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Assessment and Prediction of University English Teaching Effect Using Progressive Recurrent Generative Adversarial Network

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Abstract: - An intelligent evaluation technique of English teaching ability based on enhanced machine learning algorithm is proposed to fully explore the quality of English teaching, fully exploit the effect of intelligent evaluation of English teaching ability. It can guarantee rational allocation of English teaching resources, evaluate big data of constraint parameters of English teaching ability evaluation, attain frequent item sets of English teaching quality depend on big data mining technology. In this paper, Assessment and Prediction of University English Teaching Effect Using Progressive Recurrent Generative Adversarial Network (APETE-PRGAN-GOA) is proposed. Initially the input data is collected from fig share, it is given to preprocessing. The preprocessing, remove useless words using Learnable Edge Collaborative Filtering (LECF). Then the pre-processed output is fed to Prediction of English Teaching Effect. Here, Progressive Recurrent Generative Adversarial Network (PRGAN), is used to Predict English teaching ability. In general, PRGAN classifier does not express any optimization adaption approaches for determining optimum parameters to assure the assessment. Here Gazelle Optimization Algorithm utilized to optimize PRGAN classifier, for English Teaching Effect. The proposed technique executed in Python, performance of proposed technique is analysed with evaluation metrics likes,evaluation accuracy, correlation coefficient, mean squared error, evaluation time, occurrence (time), recall, F1-score, RoC are analyzed. The proposed APETE-PRGAN-GOA method attains 30.58%, 28.73% and 35.62%, higher evaluation accuracy, 20.48%, 24.73%, 29.32% higher RoC and 30.98%, 26.66% and 21.32% lower mean squared error analysed with existing models such as intelligent assessment method of English teaching ability depend on enhanced machine learning algorithm (ISM-ETE-CNN), application of machine learning with IoT methods in evaluation of English teaching effect in colleges (CNN-ETE-IOT),English teaching evaluation technique depend on association rule algorithm with machine learning (ETE-ARA-SCN) respectively.

Keywords: Learnable Edge Collaborative Filtering, Progressive Recurrent Generative Adversarial Network, Puzzle Optimization Algorithm

I. INTRODUCTION

The assessment of English language teaching proficiency has gained significant importance [1]. The manual evaluation approach is employed in the conventional English teaching competence evaluation process [2]. Although the manual evaluation approach has the advantage of being relatively flexible, human evaluation is subject to some degree of subjectivity [3]. On the other hand, it is simple to introduce significant evaluation errors when combined with specific mixed factors [4]. Thus, the establishing trustworthy method for assessing teaching quality is necessary in order to arrive at exact assessment of impact of English classroom instruction [5]. It is challenging to create an accurate and trustworthy teaching quality assessment method, though, as teaching English includes a dynamic method of teaching, learning. Numerous factors that influence teaching quality, these factors vary in their degree of influence [6]. Additionally, complex nonlinear relationship among assessment indicators, teaching effects. As a result, Intellectual evaluation approach of English teaching excellence emerged as prominent area of current study [7]. A weighted interval-valued double hesitant fuzzy set designates membership, non-membership values with weights in the form of intervals, is introduced as part of teaching quality evaluation approach depend on WIVDHFS [8]. Determining the degree of agreement and disagreement in greater detail through these assigned weights can aid decision makers (DMs) in reaching accurate, rational, and consistent decision outcomes [9]. For multi-criteria group decision making, novel WIVDHFS environment is built [10]. Lastly, a teaching quality evaluation application scenario is given [11]. However, this method's evaluation of teaching quality is time-consuming and requires improvement [12].] An algorithm for evaluating English teaching abilities that uses information fusion and fuzzy K-means clustering in large dataset. Utilising concept of K-means clustering, examine initial error data that was gathered, including policy relevance, teacher level, and investment in teaching services. Discard any data process deems untrustworthy, utilise remaining data that is valid to compute and rectify fuzzy logic [13]. To determine the final fusion value, the algorithm's weighting factor is weighted, averaged by node measurement data [14]. Evaluation of English teaching ability is realised, related English teaching resource allocation plan is developed, clustering and integration of English teaching aptitude index parameters are realised through combination of big data information fusion, the K-means clustering algorithm.

