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Analyse Chinese Teaching Project-Based Learning Design Application Optimization Using Keras Model

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***Abstract:* -** Educational methods for data mining may be used to successfully analyze data from a variety of educational platforms, including e-learning, e-admission programs, and automated results management solutions, to provide very helpful insights into students' performance. Chinese language teaching will reach new heights as a result of the rapid advancement of network technology and the constant improvement of network transmission speed. Additionally, the acceptance of online payment methods is growing, simplifying international and web-based trade. Deep learning models have become more significant in many spheres of life recently. It made it possible for investigators to automatically extract superior characteristics from unprocessed data.With the aid of the Keras model, make it is easier for students to rapidly obtain practical knowledge with deep learning structures and boost their confidence and enthusiasm for learning. In this study, we investigate the Long Short-Term Memory (LSTM) deep neural network model with Novel Swarm Optimization (NSO) network to accurately forecast student improvement using historical data. The most cutting-edge LSTM and an optimization mechanism model (NSO) have been employed in this work to solve research issues based on sophisticated feature categorization and prediction. For Chinese academics, institutions, and government agencies to accurately anticipate performance, this study is very important. When paired with the optimization mechanism (NSO), LSTM's better sequence learning capabilities provide performance that is superior to the current state-of-the-art. The prediction accuracy of the suggested approach is 93%.

Keywords: Chinese teaching, Deep Learning, Keras model, Improvement, Long Short Term Memory (LSTM), and Neural networks.

1. INTRODUCTION

Deep learning models are essential in all spheres of life. This educational experiment is designed to help students obtain practical experience with the deep learning framework rapidly, boost their self-confidence, and spark an interest in learning. This teaching experiment's primary objective is to show students how to use the lightweight Flask web application framework and the Keras artificial neural network library to operate a deep learning-based web-side application throughout two lessons. Students may finish a deep learning project quickly since the installation environment and framework are simpler to use and comprehend. This enables students to view the visual outcomes of this deep learning project and get first-hand experience. They may begin studying more about deep learning based on the project after the experiment is over. For the creation of an integrated design curriculum based on deep learning at colleges and universities, this experimental teaching approach is ideal [1]. Preschool education is typically regarded as an essential beginning point and basis for elite training, thus developed nations have placed significant attention on it. As a result, the faculty level and teaching quality of developed countries' preschool programmers are continually increasing [2]. Figure 1 represents the Framework of Chinese language teaching based on Keras method.

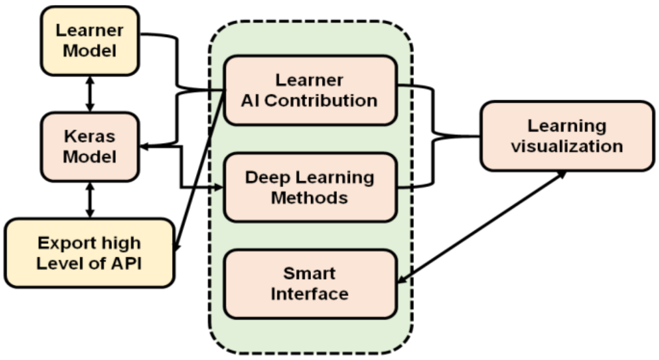

Figure 1: Framework of Chinese language teaching based on Keras method.

Computational thinking is crucial for students to develop information literacy, as stated in the "High School Information Technology Curriculum Standard Revision". It is updated into a programmatic teaching manual that incorporates Chinese features and both worldwide advanced level and real-world situations in China [3]. Building the information technology subject's teaching features, grounded theory concepts, training goals, the subject's nature, and teaching guidelines. The model may represent the teacher's teaching philosophy and method of execution since it is built on the knowledge of the

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peculiarities of the topic and the teaching guidelines [4]. Chinese professors suggested a data mining-based system that is used for evaluating Chinese teaching and the Keras method is used to assess Chinese teaching. Lastly, the algorithm's performance is evaluated, and the findings demonstrate that Keras significantly increases the model's classification accuracy, drastically reduces overfitting, and extracts more representative feature dimension data. The approach suggested in this research performs well and has the potential to significantly increase the security of the Chinese system for evaluating teachers [5]. There are still several issues with English teaching in China, despite the implementation of numerous instructional reforms. Students, for instance, lack the capacity for autonomous and collaborative learning. A novel method of instruction and classroom management is the"flipped classroom" teaching approach [6]. The flipped classroom teaching method will include and put into practice a lot of fresh ideas and concepts. Traditional classroom innovation is achieved by rearranging the time spent in the classroom and adjusting the interval between the internalization of learned material after class [7].

