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Research on the Early Warning and Intervention Mechanism for Internet Addiction among College Youth Based on Artificial Intelligence Algorithm

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Abstract: *This work aims to address the current situation of internet use and internet addiction among young students in contemporary universities. A warning and intervention mechanism for internet addiction among young college students based on improved AGNES clustering algorithm is constructed. By establishing labels for students' online behavior, quantifying and normalizing their online behaviors, and then constructing the improved AGNES clustering algorithm based on these labels, we can achieve clustering of students' internet addiction warning levels. Teachers construct intervention mechanisms for different warning levels based on students' online warning levels and class distribution models, from multiple aspects such as online science popularization, internet addiction prevention, harm response, precise monitoring, and point-to-point assistance, and then design the specific planning schemes. Experimental results show that the constructed algorithm can accurately classify the degree of internet addiction warning for students. Teachers can design targeted plans to correct students' online behavior problems and help them develop physical and mental health.*

Keywords: *Improved AGNES clustering algorithm, College youth, Internet addiction warning, Internet addiction intervention*

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I. INTRODUCTION

Under the background of the rapid development of Internet catering algorithms, college youth, as the main audience of the Internet, are greatly affected by the Internet catering algorithms. The correct use of the catering recommendation mechanism of the Internet can effectively help college students complete their studies, promote their physical and mental health, and play a role in fostering good thinking and behavior of college students. However, with the blowout development of the Internet and big data, the negative effects of catering algorithms are also gradually emerging, such as the massive emergence of information such as game addiction, erotic violence, and bad public opinion, which is very likely to breed negative emotions and unstable thoughts of college youth, leading to problems such as campus violence, illegal speech, physical and mental damage, etc. It is extremely difficult to completely block students' access to the Internet when daily teaching work is heavily dependent on the construction of digital campus and the intelligent development of education. Therefore, it is very important to do a good job in students' Internet use behavior constraints and ideological education, which is an effective way to prevent students from being negatively affected by the Internet catering algorithms. In particular, how to minimize the risk of Internet addiction has always been the core of student management.

Currently, academic research on monitoring and early warning intervention for internet addiction risk among young people in colleges is very weak, lacking scientific and reasonable quantitative basis and model methods. We have sorted out relevant academic research on this issue and analyzed some existing problems. Firstly, most studies have discussed the strategies, paths, and explorations of information technology construction for early warning and intervention of internet addiction among young students in colleges, providing some feasible ideas for the construction of early warning and intervention mechanisms for internet addiction among young students in colleges. This type of research method lacks technical, procedural, and methodological research, and lacks scientific model research on how to quantify the mental health status of college youth, determine internet addiction warning levels, and quantify mental health education decision-making plans. Secondly, research on the informationization construction of the early warning and intervention mechanism for internet addiction among young students in colleges is still at the stage of information query, information collection, information statistics and other information services and management, lacking integration with new generation information technologies such as artificial intelligence and big data, and the level of intelligence is not high. Thirdly, there is no method based on the level of internet addiction among college youth to construct a warning and intervention mechanism, which cannot scientifically and reasonably

provide dynamic, precise, and efficient mental health education and counseling services for college youth, leading to the emergence of internet addiction and social problems among college youth, and increasing the difficulty of campus supervision.

In response to the above issues, we develop an improved AGNES clustering algorithm based on early warning and intervention mechanism for college youth internet addiction. Combined with the background of "AI+", we provide decision support for the construction of early warning and intervention mechanisms and evaluation systems for college youth internet addiction, focusing on improving the efficiency of psychological problem supervision and guidance for college youth, and providing comprehensive guarantees for the construction of a stable and orderly campus environment. The key technologies involved in this mechanism include the following aspects: firstly, using the improved AGNES algorithm to construct an artificial intelligence warning clustering algorithm; secondly, constructing a student internet addiction intervention mechanism for student warning clustering.

II. CLUSTERING OF STUDENT WARNING LEVELS BASED ON IMPROVED INTELLIGENT AGNES ALGORITHM

Due to subjective factors and external objective environment, college youth tend to develop a certain degree of internet dependence in their daily learning and life. Especially in the era when the Internet is highly developed and mobile intelligent devices are frequently updated, college youth use mobile intelligent devices to access the Internet frequently, and the probability of being affected by bad information on the Internet is great. Due to the hidden nature of internet addiction, if timely warning and intervention are not taken, it may have adverse effects on the physical and mental health of college youth. To address this issue, it is necessary to construct executable and interpretable methods for classifying and warning students' internet addiction levels. To achieve this goal through scientific and rational means, it is necessary to establish rigorous mathematical methods. In artificial intelligence algorithms, the AGNES algorithm can effectively cluster research objects, calculate closeness for research objects with quantitative labels, and classify objects with high closeness into one category. Therefore, we choose the AGNES clustering algorithm to classify the warning levels of college youth.