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Nevertheless, this method's intelligent evaluation accuracy still needs to be further enhanced [15]. The characteristics of English teaching ability index are realised, together with the accompanying plan for allocating English teaching resources, assessment of English teaching capacity. Though, intellectual assessment accurateness of this technique necessities to more enhanced. The assessment of exact English teaching quality, evaluation index scheme altered along with exact situation to develop versatility of English teaching quality assessment. After, investigation will develop investigation sample, utilize it other features of English subject to develop scope of application of this technique.

It can preserve higher assessment accurateness, at similar time have higher real-time performance, verifies that technique has higher evaluation performance of this technique is excellent, it utilized to practical application of English teaching quality evaluation.

Major contributions of this manuscript are summarized below:

- The APETE-PRGAN-GOA system introduces an Assessment and Prediction of University English Teaching Effect for efficient English teaching material suggestions.
- Through the application of the Learnable Edge Collaborative Filtering (LECF), data redundancy is effectively eliminated useless words in the recommendation system.
- The recommendation of English Teaching Effect is facilitated through the application of Progressive Recurrent Generative Adversarial Network.
- Remaining part of this manuscript is arranged as below: segment 2 evaluates literature review, proposed method is designated in segment 3, results with discussion is established in segment 4, conclusion is presented in segment 5.

II. METHODOLOGY

Numerous investigation works were suggested in the literature related to Assessment and Prediction of University English Teaching Effect Using Machine Learning; some of current investigations were assessed in this part.

Narengerile and Di [16], have presented An Intelligent Assessment Method of English Teaching Ability Based on Improved Machine Learning Algorithm. Here, intellectual evaluation technique depend on an enhanced ML process was proposed in order to assess English teaching ability intelligently, investigate quality of instruction. This method can guarantee the efficient distribution of resources for instruction, analyze large amounts of data pertaining to the evaluation's constraint parameters, and produce frequent item sets of instruction quality using big data mining technology. SVM parameters were optimized using the particle swarm optimisation (PSO) technique. The decision function's optimal parameters are included to fulfill goal of English teaching quality assessment.As a result, it offers greater evaluation accuracy and lower Mean Square Error.

Shang [17], have presented application of ML-IoT methods in evaluation of English teaching effect in colleges. Here, the teaching effect in the classroom takes into accounts the techniques, approaches of the teachers, their communication skills, students' capacity for autonomous learning. Enhancing these abilities during the article's design process requires reading through a lot of pertinent literature reviews and becoming familiar with method process; fuzzy comprehensive assessment technique utilized to assess method calculation process was further laborious but simple. It offer fresh perspective on how to assess the impact of teaching English in middle schools and be used to various evaluation-related issues.As result, it offers greater recall and lower Occurrence.

Yin and Xu [18], have presented ETE method depend on ARA-ML. The purpose was to examine the model and analyze English teaching assessment using the ARA-ML. The topic of English teacher evaluation was brought up in this study. Modelling studies provide the foundation for this query. Thus, it explains the ideas behind association rule algorithms and machine learning.It provides high Correlation coefficient and low evaluation time.

Lu et al. [19], have presented supervision system of English online teaching depend on ML. Here, online English teaching audit procedure has merged remote supervision with MLA offered. Here, IRS-MLA mimics application of supervision approaches in teaching method in accordance with the actual requirements of online English instruction. Furthermore, assessing student accomplishment and delineating the educational process from the perspectives of educators and learners respectively determines the effectiveness of a teacher. As a result, it offers greater recall and higher F1-score.

Yang [20], have presented analysis of English cultural teaching method depend on ML. Here, explains parts of faculty, students along with necessities for academic assessment. Most people were unaware of the online

education model even prior to the outbreak. People are only compelled to enter the realm of online teaching when they are unable to conduct direct, offline classes. Approximately 60% of nations are attempting to transform their educational institutions to these online models, which facilitate better student-teacher connection and offer a variety of learning plans. Major technical revolutions in information technology organizations gained popularity during cloud computing disaster is big data.As a result, it offers greater RoC and a lower mean square error.

