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Research Article

Construction of Multimedia-Assisted English Teaching Mode in Big Data Network Environment

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Oral English teaching is the weakest link in multimedia English teaching at this stage. English teachers are constantly exploring effective approaches to improve oral English Teaching in their own educational practice. The big data multimedia English teaching mode conforms to embark on the historical stage. Firstly, this paper constructs the big data architecture of English teaching model mining and divides the construction of the teaching model into three parts: data mining, teaching model evaluation, and improvement optimization. Data mining uses the advanced DBN network to send data into the DBN-DELM network, which significantly improves the accuracy of the multimedia assisted English construction model. The simulation results show that teaching mode construction based on big data can effectively improve students' interest in English learning; attitude; and oral English level including pronunciation, pronunciation and intonation, dialogue and communication, and oral expression and improve students' group cooperation and communication ability, autonomous learning ability, evaluation consciousness, and ability.

1. Introduction

The information age has become the pronoun of the 21st century, and people's learning way for English have also undergone great changes. Education, as an indispensable promoter of human development, is also making changes in line with the times [1, 2]. Especially, with the continuous integration of information technology and education, exploring the path and mode of multimedia English teaching has become an important research topic for English education experts [3]. Learning mode refers to a kind of plan or model that constitutes a learning course, selects appropriate teaching materials, and guides teaching activities in the classroom or specific environment [4]. Literature [5] defines teaching mode as teaching mode, also known as teaching structure. Teaching mode is the visualization of teaching methods, and it also is the high summary of teaching experience [6]. The definition of the concept of teaching mode given in the literature [7] is teaching mode is commonly known as the big method. It is not only a kind of teaching method but also a whole and systematic operation mode from teaching principle, teaching content, teaching goal and task, and teaching process to teaching organization form. This operation mode is theorized. The literature concludes that teaching mode refers to the stable combination and application of two or more methods or strategies in the teaching process [8].

With the support of modern information technology and professional technology, each industry field will produce series of data. The statistics, analysis, mining, and sharing of these data will create unexpected value and wealth. Literature [9] points out that learners leave many digital footprints in online or offline learning. Through tracking and analyzing some digital footprints, we can find the rules and patterns of learners' learning behavior. Literature [10] believes that big data will bring fundamental changes to modern education, including the implementation of two-way education feedback that cannot be carried out in the past, the realization of customized teaching to realize the individual conditions, and the optimization of content, time, and methods for teaching through probability prediction. According to the literature [11], learning analysis can be used to evaluate curriculum and teaching and also to discover and grasp the

mechanism of learning process. According to the literature [12], big data technology can digitize process (including teaching materials and learning activities): the solution of teaching scores will no longer depend on the fuzzy experience of teachers, but based on the description and analysis of massive teaching mode and their solutions. Since the new curriculum standard condensed the concept of English learning activities, more and more studies have discussed the impact of the concept of English learning activities on the teaching of reading and writing, but there is less discussion on how to integrate the concept of learning activities into grammar teaching. It can be seen that the theoretical guiding significance of the concept of learning activities on other English courses other than reading, and writing still needs to be further explored. This study combines the concept of learning activities with grammar teaching, which helps to reverse the lack of practical, situational, and pan theoretical research on the theory of English learning activities, builds a teaching operation mode based on the concept of English learning activities, and improves the theory of English learning activities [13]. It is entirely possible for teachers to analyze the learning data of each student [14]. When using DBN to mine teaching big data, there are problems of low efficiency and slow convergence speed [15]. The main contributions are summarized as follows: (1) this paper uses hive spark framework to design a big data real-time data platform for English teaching to improve English teaching efficiency and change teaching mode. (2) ELM is used to optimize the DBN network, which can simplify the model structure and improve the model training efficiency. (3) This paper compares the experimental method with the flipped classroom model to verify the advantages of English teaching.

In order to change the English teaching mode, this paper constructs a multimedia English teaching mode based on DBN-DELM on cloud platform. Firstly, the big data information collection platform is constructed for collecting series of information. In the data mining layer, the advanced DBN-DELM network is used to mine effective information from history information of English teaching, and the multimedia English teaching mode is constructed. Simulations show that the efficiency and effect of English teaching are enhanced. Furthermore, this paper also puts forward some implementation suggestions to promote the application and development of big data education in China.

2. Structure and Design of English Teaching Platform

Based on the characteristics of big data, this paper designs the English teaching big data real-time data platform (DRTDP). Its overall architecture is as follows (see Figure 1), including four abstract and implemented technology platforms: unified data acquisition platform, unified flow processing platform, unified computing service platform, and unified data visualization platform [16]. The DRTDP platform can provide end-to-end real-time data processing capability (millisecond/minute delay), connect multiple data sources in the English teaching industry chain, extract real-time data, and provide real-time data for various English teaching big data application scenarios.

