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Application and challenge of artificial intelligence face recognition technology in adolescent mental health assessment

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Abstract: In recent years, with the rapid development of society, teenagers' mental health problems are becoming more and more serious. How to find teenagers' mental problems in time and intervene in time treatment has become a big social problem. As an emerging technology, artificial intelligence provides a solution to this problem, and the psychological evaluation system based on artificial intelligence technology has been developed to a certain extent. This paper reviews the feasibility and necessity of applying artificial intelligence technology to psychological assessment system, and discusses the existing problems of several mainstream psychological assessment systems combined with artificial intelligence and why they cannot be applied on a large scale. At the same time, this paper explains the feasibility and advantages of the psychological evaluation system based on expression recognition technology, and explains how to implement and optimize it.

Keywords: Artificial intelligence; Adolescents; Mental health; Expression recognition.

1. Introduction

"A country is strong when young people are strong, and a country is wise when young people are wise". As the future of the country, the healthy growth of young people is extremely important. With the development of the country, the growth environment of young people has made great progress in all aspects. However, with the increasing attention of social families to children's learning, the mental health problems of adolescents are becoming more and more prominent, although the education department has realized the seriousness of the problem in recent years, and has taken certain measures, but it has not been able to fundamentally solve this problem, how to make every adolescent physical and mental health growth is a long way to go.

With the development of education in China, the important period of youth growth is basically in the student stage, a lot of time is in school learning, and school has become an indispensable and important place for young people to learn and live, and it is necessary for schools to also have the responsibility to make a difference in the field of adolescent mental health.

Adolescents' mental health should cause people to attach great importance to, in recent years, depression has become the most important mental illness of adolescents. The Blue Book of China's Mental Health in 2023 released a set of startling statistics: The depression detection rate among high school students and junior high school students is as high as 40 percent and 30 percent respectively. According to the 2022 Youth Mental Health Survey Report by the Institute of Psychology of the Chinese Academy of Sciences, 14.8 percent of adolescents are at risk of depression, of which 4.0 percent belong to the risk group of severe depression and 10.8 percent belong to the risk group of mild depression. The frightening figures have not only caused people to wonder what causes the high incidence of depression, but also how to reduce it.

At present, the discovery of depression is generally parents or teachers found that the child is abnormal before sending to the hospital, and even parents are afraid of affecting the child's school even if they find abnormalities do not go to treatment, wait until the symptoms are very serious and then go to treatment has missed the best treatment opportunity. The early screening of depression is very important, and the school will also identify it through questionnaires and other ways, but this way still has many shortcomings and cannot achieve the expected purpose in many aspects. Therefore, there is still a long way to go to identify patients with depression.

So, how should we solve this problem, and make it reasonable and effective to be applied in real life? Perhaps the emerging technology of artificial intelligence will give us the answer.

As a new technology, artificial intelligence has received enough attention and has achieved certain development and achievements, and has been preliminarily applied in psychological aspects. These techniques use speech recognition and detection to identify depressed patients. In China, a mental health assessment system [1] based on speech recognition and natural language processing, jointly developed by CKOJI and related research institutions, can automatically assess the emotional state of adolescents and provide appropriate psychological intervention and support for those who need it. Overseas, Cogito, a Silicon Valley-based company, has developed a mental health service app called "Cogito Companion" for teenagers. The app uses AI technology to analyze data such as students' voice, intonation and emotional state to detect mental health problems early and provide appropriate intervention and support [2] for those who need it. The above technology illustrates the feasibility of combining artificial intelligence in the field of mental health. However, these technologies still have many shortcomings. Due to the limited number of voice acquisition devices, they mostly rely on other devices (such as mobile phones), or they are installed with other devices. However, many schools are not willing to spend extra budget to install additional devices, and students are not allowed to bring

mobile phones to school, so the application space of this technology is greatly reduced. At the same time, speech recognition may compromise the privacy of the people being tested, so not everyone is willing to participate in the technology, which further reduces the scope of application. Therefore, the combination of artificial intelligence speech recognition technology and mental health field still has some limitations. Therefore, we should find another reasonable way to effectively integrate with the field of mental health.