Wang [21], have presented ML-depend intelligent scoring of college English teaching in the field of NLP. Here, undertakes a number of theoretical investigations, including theoretical analysis of NLP technologies, an analysis of related intelligent scoring technologies, design of a methodical procedure for intelligent scoring college English instruction, theoretical investigation of NB process in ML. Furthermore, research and analysis are done on the accuracy of scoring and categorization as well as the inaccuracy of intellectual scoring of English instruction in colleges, universities. As a result, it offers greater recall and lower Mean Square Error.

Jiaxin [22], have presented evaluation method of English teaching based on ML. Here, assessment of English language instruction was gaining popularity. The development of a machine learning-based approach to English teacher assessment aims to increase the evaluation's accuracy while decreasing its inaccuracy. First, the meaning of English classroom teaching assessment was examined in detail. Next, English teaching assessment index selection process was finished, design of selection principle was created. Second, the English teaching assessment index's judgement is generated by analyzing ML technique, applying analytic hierarchy procedure.As a result, it offers greater F1-score and lower occurrence.

III. PROPOSED METHODOLOGY

APETE-PRGAN-GOA is discussed in this section. This section presents the Assessment and Prediction of University English Teaching Effect Utilizing PRGAN. Block diagram of APETE-PRGAN-GOA is represented by Figure 1. Thus, the detailed description about APETE-PRGAN-GOA is given below,

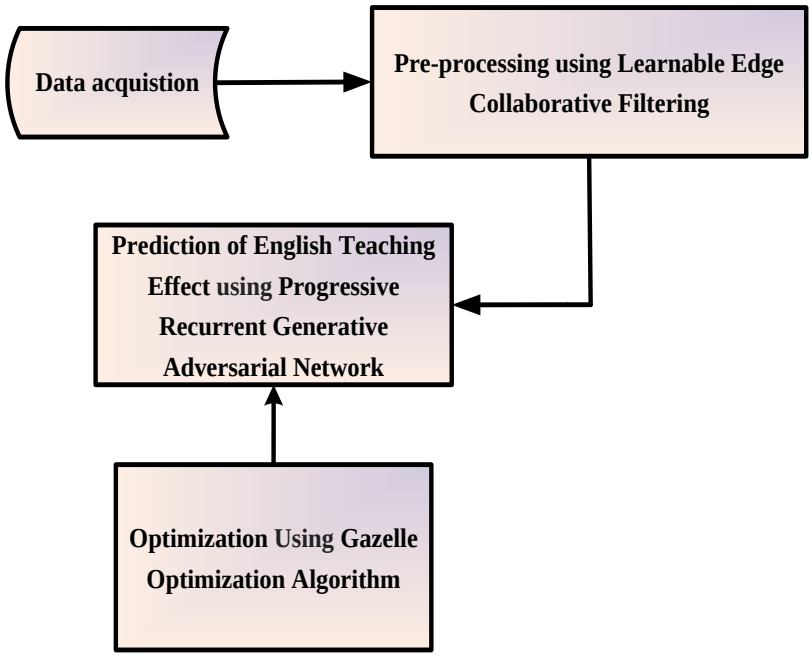

Figure 1: Block diagram of APETE-PRGAN-GOA methodology

A. Data Acquisition

The input dataset is gathered from figshare. Data collection resources on English teaching platform are mostly collected of unstructured data (likes images, audios, texts), some semi-structured data (likes XML, JSON, Encyclopedia); such dual types of data can’t be well predictable by computers, necessity to be altered into structured data to execute succeeding algorithmic calculations.

B. Pre-processing using Learnable Edge Collaborative Filtering (LECF)

In this step, LECF [23] is used for remove useless words. LECF remove existence probability of edge depend on connections between English teaching effect, is capture complex relationship in data. Intellectual assessment of English teaching ability, explore quality of English teaching, assessment technique of English

teaching ability. Then the LECF, presented with quality assessment n to represent an edge (v, j), that shown in equation (1),

$$n_t(v, j) = g(n_v, n_j) \tag{1}$$

here $g(n_v, n_j)$ denotes the words removal, transition probability for next node (vq) defines in equation (2),

