tests is described [17,18].

From this, an ideal accuracy rate of the psychological diagnosis system can be obtained. Within 100 test values, it should be maintained at over 94%, and the average accuracy rate should reach 96.8%. The naive Bayesian algorithm can achieve a maximum accuracy of 99% and an average of 96.5% within a hundred calculations. The traditional paper-based psychological diagnosis method had a maximum accuracy of only 89%, a minimum of only 70%, and an average accuracy of only 80.5%, far below the average ideal accuracy. Moreover, the accuracy of traditional measurement methods significantly decreases with the increase of detection times. Therefore, a system based on naive Bayesian methods for mental health diagnosis has a higher accuracy than a mental health diagnosis system using traditional paper-based measurement methods [19].

## 4.2. Diagnosis time

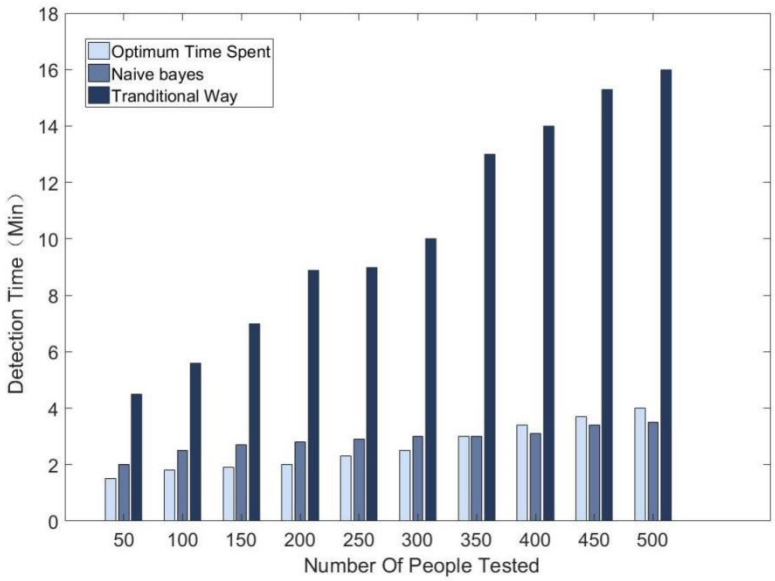


**Figure 5.** Comparison of diagnostic time for mental health system.

For patients with psychological disorders, the shorter the diagnosis time, the more time it takes to specify the corresponding diagnosis and treatment plan. The more tailored the plan is to the individual's situation, the better the treatment effect is, and

the probability of deterioration is also reduced. The time spent on the diagnosis of mental health diagnosis system based on naive Bayesian algorithm was compared with that of mental health diagnosis system based on traditional paper information collection method. 500 people were selected for psychological disease diagnosis data, and the time spent on diagnosis was compared. The comparison results are shown in **Figure 5**.

**Figure 5** shows a comparison between the time spent by traditional mental health systems for diagnosing mental illness related conditions and the time spent based on naive Bayesian algorithms for diagnosis. According to the information in **Figure 5**, the most ideal scenario was to control the calculation time for less than 500 people within 4 min, with an average value of 2.61 min. The diagnosis time of the naive Bayesian algorithm is shown in Figure 5, which can be controlled within 3.5 min. When measuring the mental health status of 500 people, the average time spent can be controlled at 2.89 min. Compared to traditional measurement methods, their performance is somewhat unsatisfactory when facing large base measurement objects. The minimum time spent was 4.5 min, and the maximum time spent was 16 min. The average time spent was 10.33 min, which was several times longer than the calculation time of the naive Bayesian algorithm. Therefore, it can be determined that the psychological diagnosis system based on the naive Bayesian algorithm has a shorter calculation time [20].

### 4.3. Diagnostic capabilities for different classifications

In the era of big data, people have become accustomed to using various types of software and efficient information processing methods. Not only can the amount of data collected be small, but it also takes longer to classify and process multiple types of data, and the probability of errors increases. The diagnostic efficiency of a mental health diagnosis system based on naive Bayesian algorithm and a mental health diagnosis system based on traditional paper-based information collection method was compared. The obtained results are shown in **Figure 6**.