2.1. Architecture Design of Cloud Platform. Real-time data platform must have real-time and security. Real time performance: the real-time performance of DRTDP determines that DRTDP must complete related services in data transmission and forwarding, which is characterized by low delay and can be processed by the analysis model in time. The data delay at any stage may influence the final output of the system. Stability: DRTDP must have high stability, which have robust system in any scenario, which directly affects the usability. Security: the importance of DRTDP determines that DRTDP must have a very high security protection capability. With the increasing value of data, when an intrusion occurs, it can timely detect the specific information of the intrusion and take targeted and effective remedial measures. Therefore, the English teaching big data real-time data platform is designed as follows:

The English teaching big data real-time data platform includes information perception, wireless transmission, data mining, and analysis and visualization. Firstly, Under the guidance of big data teaching mode, on the one hand, the circulation of educational content is strengthened, which is not only the mutual reference of resources inside and outside the school but also the circulation of educational resources at home and abroad through network interaction. On the other hand, on the basis of ensuring face-to-face teaching, we should supplement and improve the traditional teaching mode, learn from each other's strengths and make up for their weaknesses, and realize the multiplication and diffusion of educational effect by means of information technology. Generally speaking, English teaching big data platform contains data layer, GPRS layer, data mining layer, and visualization layer. (1) The data layer is divided into user information, course information, practice library, video library, and forum information. According to the scope of discussion, the user information library is divided into user name, age, education, and other basic information. The forum information library is divided into chapter forum, course forum, course forum, and platform Forum. (2) The network layer is used for transmitting the sensing layer data to platform through GPRS and other communication methods. (3) The data mining layer includes algorithm library and model library. The common mining algorithms include BP neural network, SVM, and deep neural network. (4) Application layer provides information to users.

2.2. Structure Design of Teaching Mode Based on Spark-Hive Frame. The rapid growth of data and the urgent need related to data query make the traditional data warehouse engine difficult to conditions for storage and analysis. Hadoop as an open source architecture began to replace the traditional data warehouse, using the MapReduce programming model that can effectively segment and reasonably allocate data. Hive as an especially tool provides a query interface similar to SQL [17]. However, since the execution engine of hive compiles SQL into a series of MapReduce jobs to run, its performance cost is high. The structure of English teaching cloud platform based on Hadoop is designed as Figure 2.

Hive is convenient for developers who are familiar with MapReduce to develop mappers and reducers which work that cannot be completed by built-in mappers and reducers