$$L(t_{q+1} \mid t_q) = \begin{cases} \dfrac{1-\beta}{|T(vq)|} \end{cases} \tag{2}$$

where, t_q signifies set of edges related by node V in bipartite graph, $T(vq)$ denotes number of edges in Vq. Applying dynamic processes to $L_{yx,q|q-1}$ remove data useless words and linear regression model $L_{q|q-1}$ can be developed in equation (3),

$$P = \sum_{(v,j,i)\neq C} -1m\partial(y_t) - x_t(v,i) + \gamma \tag{3}$$

where $x_t(v,i)$ signifies training set, E denotes set of edges, each detected interactions, in sigmoid function, $m\partial$ signifies method parameters, γ signifies parameter to control regularization strength. Lastly, pre-processed output is fed into Prediction of English Teaching Effect.

C. Prediction of English teaching effect usingProgressive Recurrent Generative Adversarial Networks

In this section, Prediction of English teaching ability PRGAN [24] is discussed. While the capacity to teach English is predicted using PRGAN. PRGAN is designed for predicting the effect and fine-grained in English teaching. Meanwhile, a steel surface database captured from actual hot-rolling line is built for first time for open assessment of predict English teaching ability defined in the following equation (4),

$$U(F,C) = T_{s-l}[\log(C(S))] \tag{4}$$

where U represent the English teaching ability, respectively. Opening English courses in colleges, universities should pay attention to enhancement of liveliness, interest. It develop the quality of English teaching shown in equation (5),

$$C^{\otimes} = \arg\max_{C} U(C,F) \tag{5}$$

Input of all step of generator comprises of dual roles output of preceding ability in equation (6),

$$Y_{e-0.5} = g_{in}(Y_{e-1,}x) \tag{6}$$

where g_{in} denotes stage-invariant, network parameters recycled various steps, importantly reduce memory, computing usage. Generally, minimizes sum of absolute various among target value, estimated value. English teaching quality evaluation model is denoted in equation (7),

$$P1(\hat{x}, x) = \sum_{j=0}^{n} |x^{(j)} - \hat{x}^{(j)}| \tag{7}$$

So, based on mixed strategy, exact assessment quality of English teaching is shown in equation (8),

$$F^* = \arg\min_{F}\max_{C} U(F,C) + (\beta.P_{P1} + \alpha).\lambda \tag{8}$$

where β set to 0.75. α set to 1.1. λ set to 50. L1 teacher's English teaching course was designated as test object. Total of 8,700 people appeared English teaching. Finally, PRGAN for Predict English teaching ability. Due to its convenience, pertinence, AI-depend optimization approach is taken into account in PRGAN classifier. Here, GOA is employed to enhance PRGAN optimum parameter $FandC$. Thus, GOA is employed for tuning weight, bias parameter of PRGAN.

D. Optimization using Gazelle Optimization Algorithm

The weights parameter $FandC$ of PRGAN is optimized using the GOA [25]. Every day, gazelle knows that doesn't outrun, out maneuver predators, it becomes meat for day. Gazelles are down in food chain, most hunted preys in habitat. The projected daily hazard rate from human activity is significantly higher than the hazard rate from natural predation, according to a study done on Mongolian gazelles.

1) Stepwise process of CLOA

The step by step process is defined to attain optimal values of PRGAN utilizing GOA. Initially, GOA makes uniformly distributed population for enhancing optimal parameters of PRGAN parameters. Optimal solution is promoted utilizing GOA method then equivalent flowchart given in Figure 2. The process of complete step is given in below,

Step 1: Initialization

GOA optimization instigates by initializing candidate population of gazelles Y expressed in Equation (9). Population is created stochastically among given problem's upper bound and lower bound.

$$W = \begin{bmatrix} w_{1,1} & w_{1,2} & w_{1,c-1} & w_{1,c} \\ w_{2,1} & w_{2,2} & w_{2,c-1} & w_{2,c} \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & w_{j,i} & \cdot \\ \cdot & \cdot & & \cdot \\ w_{m,1} & w_{m,2} & w_{m,c-1} & w_{m,c} \end{bmatrix} \tag{9}$$

where W signifies set of current candidate population, created randomly used, wj denotes location of $i-th$ dimension of $j-th$ population, m denotes total number of candidate populations (solutions), c signifies dimension.