The case study examined the flipped learning strategy that may be used to discover pronunciation errors in spoken English by using big data and deep neural network-based algorithms, allowing students to self-correct and improving spoken English training. The development of big data and neural data networks has changed classroom teaching informatization and emphasizes students' independent learning outside of class with an assistant teacher [8]. The article presented the method used to assess open-ended Chinese reading and comprehension questions automatically. Due to the difficulty of feature extraction and lack of consideration for grammatical structure in statistical word embedding models, we employ long-short term memory recurrent neural networks to extract important semantic information from student responses [9]. The study paper's goal evaluated the integration of teaching is done in line with learning situations based on the traits of the project-based learning model, but there are still some notable omissions, namely the fundamental questioning operations that ought to be done before any of the other operations and learning in line with the principles project-based learning model were assessed [10] [11]. The study objective used convolutional neural networks' strong feature learning and feature presentation skills in deep learning to automatically identify pigs' face traits.The article used the Image Data Generator that comes with Keras to enrich the data on the photos of 10 pig faces and produce a dataset of pig faces. To recognize pig faces in images, the paper employed a convolutional neural network model based on LeNet-5. Comparative experiments were conducted [12].The article reviewed that computerized grading in teaching and learning has grown in popularity. The fundamental difficulty in researching this field is sifting through a quantity of unorganized text-based data to find relevant data [13]. Learners from various physics and computer backgrounds were introduced to core deep learning ideas in the study case, which also prepared them to use these methods to solve a sample particle physics issue [14]. The article exploited the simplicity of tools like Jupyter notebooks, and the user-friendly approaches of data science libraries such as Keras with TensorFlow [15].

The research examined the logistic regression (LR) model-based investigation of the teaching effects of mind maps in English classrooms. The article uses the pulse neural network to identify the teaching process of English classrooms and performs real-time monitoring of student motivation in connection with the actual scenario to enhance the effectiveness of English classroom teaching [16, 17]. The questionnaire's objectives explained some issues with the actual teaching of architecture art in China since it is still mostly practiced in a traditional manner [18]. The overview's objective is to investigate how, when used in teaching, the Naive Bayesian classification model only produces a limited amount of characteristics for each item in the training set and trains and classifies each item using just the probabilities determined during the mathematical process [19] [20]. The article extracted the educational connection; the entity's information is added to Bidirectional Encoder Representations from Transformers (BERT).With this data linked into the network as a class of things, we suggest a speech-fusion technique. The article presents several forms of educational materials and shows how they may be used to enhance learning services [21] [22].The research explained about building the text clustering approach using convolutional neural networks may more effectively and thoroughly mine. Chinese character data led to the optimization of the k-means method to reach the desired accuracy [23]. The article developed the strength of the social and educational sectors involved with the standard of art education, as well as artistic potential. The article based on machine learning may more successfully address problems including nonlinearity, high dimensionality, and local minima [24].The overview's goal is to determine accurate the classification of "Chinese Bridge" learners, a classification approach based on the enhanced K-Neighbor Algorithm has been proposed. It is integrated with the theory of the internal factor evaluation matrix. The "Chinese fever" has swept the globe due to China's steadily growing overall national power and worldwide influence. KNN assisted the "Chinese Bridge" global Chinese learners in completing individualized precision suggestions [25].

CONTRIBUTION OF THE STUDY

Thus, this research contributes by demonstrating an implementation of the LSTM method to increase the effectiveness by boosting students' interest, motivation, and the field's relevance to their lives. The following are some of the particular accomplishments of this paper:

- The approach of teaching the Chinese teaching to students based on deep learning is examined.

- To encourage the Chinese teaching and assess the effectiveness of the process, an efficient learning component based on the KERAS model is suggested.

2. MATERIALS AND METHOD

With the aid of the Keras model and a deep learning algorithm called LSTM-NSO, we were able to enhance the educational experience of our pupils. Data collection, data cleaning, our proposed model techniques, and a thorough analysis of the results make up this study. Figure 2 details each module.

