





Applying Distributed Artificial Intelligence Virtual Assistants and Ensuring Secure Privacy in Psychoeducation

Weiran Wang¹ and Liyan Zhang^{2*}

^{1,2} Institute of Media, Yanching Institute of Technology, Hebei, China
wr_wang@outlook.com, zhangliyan@yit.edu.cn

Corresponding author: Liyan Zhang, zhangliyan@yit.edu.cn

Abstract. Intelligent mental health assessment can make up for the shortcomings of traditional methods, reduce the rate of missed diagnosis, and improve the efficiency of diagnosis, which is of great significance for the census and early warning of mental health problems. At present, intelligent mental health assessment is in the preliminary development stage. Researchers conduct mainly data-driven exploration and research based on online behavior data and portable device data, aiming to achieve higher prediction accuracy. However, the interpretability of assessment results and other indicators still needs to be improved. Artificial intelligence and psychoeducation are integrated and innovated from the value demands of college pupils' personalized growth and diversified development. With the surge of artificial intelligence, psychology educators should also actively respond to the arrival of new technologies and deeply understand the reshaping of educational forms such as educational outlook, teaching outlook, and learning outlook by the new generation of scientific and technological revolutions, as well as the great opportunities and challenges brought to psychoeducation. The following intelligent optimization and innovation modules are designed around the main application scenarios to optimize the teaching team, digitize the teaching process, and intelligentize the learning process. Conduct psychology practice teaching with individuality, accuracy, interactivity, and vividness, and provide concrete solutions. Promote the all-around reform of the essential connotation, basic characteristics, and implementation steps of the teaching mode of psychology courses to cultivate new people of the times with firm faith, both ability and political integrity, national self-confidence, self-esteem, and pride.

Keywords: distributed artificial intelligence; secure privacy; Education and tuition; Virtual Assistants.

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1 INTRODUCTION

In recent years, the ways and means of IPE have been continuously innovated and explored in system construction, promoting its sublimation and development from experience summary to application innovation[21]. The principles and laws of innovation of IPE are essential to the compliance of its innovation and development[16]. Generally speaking, the innovation of IPE ways should follow the law of IPE, the law of social development, and the law of people's ideological and moral development, adhere to the principle of pertinence, stress the principle of effectiveness, give play to the principle of initiative, grasp the principle of practicality, and develop towards scientific, modern, artistic, and systematic development[13]. Unlike mathematics, physics, and chemistry or specialized courses, the IPE has neither a mathematical formula nor an operational experiment, and intangible and formless thoughts are transmitted between giving and receiving[14]. The level of pupils' acceptance and mastery of this knowledge largely depends on the level of teachers' tuition[10]. AI and IPE are integrated and innovated from the value demands of university pupils' individualized growth and diversified development [6]. The following intelligent optimization and innovation modules are designed around the main application scenarios to carry out personalized, accurate, interactive, and vivid psychology practice tuition through the optimization of teachers, digitization of the tuition process, and intelligence of the learning process and provide concrete solutions[1]. The theory of deep integration of AI and IPEs is developed based on computer-assisted instruction theory[12]. Given the advantages of AI, this article adopts the appraisal method of BPNN in AI to reduce the execution cost of the arithmetic. The practice has proved that this combination can reduce error accuracy and improve the quality and efficiency of research and application optimization in IPE.

The development of emerging information skills pushes human society into a new era and space, profoundly affects people's way of thinking in study, life, and work, and also changes the way of tuition, from a single traditional tuition mode to a multi-dimensional, diverse, mixed, and complex pattern of tuition and learning[19]. The innovation of IPE under the background of AI requires a correct view of the relationship between the whole and part, change and unchanged, subject and carrier in AI and IPE[7]. AI-powered virtual assistants can adapt to individual needs and preferences. They can provide personalized recommendations, resources, and interventions based on the user's specific mental health concerns, making the learning experience more relevant and engaging. This article establishes a feature reconstruction model of research and application optimization design in IPE tuition. AI systematically constructs the IPE tuition, and the appraisal of tuition quality is optimized by using BPNN to select functions. Its innovation lies in:

This article adopts the appraisal method of BPNN in AI to reduce the execution cost of the arithmetic.