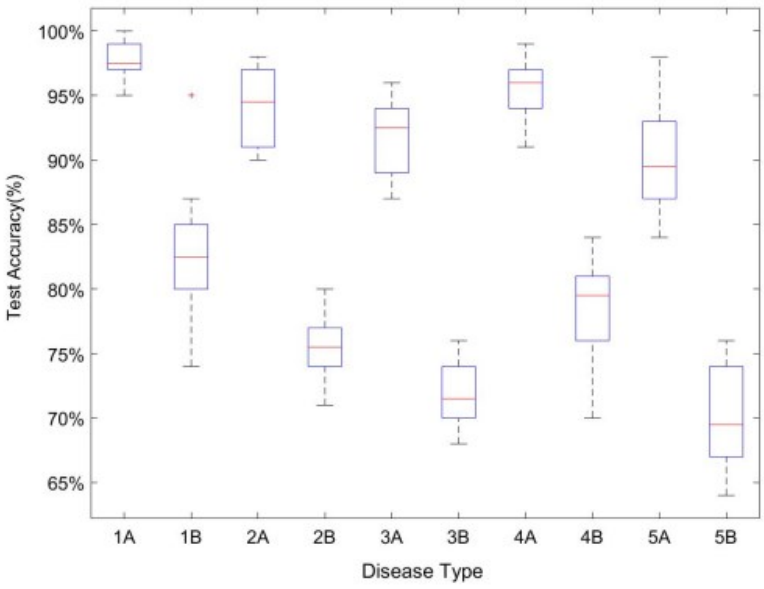


**Figure 6.** Comparison of diagnostic efficiency of mental health diagnosis system.

The diagnostic ability comparison of different types of diseases in the two methods shown in **Figure 6**. It is assumed that A refers to the naive Bayesian algorithm, B refers to the traditional paper-based diagnostic method, and 1–5 represents five different types of psychological diseases. By comparing the box plots, it can be concluded that the data of Group B was significantly lower than that of Group A. Firstly, the overall accuracy was lower than the accuracy value of the naive Bayesian algorithm. Secondly, when facing different types of psychological disease changes, the numerical fluctuation was large and the stability was poor. The naive Bayesian algorithm maintained a minimum value of over 80% when facing different types of psychological diseases. Therefore, it is determined that the psychological diagnosis system based on the naive Bayesian algorithm has stronger diagnostic capabilities for different types of diseases [21].

## 4.4. Effectiveness of diagnosis and treatment

The main purpose of using a mental health diagnostic system is to collect personal information of patients, in order for doctors to develop suitable plans. Patients are diagnosed and treated, and a mental health diagnosis system based on naive Bayesian algorithm has strong uncertainty problem processing ability, which can monitor data in real-time and assist and improve doctors' treatment plans. Therefore, it has stronger auxiliary ability and higher value in assisting psychologists in formulating and executing patient treatment plans. Psychological disease patients who collected information using traditional paper-based information collection methods were compared with those who collected information using naive Bayesian algorithms. The obtained results are shown in **Figure 7**.