Step 2: Random Generation

Input parameters created at randomly. In this case, best agent W determined after evaluating the fitness of each search agent.

Step 3: Fitness Function Estimation

A random solution is created using initialised evaluations. It is assessed by parameter optimization value for enhancing weight parameter $FandC$ of the classifier PRGAN. This is given in equation (10),

$$fitness\ \ function = optimizing\ F\ and\ C \tag{10}$$

Step 4: Exploitation phase for optimizing $FandC$

In this stage, it assumed that the gazelles are either stalked by a predator or are grazing contentedly in the absence of one. During this stage, the domain's neighbouring areas were efficiently covered by using equation (11),

$$\vec{gazzelle}_{i+1} + F * .C \bullet \cdot \left(Elite - F \bullet \cdot \vec{gazelle}_i \right) \tag{11}$$

where $\vec{gazzelle}_{i+1}$ signifies solution of succeeding iteration, $\vec{gazelle}_i$ denotes solution at present iteration, c signifies grazing speed of gazelles, F denotes vector comprising random numbers signifying Brownian motion denotes vector of uniform random numbers.

Step 5: Exploration

The instant a predator is sighted, the exploring phase begins. When faced with danger, gazelles will often stomp their feet, flick their tails, or jump into the air up to a height of two metres using all four feet. Equation (12) depicts exact method of gazelle's behaviour when it detects the predator.

$$\vec{gazzelle}_{i+1} + r.\vec{v}.\vec{S} * .\vec{S}_P \bullet \cdot \left(Elite - S_P \bullet \cdot \vec{gazelle}_i \right) \tag{12}$$

where r denotes top speed, gazelle able to be reach, $\vec{S}_P$ signifies vector of random numbers depend on Levy distributions.

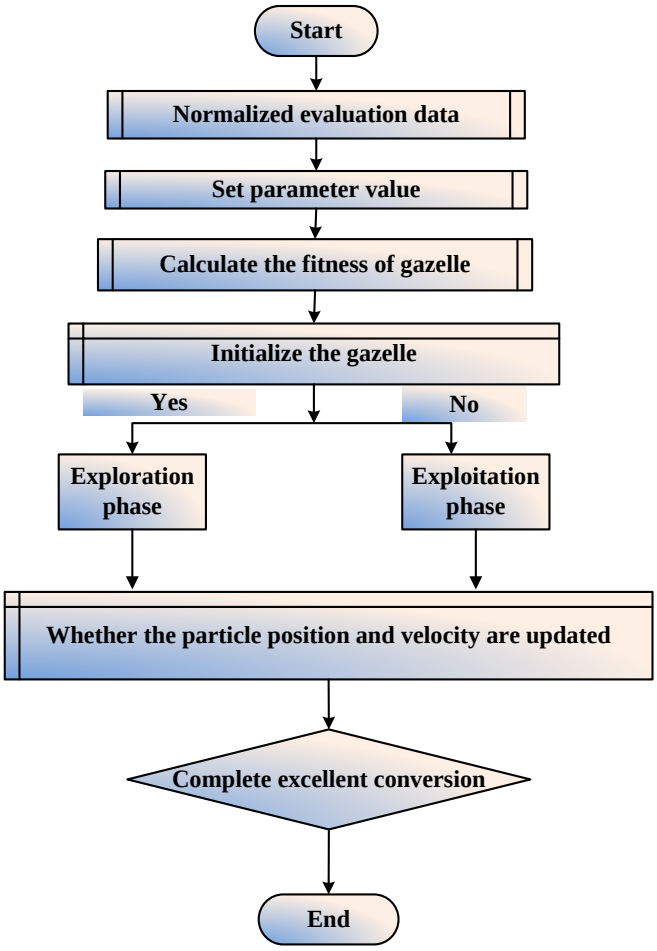

Figure 2: Flowchart of GOA for optimizing DAGAN parameter

Step 6: Termination

The weight parameters $FandC$ from Progressive Recurrent Generative Adversarial Network are optimized by support of GOA process, iteratively reiteration step 3 until halting conditions $W = W + 1$ met**.** Then finally PRGAN recommend the English teaching effect with better accuracy through lower MSE.