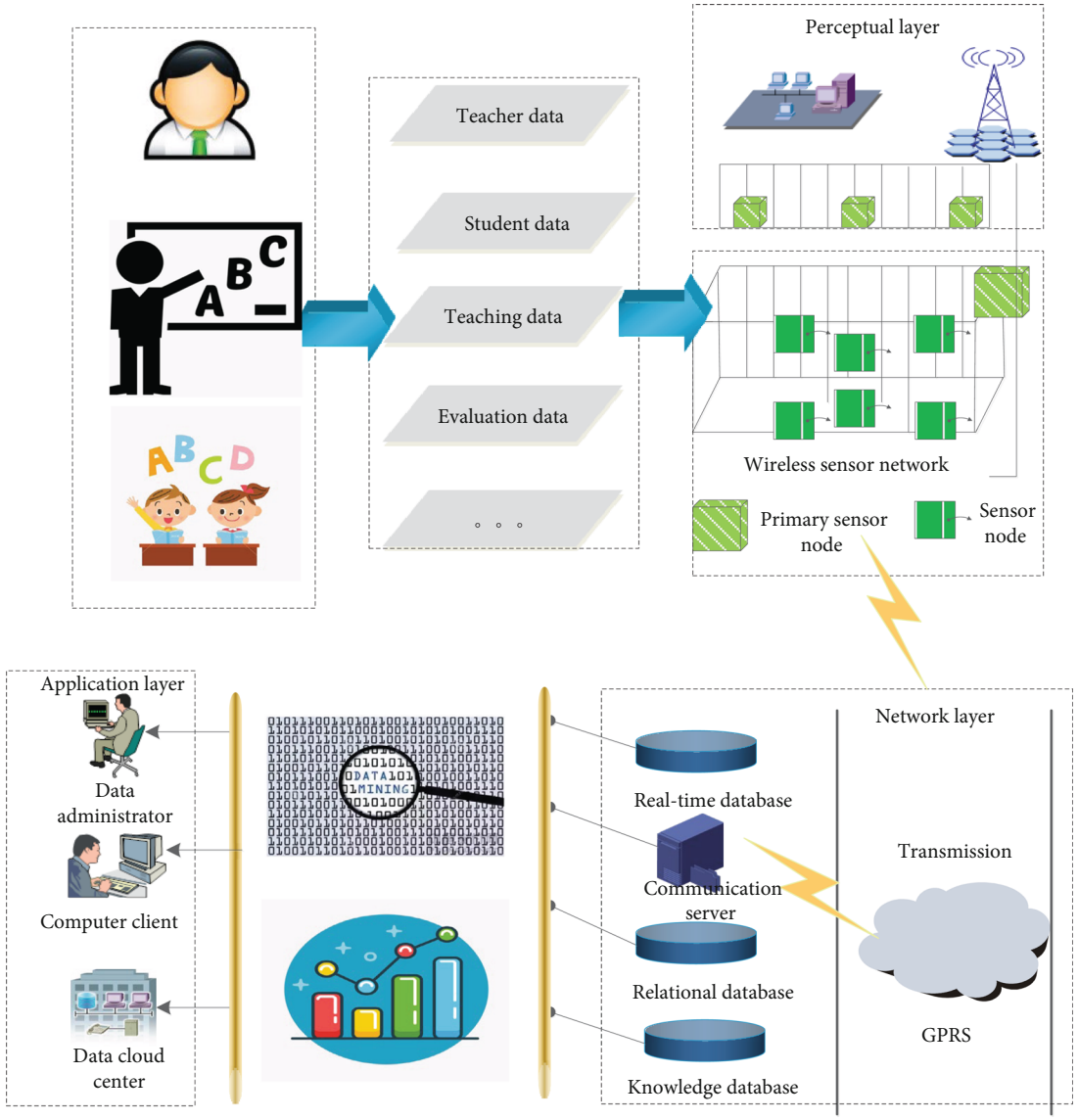

Figure 1: English teaching big data real-time data platform.

[18]. Hive's table is actually HDFS's directory/file, which divides the folder by table name. If it is a partition table, the partition value is a subfolder, which can be used directly in M/R jobs [19].

3. Research on Big Data Mining Algorithm Based on the DBN Neural Network

3.1. The Process Design for Teaching Mode Construction. To realize the intelligent construction of the multimedia English mode, this paper applies the deep learning algorithm [20–22] to the data warehouse system, uses principal component analysis [23] and normalization algorithm [24], designs a multimedia English teaching model [25], and designs an evaluation model of European media English teaching model. The deep confidence network data mining model is adjusted according to the advantages and disadvantages of the evaluation model, and its process structure is shown in Figure 3.

(1) Data sources contain two categories: internal information and external information, (1) in the teaching after class, understanding the specific situation of teachers and students, teaching content, methods, students, network English teaching and students' participation. ② In the learning practice activities after class, we need to fully master the students' written and oral communication ability, the ability to communicate with others in English, and the ability to read and write independently in English. ③ In English teaching system, multimedia data, and online data, we need to know something about college English learning materials, English teaching system; the latest microclass, audio, and video; English voice materials; and so on. Generally speaking, in the process of data collection and collation, it is necessary to ensure the timeliness, accuracy, and comprehensiveness of data collection to the greatest extent. These factors are the preconditions for the construction of ecological college English teaching mode. (2) Data preprocessing mainly processes unordered data into ordered data. (3) Data decision mainly relies