2.1 Establishing labels for students' online behavior

In the research domain, we take students from a single class in our college as the research object. Firstly, we collect characteristic labels from students in the class and establish interpretable labels for their online behaviors. The clustering results are divided into three groups:

- Group A: High warning;
- Group B: Sub-high warning;
- Group C: Low warning;
- Group D: No warning.

We use the Chaoxing Learning Platform to establish student behavior labels and design rating ranges for the labels for students to use for self-evaluation and grading. Students can self rate each question when receiving the questionnaire survey. Student self-evaluation is a key basis for constructing quantitative labels of students' online behaviors. The constructed labels meet certain requirements, firstly matching students' online habits, content, and themes, and conforming to the daily behavioral norms of college students. The second is to present interpretable label content and forms to teachers and students, which can enable them to quickly understand and accept, in line with their cognition. We use visual and easy-to-understand language to express problems when designing labels and quantification intervals. Thirdly, the constructed behavior labels have clear differentiation and can cover all students' online behaviors, facilitating comprehensive data collection. Table 1 shows an example of the student online behavior labels we have established.

Table 1. An example of the student online behavior labels we have established

Please conduct a self-assessment of the following questions
A. How long do you spend online every day? □ Less than 1 hour □ 1-3 hours □ 4-6 hours □ More than 6 hours
B. How many websites will you browse online? □ Less than 5 □ 6-10 □ More than 10
C. How many times do you shop online within a month? □ Less than 5 times □ 6-10 times □ More than 10 times
D. How many types of online games have you played? □ Less than 3 types □ 4-8 types □ More than 8 types
E. ……

2.2 Building improved AGNES algorithm to achieve student clustering

We analyze the internal mechanism of integrating the AGNES clustering algorithm with the warning levels of students' online behaviors, and construct an improved AGNES clustering algorithm that is easy for teachers and students to accept, achieving clustering of students' online behaviors. We divide students into: Group A: high warning; B: Sub-high warning; Group C: Low warning; Group D: No warning, totally four warning levels. Based on the student online behavior labels and label quantification results in Table 1, we cluster the students in the class and construct the improved AGNES clustering algorithm as follows. The construction process of the model is entirely completed in visual tools such as Excel and SPSS, with teachers and students fully involved in the model designing, data collecting, and modeling process. The algorithm has strong interpretability and is easy for teachers and students to understand. Using the interpretable AGNES clustering algorithm, students are grouped into warning levels for online behaviors, accurately obtaining their online behavior tendencies. This process is the goal of building an online behavior mining model. Teachers obtain the degree of online behavior warning for students by analyzing mining results, knowledge of online behavior tendencies, and grouping students into warning groups. The student warning levels output by the interpretable AGNES clustering model has obvious characteristics of online behavior groups, and each group is relatively independent in terms of online behavior tendencies, with different levels of warning.

Algorithm: The improved AGNES clustering algorithm for student internet addiction warning

Step 1: Place students in the same dataset and store each student's internet behavior feature vector.

Step 2: Build the AGNES clustering objective function. Construct a feature vector closeness model for students' online behavior using Euclidean distance, and calculate the feature vector closeness between student $S_{(i)}$ and student $S_{(j)}$. Based on the total number of students *n*, the closeness function value volume is obtained as C(n, n).

Step 3: Select *m* values with the lowest closeness level from the closeness volume C(n, n), and determine *k* students $S_{(i)}$ with the highest dispersion from them. Each student corresponds to a type of online behavior.

Step 4: Cluster the remaining *n-k* students. Calculate the closeness between any student $S_{(i)}$ and *k* center point students, select the cluster corresponding to the center point with the highest closeness, and include student $S_{(i)}$ in the cluster.

Step 5: Repeat the above steps until all *n-k* students are included in *k* clusters, and the algorithm ends.