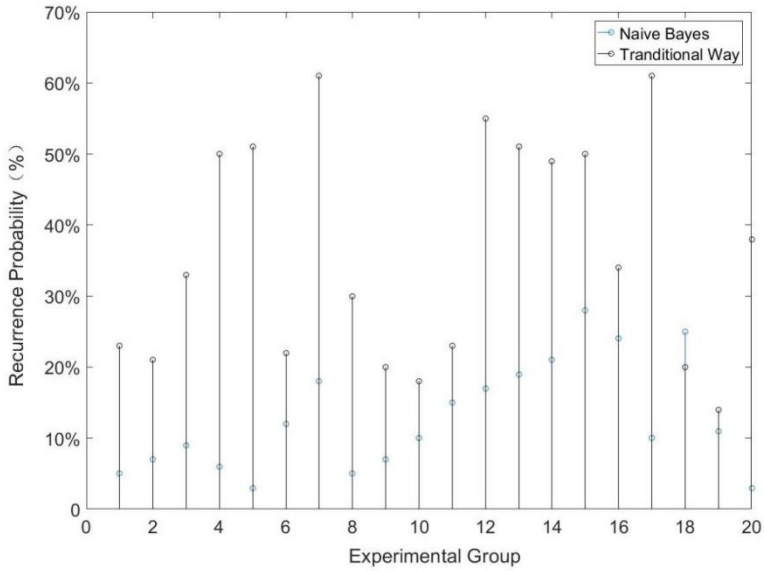


**Figure 7.** Comparison of diagnosis and treatment effects of mental health diagnosis system.

A total of 20 groups of patients with psychological disorders were selected for the experiment, and a psychological diagnosis segment system based on different methods was used to compare the effectiveness of diagnosis and treatment. From

**Figure 7**, it can be seen that patients who used a psychological diagnosis system based on naive Bayesian algorithm had a very low recurrence probability, with an average recurrence probability of 12.75%, a maximum recurrence probability of 28%, and a minimum of only 3%. For patients who used traditional methods to diagnose and treat their mental health status, the highest recurrence probability after treatment reached 61%, the lowest was also 14%, and the average recurrence probability after treatment was 36.2%. The result obtained through data testing of multiple groups of patients is that the mental health diagnosis system based on naive Bayesian algorithm has a stronger ability to prevent recurrence after treatment in auxiliary psychotherapy.

## 4.5. Discussion

Although this study focused on the diagnosis of common mental health problems such as anxiety and depression, the potential of the Naive Bayes algorithm is far more than that. In order to fully evaluate the diagnostic ability of the model, we expanded the scope of the study to explore its potential for application to a wider range of mental health problems. By analyzing the performance of the model on different disease types, we aim to demonstrate its wide applicability and diagnostic ability.

### 4.5.1. Model adaptability analysis

The core advantage of the Naive Bayes algorithm lies in its ability to handle probability and uncertainty information, which makes it suitable not only for the diagnosis of anxiety and depression, but also for the diagnosis of a variety of mental health problems. We validated the model across diseases, including bipolar disorder, schizophrenia, personality disorders, etc., by adjusting algorithm parameters and feature selection. These analysis results show that the Naive Bayes algorithm has demonstrated certain diagnostic capabilities for different mental health problems, although the accuracy for some diseases may be slightly lower than that for anxiety and depression.

### 4.5.2. Cross-disease validation

In the cross-disease validation study, we paid special attention to the diagnostic performance of the model for rare or complex mental health problems. Through collaboration with clinical experts, we conducted a detailed evaluation of the model output and adjusted the model structure based on feedback. These efforts enable the model to provide more accurate and reliable diagnostic results when dealing with different mental health problems.

### 4.5.3. Future research directions

Although the current research has demonstrated the potential of the Naive Bayes algorithm for a variety of mental health problems, there is still much work to be explored. Future research can focus on optimizing the algorithm to improve its diagnostic accuracy for specific diseases. In addition, as new problems in the field of mental health emerge, such as emerging psychological problems in the digital age, our model also needs to be continuously updated and adapted to maintain its relevance and effectiveness.

## 5. Conclusions

The speed of social development is accelerating, but due to a series of factors such as population expansion, economic environment development, inflation, social work pressure, environmental trends, etc., more and more people are experiencing various psychological problems. People's mental health problems are becoming increasingly serious, and a suitable and efficient mental health diagnostic system is needed to assist in evaluating their mental health status. Bayesian network has the ability of probability analysis. It can learn and calculate through limited or incomplete information, and can learn and reason under limited, incomplete and uncertain information conditions. This paper applied Bayesian network to the construction of mental health diagnosis system, and compared the performance of mental health evaluation system using naive Bayesian algorithm and traditional questionnaire without algorithm. The results indicated that using naive Bayesian algorithm to evaluate mental health status yielded better numerical results, higher accuracy, shorter evaluation time, and better diagnostic and therapeutic effects, which can greatly assist patients in diagnosing their mental health status. Based on the individual situation of the patient, corresponding suggestions have been given, and the patient's status has been detected in real-time and adjusted accordingly.

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