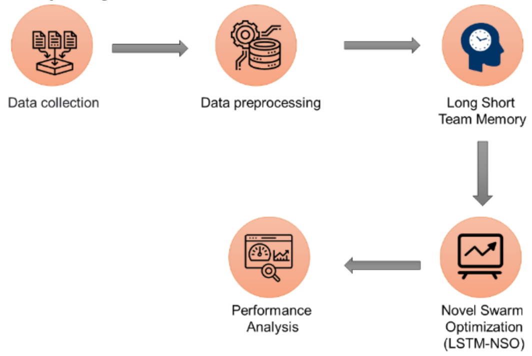

Figure 2: Framework of the proposed method

A.Data collection

The UCI Deep Learning Repository was where we found the dataset used to improve students' grades. There are a total of 1044 entries in the obtained student dataset, which is comprised of 33 characteristics.As demonstrated in Figure 3, a dataset is divided into two divisions using the Keras learning train test split method, with a ratio of 70:30.

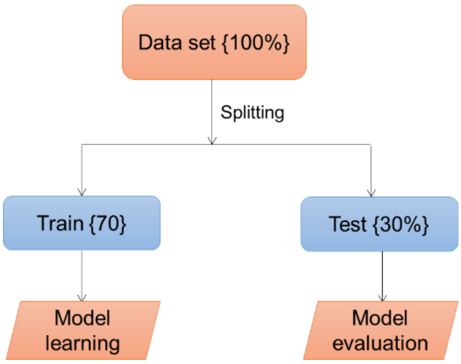

Figure 3: Data set split model

B. Data pre-processing

Data pre-processing processes must be applied if a reliable prediction model is to be developed since unprocessed data hinders the efficiency of deep learning classifiers. The collected data set is unprocessed and likely biased. The following preparatory measures were taken by us:At this phase of data pre-processing, the Sklearn Label Encoder is used to convert the textual input to a quantitative manner. Table 1 depicts the partial data of the listing.

Table 1: Partial data list

School-r	Sex-r	Age-r	Address_r	Famsize_r	P1_r	P2_r	P3_r (Target value)
0	0	15	1	0	0	12	12
0	0	19	1	0	8	13	11
0	0	14	1	1	13	14	13

Arithmetic conversion of nominal variables: Attributes with several possible values are referred to as categorical data. To properly run tests on the supervised training classifier (ML/DL), it is necessary to transform such characteristics into a numerical representation. By using the "Categorical" function from the Pandas library, we were able to transform the category variables into a numerical format, with a unique numerical value for each characteristic.To keep things simple, we just divided the entire value of every score by the overall number of grades to get the % for every record and grade then entered the percentage into the relevant column.

C. Long Short Team Memory with Novel Swarm Optimization

The Long Short-Term Memory (LSTM) model, an LSTM-based optimization network model (NSO), and a translation model including learning dependency were all investigated here.

LSTM Model

LSTM is a network topology for recurrent neural networks that address the issue of long-order dependency shown in Figure 4. The LSTM network architecture additionally comprises an input gateway, an output port, a forgetting circuit, and a memory unit in addition to the input information and the hidden layer. The LSTM model relies on a minimum structure made up of a stochastic network level and a step multiplier to either remove or add information from the state of memory blocks.

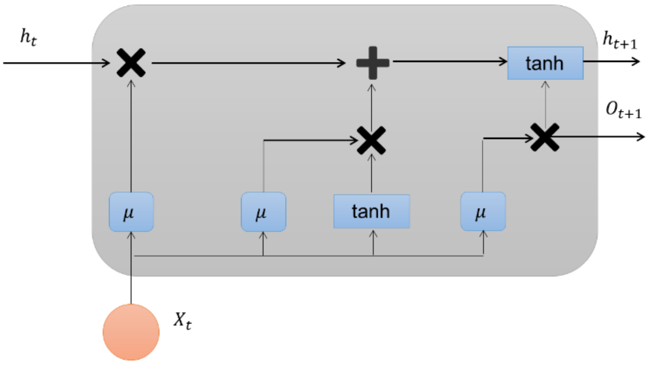

Figure 4: LSTM Model

Provided there were n samples in the raw data X_s at times$s$, a vector x, the size of the hidden layer $G$the state of the hidden layer G_{ve} at time s, and the state of the hidden layer G_{s-1} at a time, the remembering gate at period Interval S may be written as,

$$e_s = \sigma\left(X_s U_{ve} + G_{ve} + G_{s-1} U_{ge} + a_e\right) \quad (1)$$

Where $\sigma$the nonlinear function, X_s are the learnable weighting variables, G_{s-1} are the forward variables, and its addition procedure uses the broadcasting data operation approach. The second step is to count how many bits of data the memory device will need to store. By using the stochastic network layer, we can calculate the update's value. As the potential values are generated using the nonlinear activation function layer.