2.3 Construction of Intervention Mechanism for Student Internet Addiction

By constructing warning clustering algorithm, teachers can obtain different warning levels for student groups and statistically obtain a distribution model of online behavior warning levels for students in each class. Based on the clustering statistical results, different types of students' online behavior interventions can be implemented. Based on the level of online warning for students and the class distribution model, establish intervention mechanisms for different warning levels from multiple aspects such as online science popularization, internet addiction prevention, harm response, precise monitoring, and point-to-point assistance, and design specific plan schemes. According to the arrangement of student management work and the operation cycle of the online behavior intervention mechanism, the intervention mechanism and plan will be dynamically adjusted based on changes in students' online behaviors. That is, students distributed in groups A, B, C and D are not fixed, and the grouping results will change in warning categories during resampling and model screening with possible changes in online behavior habits. Teachers should determine the cycle of resampling and model screening based on the specific situation of the college, in order to dynamically monitor the degree of early warning of students' online behaviors and adjust the intervention mechanism dynamically. Figure 1 shows the basic architecture of the student internet addiction intervention mechanism based on the warning clustering algorithm.

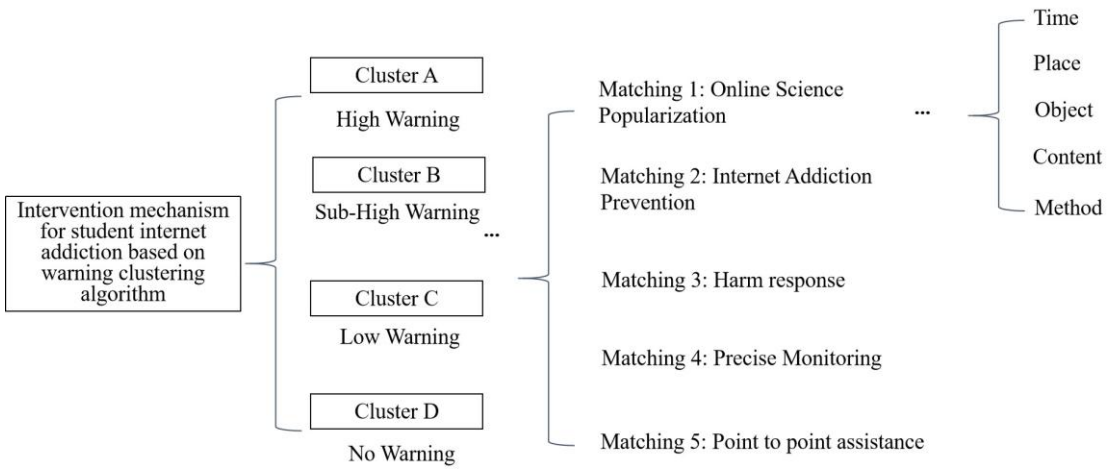


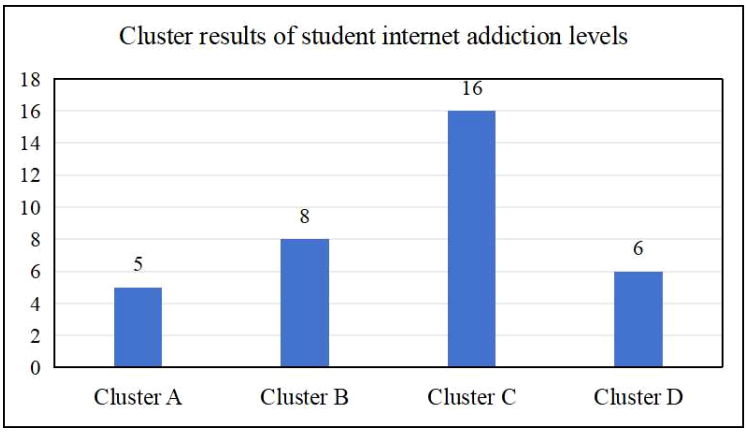
Figure 1. The basic architecture of the student internet addiction intervention mechanism based on the warning clustering algorithm