This article studies the research and application optimization design in Psychoeducational tuition. The structure is as follows:

The first section is the introduction. This part mainly expounds on the background and significance of research and application optimization in psychoeducation tuition and puts forward this article's research purpose, method, and innovation. The second section summarizes the relevant literature, the advantages and disadvantages, and puts forward the research ideas of this article. The third section is the way part, which focuses on the research and application optimization design way in the IPE tuition combined with AI. The fourth section is the experimental analysis. In this part, experimental verification is carried out on the data set to analyze the model's performance. Section V: Conclusions and Prospects This part mainly reviews the main contents and results of the study, summarizes the research conclusions, and points out the direction of further research.

2 RELATED WORK

With the surge of AI, IPE should also actively respond to the arrival of new technologies[15].

Bai et al. The era of big data has put higher requirements for IPE educators of university pupils, which is a lasting revolution[4]. Wang et al. analyzed the connotation of IPE from the perspective of the new era. They thought that IPE is a comprehensive educational concept that regards moral education as the primary task of education, a systematic project, a new measure, a new reform, and a new direction of talent cultivation and IPE in the new era[20]. Allen Becky et al. Think that curriculum IPE bears a kind of educational responsibility, shows a new way of education and tuition, and should be implemented as an educational system. It is an educational and tuition way based on all-round reform, incorporating knowledge, consciousness, quality, personality, and other guiding psychology elements to promote pupils' complete improvement in moral education and scientific knowledge[2]. JLM et al. analyzed from the curriculum perspective and thought that we should take the joint efforts of curriculum as the axis and the creation of the environment as the radius, constantly expand the radiation area of IPE and enhance its effectiveness [11]. Duong et al. analyzed from the perspective of the geography specialty and thought that the lag in the construction of national conditions education, aesthetic value, rule of law education, integrating theory with practice, etc., was the main problem of curriculum psychology construction[5]. Liu et al. analyzed from the perspective of the inherent regulations of curriculum IPE and thought that knowledge imparting [18]. Gao et al. Put forward the "Internet plus" judging from the Internet perspective to promote the curriculum's IPE. The technical foundation is based on the general Internet platform, and the emphasis is on the educational content [8]. Liu et al. think that the socialist core values should be taken as a significant breakthrough, and the construction path and institutional mechanisms should be discussed using cultural enlightenment, classroom enlightenment, teacher demonstration, and practical learning [17].

3 METHODOLOGY

3.1 Using Artificial Intelligence to Construct the Teaching System of Psychoeducation

Focus on solving the problems of intelligence and value discovery of various elements so that AI can genuinely empower educators, educational objects, resource supply, educational process, tuition appraisal, and management services of IPE, and develop intelligent optimization and innovation platforms in different scenarios [9]. The overall application framework is shown in Figure 1.

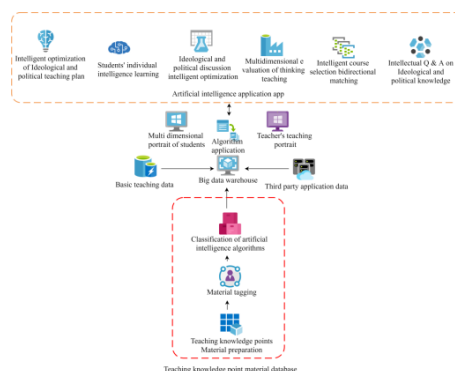


Figure 1: Application framework of AI in college psychoeducation.