$$j_s = \sigma\left(X_s U_{ve} + G_{ve} + G_{s-1} U_{ge} + a_e\right) \quad (2)$$

$$\bar{D}_s = tanh\left(X_s U_{ve} + G_{ve} + G_{s-1} U_{ge} + a_e\right) \quad (3)$$

The contents of memory are then modified. As demonstrated, the memory is updated using a marker operation, and the data flow is regulated using a recollection gate and an input value.

$$D_s = e_s \Theta \mathrm{D}_{s-1} + j\Theta \bar{D}_s \quad (4)$$

According to the aforementioned formula, a storage unit in its previous state is saved up to the current time. When the input gate is consistently near 0 and the remembering gate is consistently close to 1. As the LSTM unit can prevent differential vanishing in the flowing nerve, this issue may be addressed. Lastly, the state of the memory unit's outputs is determined by the sigmoid layer before being sent to the output nodes.

$$P_s = \sigma\left(X_s U_{ve} + G_{ve} + G_{s-1} U_{ge} + a_e\right) \quad (5)$$

$$G_s = P_s \Theta \tanh(D_s) \quad (6)$$

The information is transformed from the storage facility to the hidden state when the output gate produces 1, as shown by the formula above, and is retained by the main memory when the outer loop outputs roughly 0.

Novel Swarm Optimization (NSO)

Learning representations from data is the focus of machine learning. Using a multi-layer neural network and a variety of techniques, it finds solutions to a wide range of issues. It relies on a concept called "featured learning," which aims to segment the network to harvest layer-specific feature data. Each layer of a model that is made up of neuron cells performs its unique transformation of conceptual characteristics. After being subjected to many iterations of enlargement, valuable characteristics became more prominent. Several representations of an image allow a machine to get distinct observational values from the same set of inputs. The image's pixel values may be represented as a vector or, more abstractly, as a graph of edges. By using this approach, the characteristics collected will be abstracted more and further via the multi-level simple modification.CNNs, a popular kind of neural network, multi-layer feedback loop neural networks, and many more techniques are all part of the deep learning framework. The basics of CNN are outlined here. Like real neurons, this network learns by accumulating and linearly processing data. Neurons can abstract information about where stimuli are coming from in the physical world and how to react to them, making them useful in the information science realm. The procedure may employ the mathematical estimate provided by the combination technique. A morphological layer, activation function, pooling layer, and fully linked layer make up the bulk of a CNN. The convolution operation uses layer-by-layer convolution to feature extraction, and the pooling layer then takes those features and uses them to lower their parameters. All of the neurons in the brain are linked together through a series of interconnected layers.The learning model's dual purpose is to assess performance likelihood and enhance future learning. There is a simple formula for determining the odds:

$$\partial_1 \|d\|^2 \leq \int_{s_0}^{s_0+s_0} |T^S(\tau) d|^2 cx(\tau)$$

$$\leq \partial_2 \|d\|^2, \forall_{s0} \geq 0, d\epsilon Q^m \quad (7)$$

This approach to calculating probabilities involves arithmetic that becomes increasingly more complicated as the length of the word sequence grows. Current technology makes calculating the model's parameters very challenging, if not impossible.

$$e^m(s) = \lim_{n=0} (-1)^n \binom{m}{n} e(s - ng) \quad (8)$$

A learning's structure is solely determined by the Keras model, which is represented as,

$$-div\left(\frac{\nabla^b w}{|\nabla^b w| + o}\right) + \lambda_f (w - w^0) = 0 \quad (9)$$

The resource has four elements related to knowledge communication directly, and the individual learners include intellectual capabilities, the data being learned from the instructional tool, the learner driver predicted goal understanding point data, and the learner permitting effective education time. There are four goal functions in the set used to optimize the learning route.

$$n_j(h) = \frac{fit_j - worst(h}{best(h) - worst(h)} \quad (10)$$

The learner's intended outcome is the sum of the information the resource provides minus the information the learner anticipates gaining from the tool. The closer the two numbers are, the more closely the information presented in the resource matches the information the learner anticipates finding.

$$E_j^c(s) = \sum_{i\epsilon L} rand_i E_{ji}^c \quad (11)$$

The order constraints association issue cannot be solved by the conventional novel swarm optimization technique, and the learning route optimization issue is discrete. As a consequence, researchers have had great success using the LSTM method to tackle the issue of learning route optimization. The three components of speed stagnation, self-learning, and social cognition are also used to update the particle velocity components in the LSTM algorithm. The location of the component in the generation and the decade's velocity gradient work together to establish the molecule's updated position.