By definition, artificial intelligence is a very broad science, including robotics, speech recognition, image recognition, natural language processing, expert systems, machine learning, computer vision, etc. The subdivision of image recognition technology, face recognition, has been able to accurately identify human expressions (mentioned below).

Studies have shown that one of the most distinctive features of people with depression is their facial expressions, which are often expressed as[3] sadness or disgust. Based on this feature, we can be more accurate to identify depressed patients. At present, this technique has been studied to some extent. Based on this technology, a mental health monitoring and evaluation system has been initially established (discussed below). However, there are still problems with the technology. This paper aims to discuss how to combine artificial intelligence face recognition technology with mental health assessment, and make the implementation of this technology more reliable, and minimize the impact on the daily life of the tested subjects. It is hoped that in the future, this technology can be widely used and actually change the high rate of depression in teenagers.

2. Overview of artificial intelligence technology and the application framework of artificial intelligence in mental health assessment

2.1. Overview of artificial intelligence technology

With the continuous development of artificial intelligence technology in recent years, face recognition technology has also been continuously improved, and the subfield of expression recognition has also been fully studied. According to "Emotional data acquisition Analysis and psychological early warning System based on 3D face data and artificial intelligence algorithm"[4], through Kinect V2 to achieve human face positioning, tracking and data acquisition, even in dim environment, can accurately detect the face of the object. (At the same time, as a new generation of motion-sensing equipment, Kinect V2 still has a certain development space, can support the subsequent technical upgrades.) Then, through technical means, BP neural network is used for expression recognition training until the target result is achieved. The model trained in this way can recognize the characteristic expressions of depression patients more than 70%. Meanwhile, Kinect V2 can be analyzed in the background, and up to six people can be analyzed at the same time, which further enhances its reliability. According to "Multi-scale Residual Attention Network and its Expression Recognition Algorithm"[5], the CBAM attention mechanism is introduced to obtain key feature information of expression images, which is conducive to improving the recognition of blocked expressions, and the recognition accuracy is improved by adding various means. According to the experimental results, the recognition degree of specific expressions is more than 95%.

The above technology is the core of the application of artificial intelligence face recognition technology to mental health assessment. Through this technology, the characteristic expressions of depressed patients can be accurately identified. Next, I will explain how to apply this technology to campus life reasonably. The following shows the overall framework.

2.2. The application framework of artificial intelligence in mental health assessment

The application of this technology is mainly divided into the following parts: the construction of face recognition and expression recognition model, the selection of hardware facilities, the selection of detection sites and detection methods, the summary and analysis of background detection results, and further optimization.

2.2.1. The construction of face recognition expression recognition model

As mentioned above, the model has been relatively mature, there are many open models on the network, you can through the selection and optimization of the model, train a better model to be applied to expression recognition. You can also design and train the model according to your own ideas to achieve higher recognition accuracy. As mentioned above, this technique is the core of the psychological evaluation system and should be treated with caution.

2.2.2. The selection of hardware facilities

After the model is trained, the appropriate hardware facilities should be selected to carry the model. As mentioned earlier, one of the main problems with the two speech-recognition health systems is the hardware. The hardware should have the following characteristics: 1. High precision. It can accurately scan the face of the detected object and feed back to the background, giving the recognition model a good recognition object, in order to ensure the success rate of recognition. 2. Light and easy to install. As mentioned above, the psychological evaluation system should not occupy too much time of the tested object, so as not to interfere with its normal life, therefore, the hardware facility is best combined with the existing facilities, and the tested object completes the daily activities at the same time to complete the detection. Therefore, the hardware facilities should be light and easy to install 3, reasonable price. The high cost will make the government and school prohibitive, thus hindering the promotion of the system, so the price of the hardware facilities should be reasonable and acceptable to the government and school. 3. Separate storage. The selected hardware facility should be able to store the identification data separately (in the case of non-networking), and then feed the data back to the background, in order to protect the privacy of the tested object.