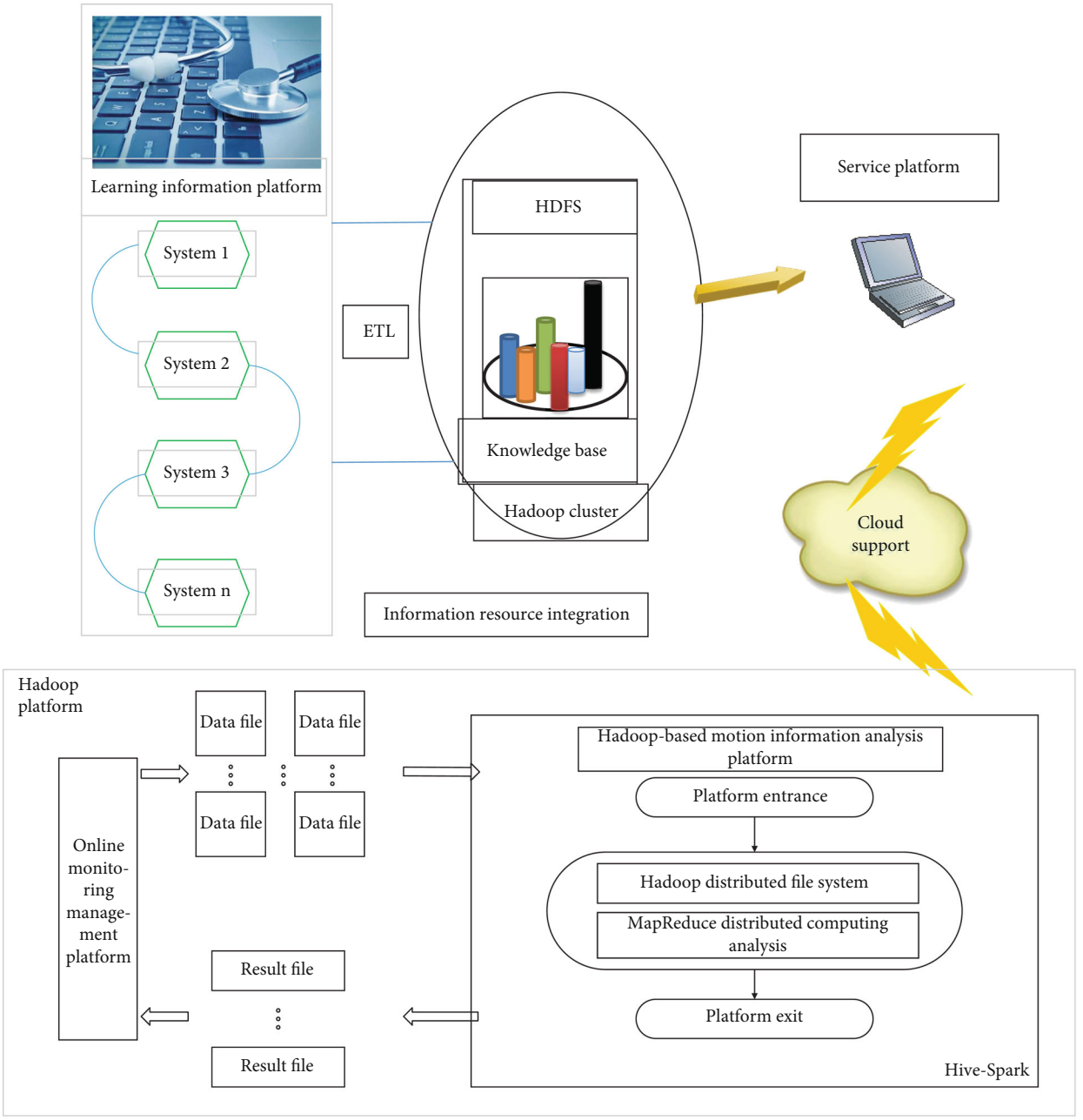

Figure 2: Hadoop-based architecture of operation support computing platform.

on the deep neural network. Data is directly sent to the deep neural network, and the optimal decision model can be obtained through training. (4) The model evaluation mainly evaluates the above data mining model through experiments and modifies the data decision model

3.2. Data Mining Model Based on DBN-DELM. Whole network: for an elm with n hidden layers, the improved dbn-delm algorithm obtains the parameters of the first n hidden layers through the DBN pretraining process and finally connects an output layer. The three-layer dbn-delm network structure is shown in Figure 4.

Deep learning itself is a branch of machine learning [26–28]. There are many similarities and differences between deep learning and traditional neural networks [29]. The similarity between the two is that deep learning adopts a hierarchical structure similar to the neural network [30–32]. The system consists of a mult-layer network composed of input layer, hidden layer (multilayer), and output layer. Only the nodes of adjacent layers are connected, and the nodes of the same layer and cross layer are not connected with each other. Each layer can be regarded as a logistic regression model. This hierarchical structure is relatively close to the structure of the human brain. There is no link between the nodes of each layer.

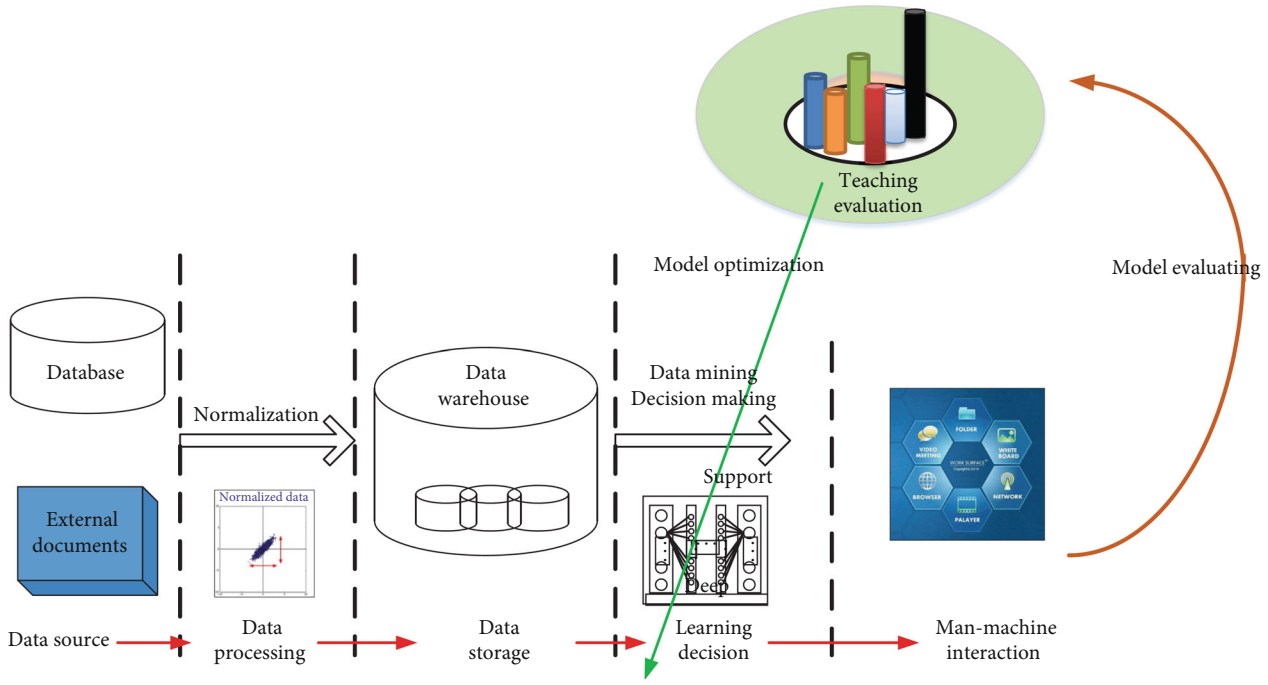

Figure 3: The process of teaching mode construction based on DBN-DELM.