$$f = \frac{(\delta 30 + \delta 03)^2 + 4\delta_{22}^2}{(\delta 30 + \delta 03)^2} \quad (12)$$

$$B = \frac{\sum_{j=1}^{p} N_j M_j}{\sum_{j=1}^{p} N_j} = \frac{\sum_{j=1}^{p} N_j M_j}{T} \left(N_j \epsilon N\right) \quad (13)$$

The LSTM technique uses a probabilistic framework to describe a particle's velocity state. Each bit in a subatomic particle state vector has a value that is either 0 or 1, and the calculation looks like this:

$$N" = \left\{N" \middle| m" = \frac{n' \times c}{C}, \forall n' \epsilon N'\right\} \quad (14)$$

$$\frac{\partial L}{\partial K} = \sum_{j=1}^{m} \left[z_j - \frac{exp\left(b + \sum_{i=1}^{n} v_{ji}\beta_i\right)}{1 + exp\left(b + \sum_{i=1}^{n} v_{ji}\beta_i\right)}\right] = 0 \quad (15)$$

The paper provides a comprehensive evaluation of the current situation, course features, and pedagogical environment. Using LSTM-NSO and the backing of deep learning theory, we took into account the whole classroom setting, all of the available instructional materials, and the technological strategies that may help teachers succeed.

3. RESULT AND ANALYSIS

We employed the most popular assessment measures in this research, including Accuracy, Precision, Recall, and F1-score.Based on the categorization outcomes of the true positive rate, false positive rate, predictive positive value, and negative predictive value.

Accuracy

The accuracy with which a tool's estimations correspond to the real values of the parameters being examined is one way to evaluate the material's dependability. It has been demonstrated that the proposed strategy provides more accurate learning improvement than the current method. The existing methodologies like CNN [23], SVM [24] and KNN [25].

With the suggested system, accuracy is at 93%, while CNN is at 75%, SVM is at 63%, and KNN is at 82%. This proves that the proposed solution is better than the current one. The accuracy comparison results are shown in Figure 5 and Table 2.

$$Accuracy = TP + TN \div TP + TN + FP + FN \quad (16)$$

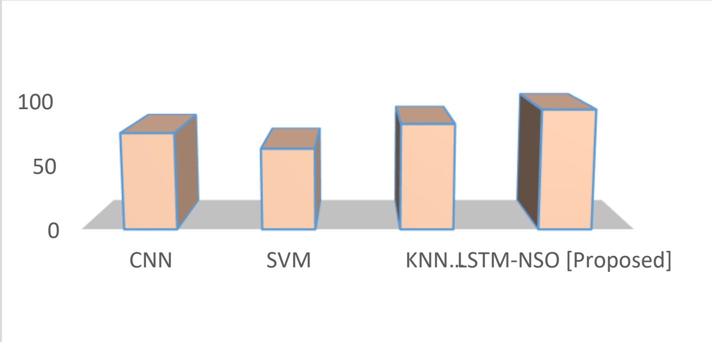

Figure 5: Comparison of Accuracy

Table 2: Accuracy

Methods	Accuracy (%)
CNN	75
SVM	63
KNN	82
LSTM-NSO [Proposed]	93

Precision

Precision is used to assess a classifier's capability to identify the significance of classed objects and reject inconsequential subjects, and it is determined using the continuity formula:

$$Precision = TP/(TP + FP) \quad (17)$$

The proposed analysis has considerably greater precision than the current method. In comparison to current systems, which have prediction capabilities of 88% for CNN, 66% for SVM, and 71% for KNN, the suggested approach has a precision of 97%. As a consequence, the proposed technique performs well. A comparison of accuracy is depicts in figure 6 and Table 3.