The core ideas for the above application framework include: (1) constructing the material database of IPE and tuition knowledge. Generally, it consists of three steps. (2) Build and improve the big data warehouse. The primary tuition data and the data of third-party applications needed by subsequent AI applications will be integrated into the big data warehouse, which will provide the cornerstone of data analysis and arithmetic calculation for more subsequent AI applications. (3) Develop intelligent optimization and innovation modules in different scenarios. Promote the integration of AI and IPE from value discussion to practical application. Aiming at the application scenarios of teachers' lesson preparation, intelligent learning, thought discussion, quality appraisal, etc., the arithmetic application engine provides different arithmetic models to support users' use, and all kinds of usage information data of users will also enter the big data warehouse in reverse and participate in the subsequent arithmetic application.

DM (data mining) emerges as the times require. It can not only mine adequate information from massive data [3]. The core value of big data lies in using the logical process of data itself to reveal laws, judge trends, and provide solutions to realize value. Accelerating the implantation of big data in personnel training and building a big data tuition platform for work is not only the necessity of responding to the big data revolution but also the need to explore the self-development path of work's collaborative education. The Big data tuition platform is supported by a pupil information database, a user portrait system, and an intelligent appraisal and feedback system embodying the operation logic and management ideas of data collection and verification, arithmetic modeling, content supply, and learning feedback. Big data builds a collaborative education platform for work with multiple functions, including real-time regulation, information sharing, and human-computer interaction, which promotes precise tuition and information management and optimizes, expands, and upgrades the intelligent service function of work, as shown in Figure 2.

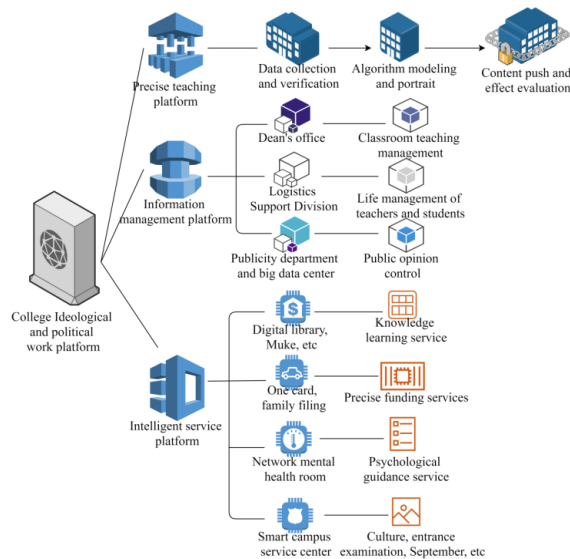


Figure 2: Big data application college psychology work platform.

In the era of big data, universities should tilt their work services in the direction of intelligence, informatization, and networking to meet the diversified service needs of pupil groups accurately, timely, and comprehensively. Extensive data analysis can timely and genuinely reflect people's spiritual needs. According to the differences in the needs of work objects, it is an inevitable requirement for universities to cooperate with other subjects and resources to upgrade the service

content of collaborative Psychology education. Colleges and universities should deepen their awareness of building an intelligent service platform for work and provide work services through multi-channel communication, multi-platform display, and multiple forms to enhance pupils' sense of gain.

3.2 Optimization Design of Psychology Teaching Evaluation Based on BP Neural Network

Preparing and selecting materials for the psychology tuition plan is time-consuming and troublesome. The intelligent optimization module based on AI can provide teachers with several smart choices, such as (1) popular recommendations. In the past, all pupils made popular choices in personalized learning. Of course, there are also multi-dimensional options, such as time selection (popular in the past year) and grade selection. (2) Recommendation of the current class. Combined with the current class's professional background and past learning records, more suitable material content is screened, and the collaborative filtering arithmetic of AI recommends the matching knowledge point materials.