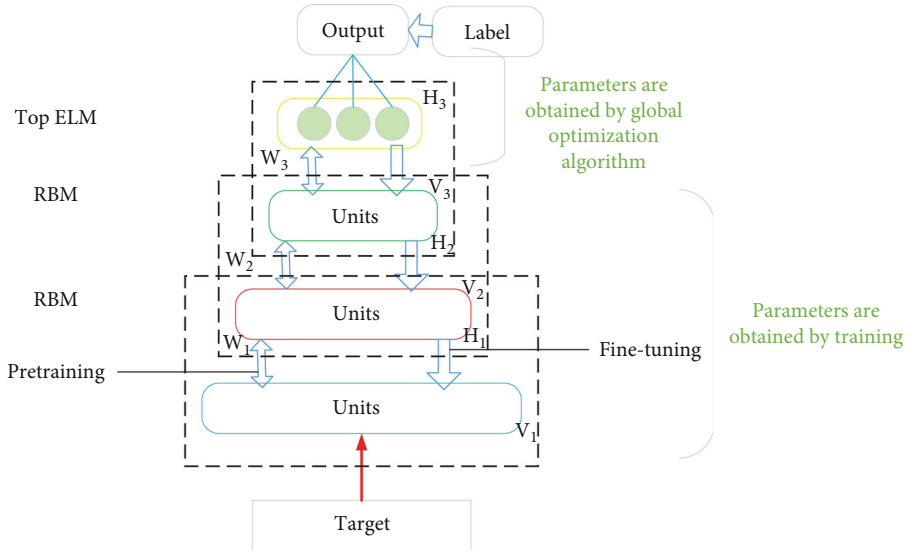

Figure 4: DBN network structure with the ELM algorithm.

One layer is the visual layer; that is, the input data layer (V) and the other layer are the hidden layer (H). If we assume that all nodes are random binary variable nodes (only 0 or 1 can be taken) and assume that the full probability distribution P (V, H) satisfies the Boltzmann distribution, we call this model restricted Boltzmann machine (RBM).

According to the pretraining method of DBN, we assume that v is the observation data, h is the feature data for hidden layer, and ω is the link between the two layers. In the RBM unit, we can see m visible neurons and N corresponding hidden layer neurons. I used the contrast divergence (CD) algorithm to learn the parameter [33] updating criteria of RBM in each layer.

$$\begin{cases} \omega_{ij} = \omega_{ij} + \varepsilon\left\{\left\langle v_i h_j\right\rangle_{\text{data}} - \left\langle v_i h_j\right\rangle_{\text{recon}}\right\}, \\ a_i = a_i + \varepsilon\left\{\left\langle v_i\right\rangle_{\text{data}} - \left\langle v_i\right\rangle_{\text{recon}}\right\}, \\ b_j = b_j + \varepsilon\left\{\left\langle h_j\right\rangle_{\text{data}} - \left\langle h_j\right\rangle_{\text{recon}}\right\}. \end{cases} \tag{1}$$