2.2.3. The detection location and detection method should be selected

As mentioned above, one of the main problems in the application of artificial intelligence technology in the field of mental health is that it cannot achieve large-scale detection, that is, it cannot detect all the objects that need to be detected. Therefore, it is important to choose a location where all the objects can be detected. At the same time, as mentioned above, it is best to complete the detection of students at the same time of their daily activities, so as not to interfere with their daily life. Therefore, the test should be carried out at a place where

each student will arrive every day. Next, I will give my suggestion: the school has a unique advantage, in order to ensure the safety of students, almost all the schools will install the clock machine at the school gate or at the dormitory gate, every student will clock in the clock machine every day, which gives us the opportunity to check every student. Taking the cD-punching machine as a daily detection place and installing hardware facilities on the CD-punching machine, each student's facial expression can be well detected. At the same time, there are two significant advantages to installing the hardware on the card punch machine. 1, the card punching machine has each student's personal information, so that the hardware facilities can perfectly match the detection data with the detected object at the same time, to prevent the data pairing error caused by the analysis error. At the same time, the detection facility is separated from the data storage facility, which can ensure the privacy and security of the tested object to a certain extent. 2. When punching in, students appear one by one, and there will be no situation of insufficient system computing power due to multiple targets being detected at the same time, which leads to unstable detection.

2.2.4. Data collection and analysis

The detected data will be collected, summarized to the background and analyzed, so as to achieve the purpose of identifying patients with depression. It should not be based on one or three days of data analysis and direct conclusions, in case there are special circumstances that will cause the detection to fail. A suitable data analysis model should be established and a certain target value should be set. Only when the target reaches the target value will the early warning be triggered, so as to ensure the reliability of identification. For example, after the results of the identified expressions are summarized, the scoring operation is carried out, and the negative emotions such as sadness and depression are added 2 points, the negative emotions such as anger that have little relationship with depression are added 1 point, and the positive emotions are subtraction 2 points. The early warning is triggered when the 5 detection exceeds 9 points, and the 10 detection exceeds 15 points. Of course, the above is only an example, the actual model should be set up according to the specific situation more accurate model. At the same time, the detection cycle of the model should not be too long, so as not to delay the best treatment time of depression, which will lead to further aggravation of depression in patients with depression.

2.2.5. The test results should be reviewed again regularly

After the technology is put into use for a certain period of time, the detection results are reviewed to check the success rate and accuracy rate of expression recognition, as well as the accuracy of the data analysis model, such data is collected, and the face recognition model and data analysis model are further optimized. This process is repeated several times until the accuracy of the model meets the expected requirements.

3. Research status at home and abroad

3.1. The shortcomings of the existing methods

According to the Construction [6] of Students' Mental Health Monitoring and Evaluation System based on Artificial Intelligence, traditional mental health monitoring and evaluation methods have great limitations and low efficiency, and artificial intelligence provides a new idea for objective and efficient mental health monitoring and evaluation. However, the large-scale application of artificial intelligence in student mental health monitoring and evaluation is still limited by many factors. Although more and more schools begin to apply artificial intelligence in the field of high-quality school running, the application of artificial intelligence technology in the mental health evaluation system is few and far between. One of the main problems is that the school mental health education infrastructure is not in place. Therefore, in the environment of large-scale construction of campus infrastructure, an important goal of combining artificial intelligence technology with mental health evaluation system is to reduce the dependence on hardware facilities as much as possible.

"New Mental Health Assessment with the aid of Artificial Intelligence"[7] provides four ways to combine artificial intelligence technology with mental health assessment system: mental health assessment based on social media data, mental health assessment based on smart device data, mental health assessment based on video game data, and mental health assessment based on wearable device data. The first two methods rely on the user's personal privacy data and have a high degree of access to personal privacy, so it is difficult to be popularized. The third method relies on game data, but not everyone is a game player, and teenagers have a short time to access electronic devices, data acquisition is unstable, and they are susceptible to extreme values, so it is difficult to popularize. The fourth method relies on hardware facilities, which have high requirements and are not in line with the current school situation (mentioned above), so it is difficult to achieve.