Teaching appraisal needs to be guided by values, which will have a corresponding impact on the relevant theory and practice of tuition appraisal. To give full play to the function of education appraisal, it is necessary to establish the correct value concept of tuition quality, which will play a positive role and reflect these value factors through talent, quality, and education concepts. There are different distinctions between philosophical values: dialectical materialist, objectivist, and subjective. In analytic materialist values, it is believed that the value can be displayed through the unique effect of the object on the subject, and the subject and the object can be unified to a certain extent. The value can be displayed only when the subjective needs and the objective things show a sure consistency. The appraisal of education covers various value issues, which are more complex than other aspects of assessment.

The learning process of BP arithmetic is that two parts are repeated, and the weights of each layer are adjusted. The network's learning and training process constantly changes each layer's weight. Cycle these two parts until the error in network output is within an acceptable range or the number of cycles reaches the upper limit. The error E between the network output and the expected output is as follows:

$$E = \frac{1}{2}(d - o)^2 = \frac{1}{2}\sum_{k=1}^1(d_k - o_k)^2 \quad (1)$$

The formula of error E in the hidden layer is as follows:

$$E = \frac{1}{2}\sum_{k=1}^1[d_k - f(\sum_{j=0}^m w_{jk}y_j)]^2 \quad (2)$$

The error E is expanded to the output layer as follows:

$$E = \frac{1}{2}\sum_{k=1}^1\{d_k - f[\sum_{j=0}^m w_{jk}f(\sum_{i=0}^n v_{ij}x_i)]\}^2 \quad (3)$$

Using the gradient descent way, the weights are continuously adjusted as follows.

$$\Delta w_{jk} = -\eta \frac{\partial E}{\partial w_{jk}} \quad j = 0, 1, \dots, m; k = 1, 2, \dots, l \quad (4)$$

$$\Delta v_{jk} = -\eta \frac{\partial E}{\partial v_{jk}} \quad i = 0, 1, \dots, n; j = 1, 2, \dots, m \quad (5)$$

After repeated cycles, the value adjustment function of the weight of the BP learning arithmetic is:

$$\Delta w_{jk} = \eta \delta_k^o y_j = \eta (d_k - o_k) o_k (1 - o_k) y_j \quad (6)$$

$$\Delta v_{jk} = \eta \delta_j^y x_i = \eta (\sum_{k=1}^1 \sigma_k^o w_{jk}) y_j (1 - y_j) x_i \quad (7)$$

The normalization formula of input data is as follows:

$$P = \frac{I - I_{min}}{I_{min_{max}}} \quad (8)$$

The arithmetic programming steps of the BPNN of the pupil appraisal subsystem are as follows:

1. Initialize

The weight matrix of the input layer node and the hidden layer node is V , and the weight matrix of the remote layer node and the output layer node is W . Random initial values are respectively assigned to the two weight matrices; p is the iterative sample pattern counter, which is set to 1, q is the training number counter, which is set to 1, E is the error, which is set to 0, η is the learning rate, which is set to 0.001, and E_{min} is the accuracy achieved after network training, which is set to a positive decimal.

2. Input training samples

The vector X , d is assigned with the current sample X_p, d_p .

3. Calculate network output error

The number of training samples is P , and the BP network has different errors E_p for different samples. The total error of the network can be represented by the largest E_{max} or the root mean square $E_{rms} = \sqrt{\frac{1}{p} \sum_{p=1}^p E_p^2}$ of the error. This article uses the mean square as the total error E .

4. Calculate the error signal of each layer

Calculate δ_k^o, δ_j^y using equation (9) and equation (10)

$$\delta_k^o = (d_k - o_k) o_k (1 - o_k) \quad (9)$$

$$\delta_j^y = [\sum_{k=1}^1 (d_k - o_k) f'(net_k) w_{jk}] f'(net_j) = (\sum_{k=1}^1 \delta_k^o w_{jk}) y_j (1 - y_j) \quad (10)$$

The design of the BP artificial neural network includes many aspects, which is a comprehensive problem. The design should consider the following elements: network structure, complexity of the situation, and sample size. In the design of tuition appraisal based on BPNN, the determination of the number of network layers, the selection of the initial value, the number of neurons in each layer, the learning rate, the expected error, and the activation function of the network must be considered.