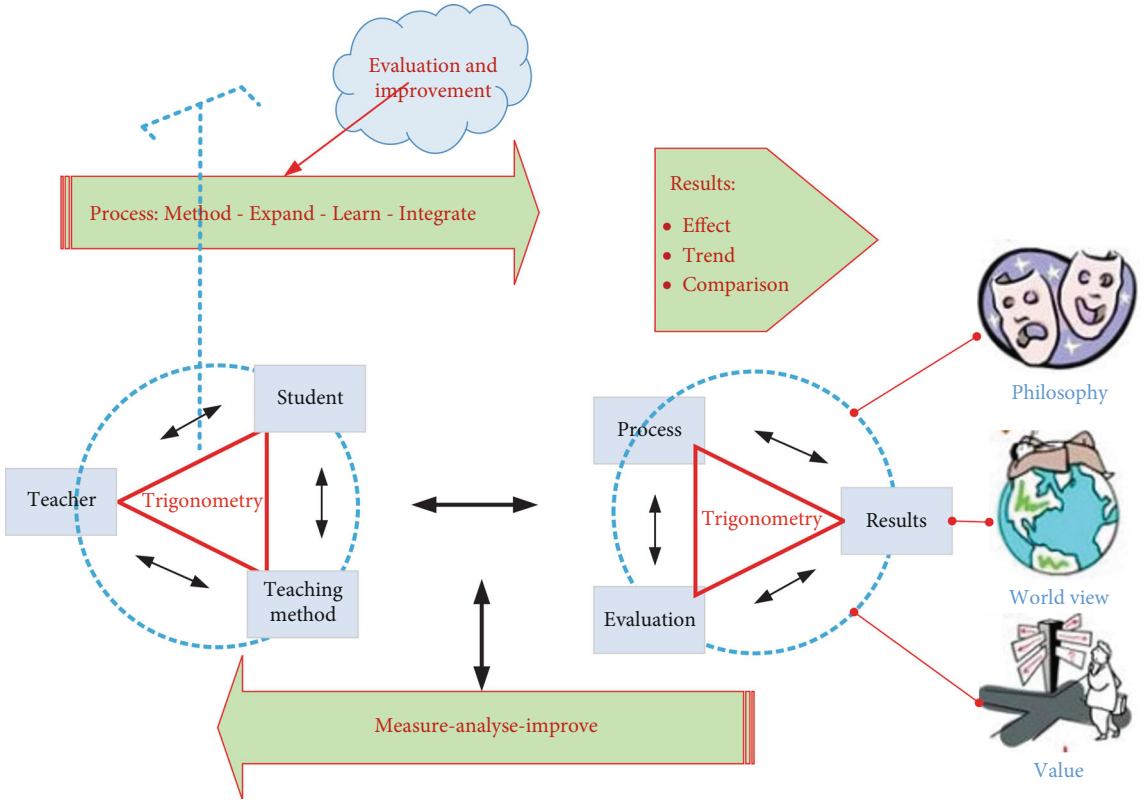

Figure 5: English teaching evaluation model.

Table 1: Cloud environment of platform.

Server type	OS	Memory	IP address	Others
Data server1	Windows 7	16GB	192.168.39.128	Opc.Tcp://10.32.42.48 : 4401
Data server2	Windows 7	16GB	192.168.39.129	0pc.Tcp://10.32.42.48 : 4401
Namenode	CentOS 7.5	64GB	192.168.39.130	Hadoop 2.6.1; spark 1.7.1
Slave node1	CentOS 7.5	64GB	192.168.39.131	Hadoop 2.6.1; spark 1.7.1
Slave node2	CentOS 7.5	64GB	192.168.39.132	Hadoop 2.6.1; spark 1.7.1

The weight vector $\omega = \omega^1, \omega^2 \cdots \omega^N$, the offset vector $b = b^1, b^2 \cdots b^N$, and the number of hidden layers are obtained by pretraining. It can be as follows:

$$\begin{cases} h^2 = g\left(\omega^1 x + b^1\right), \\ h^3 = g\left(\omega^2 h^2 + b^2\right), \\ \cdots \\ h^{i+1} = g\left(\omega^i h^i + b^i\right). \end{cases} \tag{2}$$

Finally, the parameters from the nth hidden layer to the output layer are obtained by the ELM algorithm

$$\sum_{j=1}^{N} \beta_j h_j^n = o_j \quad j = 1, 2, \cdots, N, \tag{3}$$

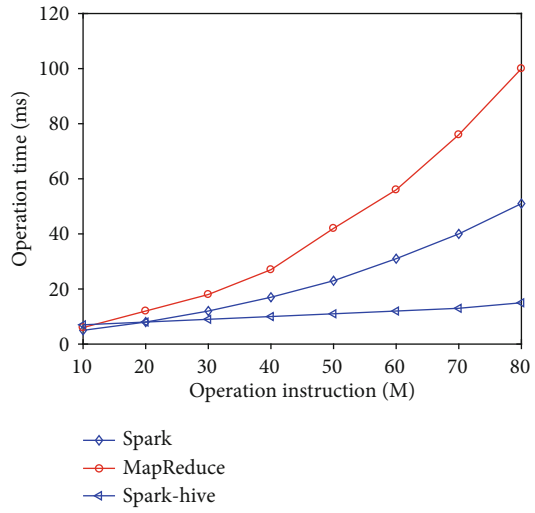

Figure 6: Comparison of operation efficiency of big data platforms.

Table 2: DBN-DELM model compared with other models.

Samples		1	2	3	4	5	6	7	8	9	10
DBN-DELM	Error	0.2	-0.1	-0.4	-0.5	0.2	0.7	0.15	0.7	-0.4	0.21
	MPE%	1.26	0.66	2.65	3.4	1.26	4.87	1.01	4.17	2.8	1.35
	RMSE	2.34%									
DBN	Error	0.4	0.6	1.3	0.2	-0.9	1.7	1.3	-0.1	2.3	0.9
	MPE%	2.56	3.97	8.33	1.36	5.66	11.2	8.78	0.6	16.1	5.81
	RMSE	6.44%									
BPNN	Error	1.3	0.55	1.48	3.25	-3	1.53	1.6	4.6	-2.6	3.4
	MPE%	9.09	3.78	10.6	28.3	15.9	11.2	12.1	37.7	15.4	28.1
	RMSE	17.22%									

where $\beta_i = [\beta_{i1}, \beta_{i2}, \cdots, \beta_{iN}]$ is the parameter vector between the nth hidden layer neurons and the output layer neurons, and N is the number of nth hidden layer neurons.

The difference between the DBN-DELM algorithm and IDBN algorithm is that IDBN simply stacks and combines the DBN and elm algorithm, while the DBN-DELM algorithm gets better initialization parameters through the unsupervised process of DBN through the random initialization of the deep elm algorithm and then gets the top parameters through the global optimization of the elm algorithm, which speeds up the training speed of DBN, and the accuracy of the elm algorithm is improved.

3.3. Teaching Mode Evaluation Model. The realization of multimedia teaching effect is inseparable from the production of high-quality multimedia courseware. Without the design and production of multimedia courseware, it is impossible to produce the expected ideal classroom teaching effect. The realization of multimedia English teaching mode effect is inseparable from the appropriate multimedia teaching methods. To correctly evaluate the advantages and disadvantages of English teaching mode based on DBN-DELM, the teaching mode evaluation model is as shown in Figure 5.