Although the speech recognition technology has been relatively perfect (mentioned above), its heavy reliance on hardware facilities leads to its large-scale application in the campus status quo, and there are also user privacy issues. Therefore, until the relevant infrastructure is built on a large scale and the privacy issues are solved, it is not realistic to build a mental health assessment system through this technology.

3.2. A viable plan for the future

So, a different approach is needed to realize the combination of artificial intelligence and psychological assessment system. Therefore, the way to combine facial recognition with mental health assessment came into being.

This approach has been proposed [6], but little research has been done. It relies on artificial intelligence (AI) facial recognition technology, which has not yet been used in psychological assessment systems, but which is already reliable (mentioned above). Therefore, it has great potential for development.

4. Challenges and opportunities of artificial intelligence technology in mental health assessment

4.1. User privacy Issues

As mentioned earlier, the main problem with a number of AI-related psychological assessment systems is privacy. Does facial recognition technology pose the same problem? The answer is no. As mentioned earlier, the technology's hardware should store identifying information without networking, and then feed it back to the background. At the same time, student data is controlled by the university. Hardware data and school data are aggregated in the background of the school, which is controlled by the school to avoid direct communication of

information. With multiple safeguards, the privacy issues of the tested objects will be solved.

4.2. Technical accuracy problem

As mentioned above, the core of the technology: expression recognition technology has been relatively mature, so the technical accuracy of the recognition model has a certain guarantee. In the aspect of data analysis model, the data type is relatively simple, and the time for data analysis is long (detection frequency is usually once a day), so the requirements for data analysis model are not high, and the technical accuracy of the model construction is also solved. At the same time, as mentioned above, the evaluation system should receive multiple data results review and optimization, which further guarantees the accuracy of the technology.

4.3. Potential Advantages

As an emerging technology, artificial intelligence technology has broad development prospects and fast development speed. Artificial intelligence has developed rapidly. All walks of life are faced with the key question of how to integrate and apply intelligent technology [8]. And as the research results that rely on artificial intelligence technology, the technology also has the same vitality and development prospects. With the further development of artificial intelligence, the accuracy, reliability and application range of this technology will also be further improved.

4.4. Future development

Facial expression recognition technology should not stop at the psychological evaluation system, according to the Review [9] of Research on User micro-expression information Representation, metaverse, privacy issues and technology drivers are the future application trends of micro-expression recognition technology. Psychological assessment system may serve as a template to promote the application of facial expression recognition technology.

5. Conclusion

5.1. Technological advancement and social progress

There are many ways to apply AI to mental assessment systems: mental health assessment based on social media data, mental health assessment based on smart device data, mental health assessment based on video game data, mental health assessment based on wearable device data, and mental health assessment based on voice recognition. However, these methods are limited by hardware facilities and privacy protection, which makes it difficult to apply in campus on a large scale. However, the psychological assessment system based on facial expression recognition meets the requirements of campus psychological detection better by virtue of its superior core technology development, less dependence on hardware facilities and full protection of privacy.

The application of artificial intelligence technology in the field of mental health is a major social progress, bidding farewell to the rigid, large error, difficult to carry out large-scale traditional recognition methods, and providing mental health protection for the healthy growth of teenagers. However, many methods still have shortcomings, and the psychological evaluation system based on expression recognition still needs to be further developed. Therefore, the application of artificial intelligence technology in the field of mental health is still a long way to go. But what is certain is that we have come a long way.

5.2. Conclusion

As for our future direction, I would like to make the following suggestions:

5.2.1. About identifying models

Since the common expressions of depressed patients are distinctive, we can design more accurate models that are more consistent with psychological assessment systems based on this feature. The recognition of other expressions should be weakened, and the characteristic expressions should be emphasized in order to achieve accurate recognition.

5.2.2. Elated to artificial intelligence technology

As mentioned earlier, AI technology is developing rapidly, keeping an eye on new technologies and further optimizing models to improve detection accuracy.

5.2.3. Related to depression judgment

Pay attention to the new development related to depression, pay attention to whether there are new characteristics that can be judged, and add these characteristics into the recognition model to further improve the accuracy of recognition.

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