4 RESULT ANALYSIS AND DISCUSSION

In the new era, the reform and innovation of IPE should adhere to the fundamental task of "cultivating people by virtue," focus on improving talents' training ability, complying with the combination of integrity and innovation, simplification and expansion, and information and management, and promote path innovation based on scientific understanding of pupils' growth needs, such as exploring innovation-driven growth points from the dimensions of digital drive, network drive, and intelligent drive, and striving to achieve the integration and development between tradition and modernity, virtual and reality, skill and society to realize accurate political thinking and intelligent thinking. Promote the coordinated development of IPE and IPE courses, establish a three-level linkage guarantee mechanism for the state, schools, and universities, provide

a complete organizational and institutional guarantee, and build a "great IPE" pattern from point to point.

For a long time, many institutions and scholars have carried out a lot of research work on how to track the tuition situation of teachers, how to accurately evaluate pupils' mastery and understanding of different knowledge points in the tuition process, and how to horizontally compare and evaluate the tuition effect of other teachers on the same knowledge point in the same course. Generally speaking, the primary data of this research and analysis, investigation, and statistics mainly rely on spot checks, questionnaire surveys, classroom observation by teachers or tuition supervisors, subjective grading, etc. These ways are simple, practical but also random and personal, and the statistical process is tedious and time-consuming. For the appraisal of the tuition quality of teachers, the main focus is on teachers' language expression ability, proficiency in knowledge points, ability to communicate and interact with pupils, courseware production level, and teachers' style and appearance on the platform.

In the appraisal system of IPE quality, collecting input data and information adopts how pupils' online appraisal is done. The indicators mentioned above are input into the classroom tuition quality appraisal system. Then, the educational administration department classifies the types of courses and then organizes pupils to evaluate each teacher in order. In the appraisal process, each pupil's appraisal must be conducted independently. At the same time, besides appraisal, pupils can also input their own opinions to a teacher.

After 15 training sessions, the network error meets the requirements. The error curve of the network is shown in Figure 3. Trainlm is selected as the learning arithmetic.

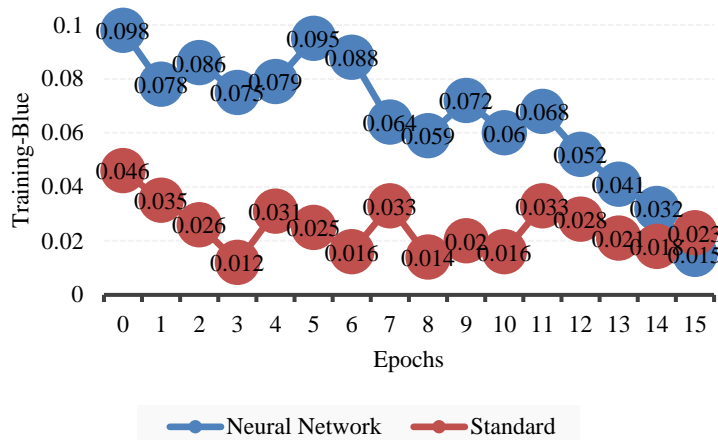


Figure 3: Training results (function: trainlm).

The advantage of this training function is that it converges quickly. Optimization by using functions is mainly for the system's validity test. The higher the coincidence degree, the better the construction effect of the system. Content validity, criterion validity, and structural validity are three types of validity. Content validity tests the content of the whole system to see if it meets the content to be examined. This subjective factor has a significant influence. Validity is whether the measured data is consistent with the standard variables or standard data prepared for implementation and is within a specific error range. Structural validity refers to whether the structure obtained by the experiment conforms to the theory and the degree of consistency between the structure and the theory. The error curve of the network at this time is shown in Figure 4.