The selection and determination of evaluation content are the key to the implementation of teaching evaluation. According to the new English curriculum standard, teachers should consider comprehensively and analyse the actual situation of students, choose the evaluation content in an appropriate way, and devote oneself to the diversification of the evaluation content, so as to avoid overemphasizing the examination of language knowledge and ignoring the practical application of language.

Referring to the new English curriculum standard, the author divides the evaluation content of English teaching mode based on DBN-DELM into two parts: the oral English ability and the evaluation of learning behavior. Language competence is evaluated from two aspects. The MAE index is as selected:

$$\min_{\theta \in \Omega} \mathrm{MAE} = \frac{1}{M} \sum_{i=1}^{M} \left| T_e^i(iT \mid \theta) - T_e^i(iT) \right|, \tag{4}$$

where i is the length of the $i$thtime step. M is the total number of the sample time that are used to train or validation. Ω is the solution space of θ.

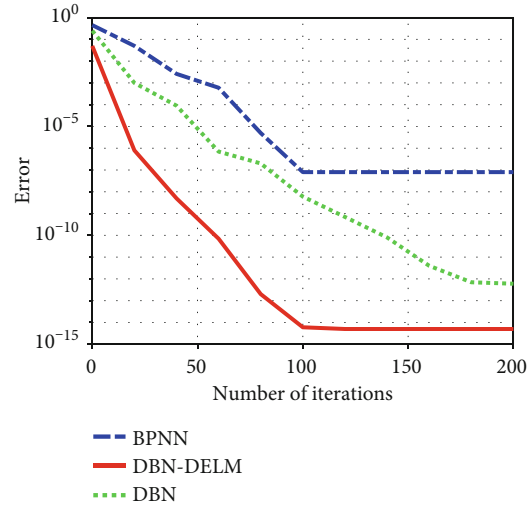

Figure 7: The error convergence comparison of three models.

4. Simulation and Results Analysis

4.1. Simulation Environment of Cloud Platform. In this experimental environment, spark is used to compare with traditional MapReduce to test teaching mode in the professional model. Hadoop 2.6 big data platform is adopted, and yard is used to manage the cluster with two hosts. Configuration of each host: each machine has 4 memory modules, each 4 GB, a total of 32 GB of memory, the amount of data is 2 GB, and a total of 1 million pieces of data. To improve the efficiency of test operation, Hadoop cluster consists of one Namenode (host name is node1) node and four datanodes (host name is node 1, node 2, node 3, node 4). Hive runs on node 1 node, and zookeeper runs on node 2, node 3, and node 4 node with odd number of nodes. The configuration of each node is shown in Table 1.

In order to improve the convergence speed of DBN, this paper mainly optimizes and improves the deep confidence network DBN and applies it to the multimedia English teaching system. Therefore, this paper has carried out three experiments:

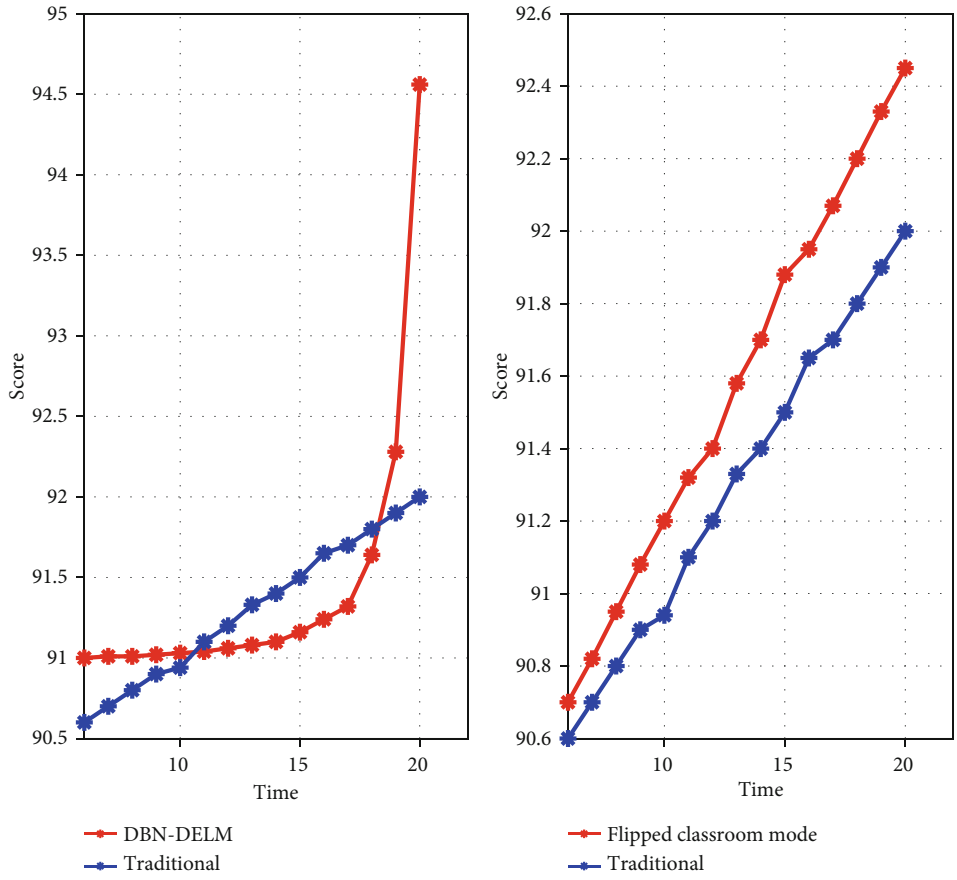

Figure 8: The score results compared with flipped classroom teaching mode.