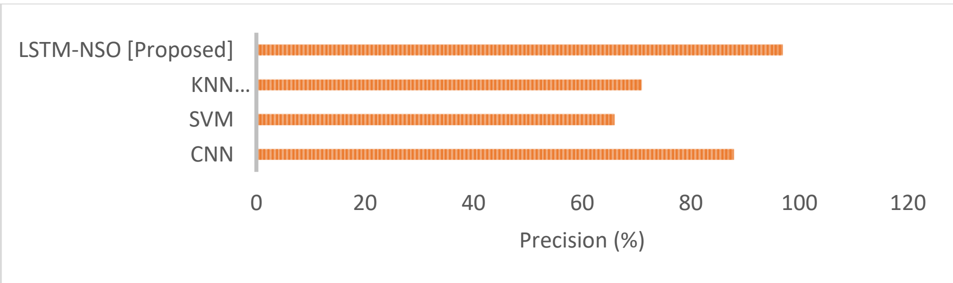

Figure 6: Comparison of Precision

Table 3: Precision

Methods	Precision (%)
CNN	88
SVM	66
KNN	71
LSTM-NSO [Proposed]	97

Recall

A recall is applied as a tool for measuring and evaluating the significance of the categorized issues, which is accomplished via the utilization of the following equation:

$$Recall = TP/(TP + FN) \quad (18)$$

The recommended method achieves 90% of the recall value. In comparison to other methods, the recall value of CNN is 71%, SVM is 63% and KNN is 81%. In a conclusion, our suggested method performed well. Figure 7 and Table 4 displayed the comparison of recall.

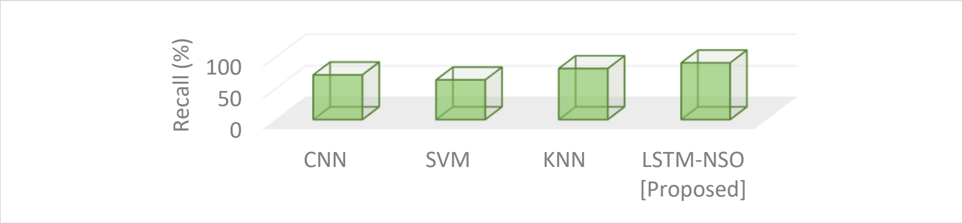

Figure 7: Comparison of Recall

Table 4: Recall

Methods	Recall (%)
CNN	71
SVM	63
KNN	81
LSTM-NSO [Proposed]	90

F1-measure

The F1-measure is derived by assessing precision and recall, with the highest F1-measure having a value of 1 or very close to 1, and the poorest F1-measure having a value of 0 or very close to 0, which is measured by,

$$F1 - measure = Precision * Recall / Precision + Recall \quad (19)$$

In contrast with other methods, the f1 measure for the suggested method got 95% while CNN achieves 84%, SVM achieves 66% and KNN achieves 71%. As an outcome, our proposed method has a high f1-measure value when compared with other methods. A comparison of the f1-measure is displayed in figure 8 and Table 5.

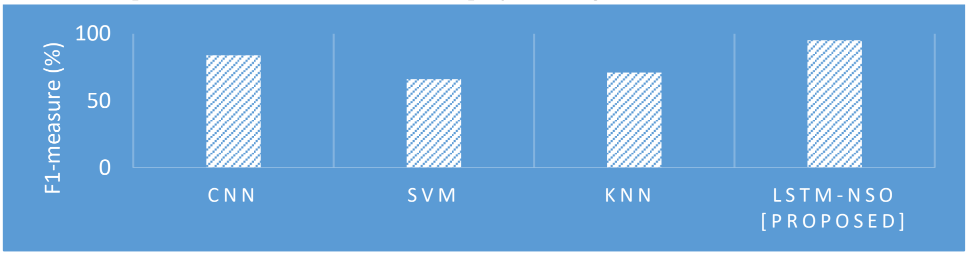

Figure 8: Comparison of F1-measure

Table 5: F1-measure

Methods	F1-measure (%)
CNN	84
SVM	66
KNN	71
LSTM-NSO [Proposed]	95

4. CONCLUSION

Using academic achievement data from the past is a crucial step toward raising today's students' bar. The proposed technique executes many operations, including (i) data collection, (ii) data preparation, (iii) method recommendations, and (iv) the deployment of a deep learning model to boost students' grades. A standard dataset created by the students is used for the experiments. When all the required pre-processing processes have been taken, the most relevant characteristics with a prestigious position in the statistical outcome are chosen through feature selection. Ultimately, the Keras model is used in conjunction with an LSTM-NSO model to boost students' improvement and helps in enhancing Chinese teaching. The suggested method is tested by student experiments on a standard dataset. From what we can tell experimentally, the suggested model improves upon the state of the art. In addition, only important elements are taken into account for enhancement of Chinese teaching, even if taking into account additional factors, such as pupils' social and cultural qualities and the amount of time it takes to complete a unique activity, can improve outcomes. More research into various datasets using a wider range of fused deep learning algorithms is required in the future.

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