III. EXPERIMENT AND ANALYSIS

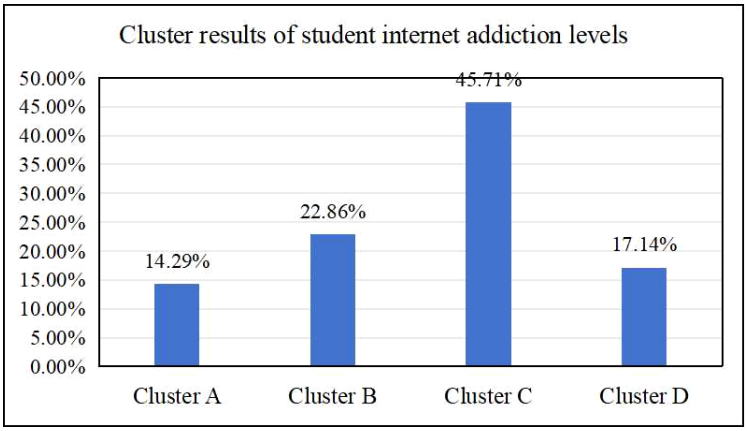
Using the constructed model, we select a teaching class for experimental analysis. Firstly, a questionnaire survey is developed as shown in Table 1, and label data is collected from 35 students in the class to obtain the online behavior labels of each student. Then, the labels are normalized to constrain the quantitative values of each label within the range of (0,1). Using the constructed AGNES clustering algorithm to calculate the closeness of labels and achieve class student clustering. Table 2 shows the labels selected by one student in the class, and the quantified values of the first four online behavior labels are determined as A-0.2; B-0.5; C-0.5; D-0.6. After collecting data from 35 students in the class, the improved AGNES clustering is performed to obtain the clustering results shown in Figure 2. Figure 2 (a) shows the experimentally calculated student internet addiction clusters and the number of students in each cluster. Figure 2 (b) shows the experimentally calculated student internet addiction clusters and the proportion of students in each cluster.

Table 2. The labels selected by one student in the class

Please conduct a self-assessment of the following questions
A. How long do you spend online every day?
□ Less than 1 hour ☑ 1-3 hours □ 4-6 hours □ More than 6 hours
B. How many websites will you browse online?
☑ Less than 5 □ 6-10 □ More than 10
C. How many times do you shop online within a month?
☑ Less than 5 times □ 6-10 times □ More than 10 times
D. How many types of online games have you played?
□ Less than 3 types ☑ 4-8 types □ More than 8 types
E. ……



(a)



(b)

Figure 2. Clustering results of internet addiction levels among students in the experimental class

According to the analysis of the experimental data, there are five students in the experimental class who belong to the "high warning" category, accounting for 14.29% of the total number of students. Teachers should attach great importance to these students and further understand their situation in detail. Effective measures should be taken to guide students to reduce their mobile phone usage and internet frequency, and avoid situations that affect their physical and mental health. Eight students in the experimental class are classified as "sub-high warning", accounting for 22.86% of the total number of students, indicating a high level of warning but not reaching the high level of warning. For such students, teachers should attach importance to them, further understand their situation, take appropriate and effective measures to guide them correctly, moderately reduce the frequency of mobile phone use and internet access, and avoid these students from developing into high warning categories. Sixteen students in the experimental class are classified as “low warning”, accounting for 45.71% of the total number of students. For such students, teachers need to pay close attention at all times and take measures to track and observe their situation, in order to avoid them developing into high warning or general warning categories. Six students in the experimental class are classified as “no warning”, accounting for 17.14% of the total number of students. For such students, teachers need to regularly understand the situation to avoid them developing into categories with warning risks.

For students with warning risks, teachers can usually intervene in their internet addiction behavior by using effective measures such as internet knowledge popularization, internet addiction prevention lectures, harm response measures explanations, precise point-to-point monitoring, and one-on-one targeted assistance. They can promptly correct problematic students, guide them to reduce their mobile phone usage and internet frequency, change their wrong internet habits, develop good study habits and internet habits, and ensure their physical and mental health development.

IV. CONCLUSION

This work focuses on the research background and current status of internet addiction and early warning among young college students. It analyzes the practical problems of internet addiction early warning intervention and proposes a solution to the problem, which is to construct a model that uses artificial intelligence methods to cluster and intervene in the degree of student internet addiction early warning. We firstly chose the AGNES clustering algorithm in artificial intelligence methods to classify students for internet addiction warning, establish the labels for students' online behaviors, and quantify them. By calculating the closeness level of students' online behavior labels, students are classified as Group A: High warning; Group B: Sub-high warning; Group C: Low warning; Group D: No warning, totally four warning levels. On the basis of clustering students, we construct a student internet addiction intervention mechanism, which provides assistance to students with varying degrees of internet addiction from multiple aspects such as online science popularization, internet addiction prevention, harm response, precise monitoring, and point-to-point assistance, in order to avoid serious physical and mental health problems. Through experiments, we collect data from students in the experimental class, use the constructed algorithm to cluster the warning levels of students in the class, and analyze the clustering results. The experiment demonstrates that the constructed algorithm can effectively cluster the level of internet addiction warning among class students. Teachers can correct students with warning levels through scientific and reasonable means, ensuring their physical and mental health development.

Conflict of interest

There is no conflict to disclose.

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