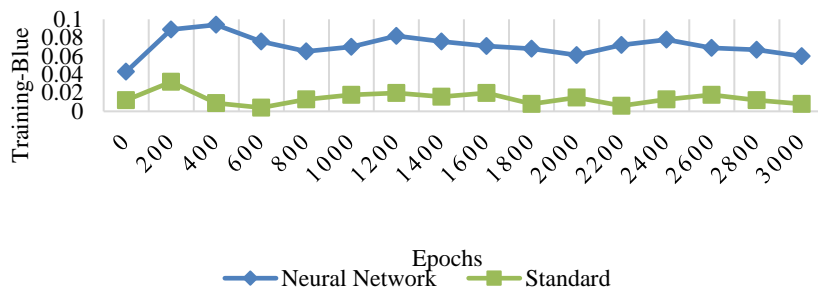


Figure 4: Training results (function: training d).

The learning arithmetic of this function is gradient-descending momentum, and the learning speed is adaptive in the training process. After 2000 training sessions, the network's error target still needs to be met, and the training curve of the network is shown in Figure 5.

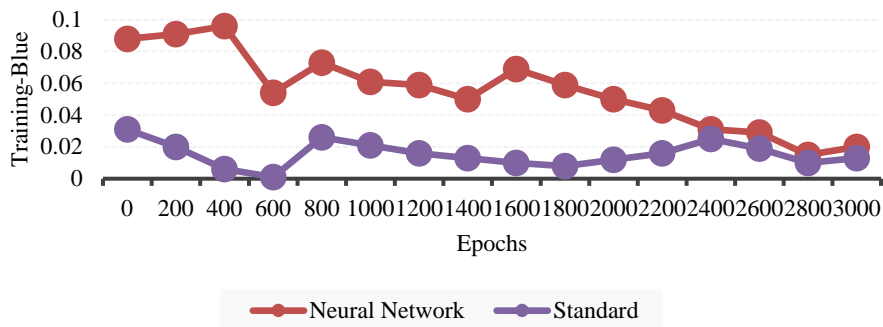


Figure 5: Training results (function: training dx).

BPNN is a multi-layer feedforward network. The basic principle used for a comprehensive appraisal is to take the information used to describe the characteristics of the appraisal object as the input vector of the neural network, take the value representing the corresponding comprehensive appraisal as the output of the neural network, and then train the network with enough samples so that different input vectors can get different output values. The trained neural network can be used as an effective tool, combining qualitative and quantitative methods to appraise the object system outside the sample mode comprehensively. The tuition content of the school is relatively large, and the scope of work involved is also broad. It takes work to make a reasonable appraisal of the teachers. Therefore, the assessment should stick to the core link. In real life, because the quality of tuition involves many factors, its appraisal results are often relatively comprehensive. Generally, tuition appraisal is to put forward an overall appraisal index for a particular appraisal object, divide the general appraisal index into multiple first-level appraisal indexes, and then subdivide the first-level appraisal indexes into second-level appraisal indexes.

According to the above steps, the system conducts simulation training experiments in the MATLAB neural network toolbox, and the appraisal results after network training and those of experts are shown in Figure 6.

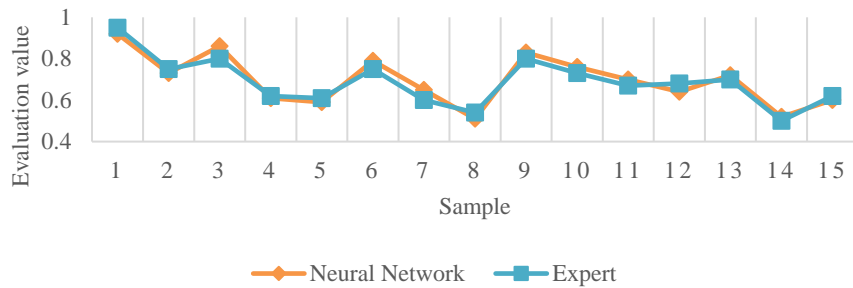


Figure 6: Comparison between expert appraisal results and neural network appraisal results.