(1) apply hive spark framework to the multimedia big data English teaching system, optimize the system, and improve the mining efficiency of the system. At this time, compare this framework with spark and MapReduce framework, (2) the elm algorithm is used to optimize DBN. At this time, DBN-DELM is compared with DBN and BPNN to verify the efficiency of the algorithm. (3) The multimedia English teaching system is compared with the traditional flipped classroom to verify the advantages of the system.

4.2. The Evaluation of Hadoop Platform. The efficiency of big data platform is not verified. This paper selects the common Hadoop framework platform for comparison. The frameworks of Hadoop are shown in Figure 6.

From the information shown in Figure 6, the time required for hive is basically proportional to the amount of data. The call of MapReduce by hive through SQL statements will lead to network and read-write disk overhead, which affects the query efficiency. For the same amount of data, hive is more efficient. In addition, for hive, the query time in spark mode is one tenth of hive-stand-alone and spark hive. In the client mode, there is not much time difference. With the increase of the number of data, hive is more stable. The advantage of spark framework query ability will be more and more obvious. Overall, the combination of spark hive is better than hive.

4.3. The Superiority Validation of Teaching Mode Based on DBN-DELM. To verify the superiority of the teaching mode, two groups of experiments are designed: (1) compared with DBN [34] and BPNN [35], the accuracy of the model is verified. (2) Compared with the Hadoop platform of MapReduce, the efficiency of big data platform is verified.

From the prediction results, we can see that the construction of teaching mode mined by the DBN-DELM algorithm has higher prediction accuracy than traditional DBN and BPNN, and the comparison results are shown in Table 2. The accuracy of the prediction results is evaluated by calculating the mean square deviation of the prediction results, that is, the average relative error (PMSE) value in the graph. Intuitively, the error of the improved algorithm is the smallest, between 1.5% and 2.5%, and the prediction effect is better. Secondly, due to the introduction of interest degree, it can effectively remove the wrong strong association rules, the prediction effect is second, and the average relative error is maintained between 5% and 10%. Compared with the former two optimization algorithms, the traditional BPNN algorithm has the worst prediction effect, with the average relative error between 10% and 20%.

To further verify the convergence index for DBN-DELM models, the MAE index convergence of the three models is shown in Figure 7. The DBN-DELM algorithm can converge faster, and the final convergence value is much smaller than

DBN and BPNN algorithms; The DBN-DELM mining model is further verified by the comparison figure.

To verify the superiority of the DBN-DELM-based model, I randomly select three classes for comparison. One of the classes is the traditional teaching mode, as the control class. The others as the experimental group, respectively, applied the DBN-DELM-based model and flipped classroom mode. The comparison data are shown in Figure 8. The 20 English tests were selected as the control. The results show that the scores of the traditional control group are rising steadily with the recommendation of time, and the multimedia English teaching mode based on flipped classroom can also achieve good teaching results over time. Flipped classroom reflects students' awareness of autonomous learning to a certain extent. Under the traditional grammar teaching mode, students are used to accepting and executing the learning tasks assigned by teachers and rarely actively reflect and evaluate their own grammar learning methods and effects. However, this experimental teaching cycle is short, and it is unable to significantly improve students' internal awareness of autonomous learning grammar in a short time; this may be one of the reasons why the experimental class students' metacognitive strategies have not improved significantly. However, the effect of multimedia English teaching mode based on DBN-DELM is not obvious in the early stage. After 15 examinations, the score will rise exponentially, which has a good effect. Furthermore, the English teaching model based on DBN-DELM plays a significant role in improving students' grammar ability and the use of grammar learning strategies, especially in improving the use of learners' emotional strategies, communication strategies, and cognitive strategies.

5. Conclusion

In the past, the teaching model used in college English teaching pays too much attention to students' classroom performance, but ignores students' practical ability of English language, and does not create practical communication opportunities for students, which leads to the disconnection between learning and practice. Therefore, this paper designs the construction of the DBN-DELM-based model. Through the design of big data platform architecture and hive technology application, the efficiency and speed of big data mining increase. The combination of elm and DBN can improve the speed and accuracy of model training convergence. In addition, the multimedia English teaching mode based on big data attaches importance to the relevance and openness of its constituent elements and implements the practical application awareness into the whole teaching process. It uses big data technology to reasonably associate the elements involved in teaching and each teaching environment, so as to ensure the effective sharing of information. Finally, the accuracy of the model and solve the problem of students' scores in Multimedia English teaching environment is verified. In addition, using the deep loop network to improve multimedia English teaching methods is the focus of the next research.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The author does not have any possible conflicts of interest.

Acknowledgments

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