Classroom tuition is still the main channel for implementing education, and its quality primarily reflects and determines the quality of education. Therefore, improving the quality of classroom tuition has become the top priority. In the tuition quality appraisal, teachers' tuition work is identified or graded so that the tuition management department can better understand the tuition quality and level of teachers, which can be used as one of the essential bases for teachers' promotion, appraisal, and use. Classroom tuition includes many factors, such as tuition conditions, course difficulty, teachers' tuition, and learning effects, which interact to form a tuition network. To verify the accuracy of the appraisal results of the model, the 30 groups of test data mentioned above are input into the trained neural network. The results obtained through experimental analysis are shown in Fig. 7.

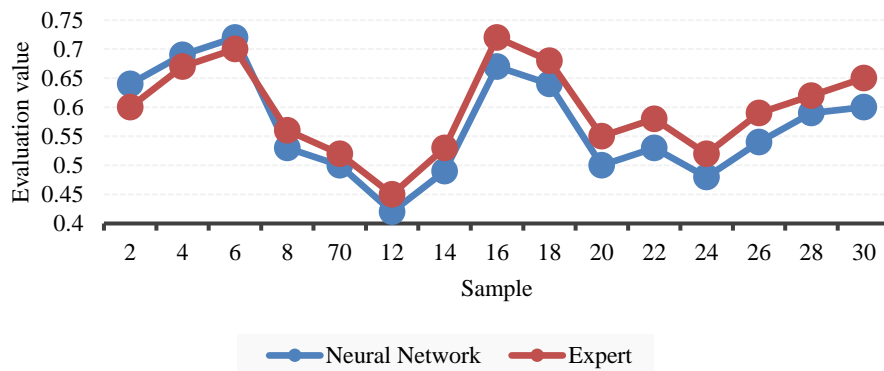


Figure 7: Comparison between simulation appraisal results and expert appraisal results.

By comparing Fig. 6 with Fig. 7, not only is the training and prediction accuracy entirely within the acceptable range, but also the error of the test sample is very close to that of the test sample.

The appraisal of tuition quality generally takes the form of manual scoring, which inevitably leads to inevitable subjectivity. In particular, teachers mainly undertake the tuition mission of cultivating and leading values, and it needs to be more comprehensive to evaluate their tuition quality with a single score. Therefore, rational scoring can be supplemented by some perceptual multi-dimensional label appraisal, which helps use the intelligent skill of data analysis to form a multi-dimensional portrait of teachers' tuition. For example, during the epidemic prevention and control period, the live webcast lectures adopted by significant universities can be based on manual scoring.

5 CONCLUSIONS

In this article, an optimization design scheme for research and application of AI in IPE tuition is put forward. AI skills construct the overall system of IPE tuition, and then the appraisal of teachers' tuition quality is optimized using BPNN to realize the optimization of IPE tuition. Simulation results show that this arithmetic has an accuracy of 8.69% higher than traditional arithmetic. This result fully indicates that the established neural network can not only meet the requirement of error accuracy but also train quickly with little error, so it is entirely feasible to use the neural network in tuition quality appraisal, and it does provide a convenient and practical tool for tuition quality appraisal. On political and moral issues, AI can't make choices like human consciousness but turns them into technical problems to solve. AI doesn't contain a position, but the machine may make different technical choices for the same thing because of the manufacturer's political concept and moral level. Continued attention to privacy, ethics, and user-centered design principles is essential as we navigate the intersection of technology, mental health, and cultural diversity. By striking a balance between innovation and responsibility, this approach can make mental health resources more accessible, effective, and respectful of individual and cultural nuances on a global scale. It is a journey that necessitates ongoing collaboration, adaptability, and a commitment to the well-being and privacy of users across diverse cultural landscapes.

Weiran Wang, <https://orcid.org/0009-0008-8306-6385>
Liyang Zhang, <https://orcid.org/0009-0006-8827-842X>

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