IV. RESULT WITH DISCUSSION

Experimental result of suggested technique is discussed. The proposed technique is implemented in python. Utilising a workstation equipped with an 11-GEN CPU and an Intel Core i7 with 8 GB RAM. Obtained outcomes of APETE-PRGAN-GOA technique is analysed with existing method likes ISM-ETE-CNN, CNN-ETE-IOT, ETE-ARA-SCN respectively.

A. Performance measures

Performance of proposed approach is calculated utilized the following performance metrics. The performance evaluation matrices such as evaluation accuracy, Correlation coefficient, mean squared error, evaluation time, occurrence (time), recall, F1-score, and ROC have been taken into consideration while conducting proposed research. Measure performance matrix, true negative, true positive, false negative, false positive values are required.

1) Accuracy

It is a metric utilized to scale English teaching ability made a method calculated as ratio of correctly categorized the instances to total instances in dataset. It determined in equation (13),

$$Accuracy = \frac{(TP + TN)}{(TP + FP + TN + FN)} \tag{13}$$

2) Correlation coefficient

The correlation coefficient is statistical scale that quantifies degree, which dual variables are linearly related in equation (14),

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 . \sum (y_i - \bar{y})^2}} \tag{14}$$

where x_i, y_i denotes individual data points in dataset X and Y.

3) MSE

The average squared difference among actual (observed) values, anticipated values in a collection of data is quantified using MSE metric is presented in equation (15),

$$MSE = \frac{1}{n} \sum_{i=1}^{n} \left(y_i - \hat{y}_i \right)^2 \tag{15}$$

here n denotes data points, y_i signifies actual value for i-th data point, $\hat{y}_i$ represents forecast value for i-th data point.

4) Recall

Recall is considered by separating total number of elements in positive class with number of genuine positives. It's determined by equation (16),

$$\text{Re}call = \frac{TP}{(TP + FN)} \tag{16}$$

5) F1-score

It is a metric commonly used in classification methods that combines precision, recall into single value, providing more balanced evaluation of a method's performance is given in equation (17),

$$F1 - Score = 2 \times \frac{recall \times precision}{recall + precision} \tag{17}$$

6) RoC

RoC provides information about University of English Teaching Effect. It is scaled in equation (18),

$$RoC = 0.5 \times \left(\frac{TP}{TP + FN} + \frac{TN}{TN + TP} \right) \tag{18}$$

B. Performance analysis

Figure 3 to 9 displays simulation results of APETE-PRGAN-GOA technique. Then, APETE-PRGAN-GOAmethod is analyzed with existing ISM-ETE-CNN, CNN-ETE-IOT and ETE-ARA-SCN methods respectively.

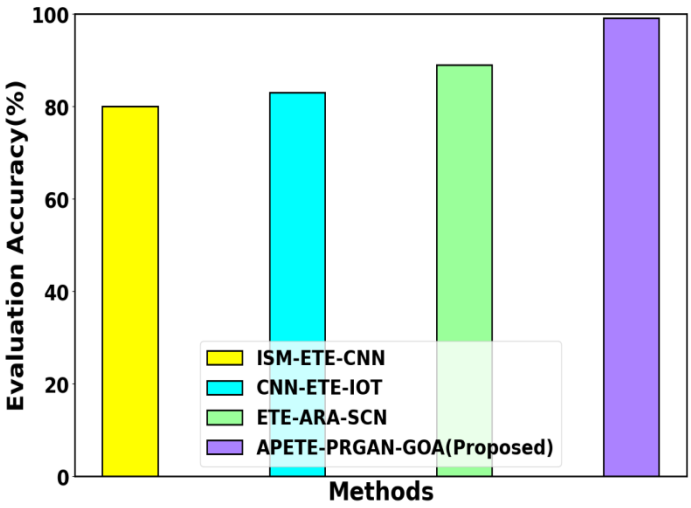

Figure 3: Evaluation Accuracy analysis

Figure 3 depicts evaluation accuracy analysis. A metric used to quantify the correctness of forecasts made by system. It measures ratio to total number of examples in dataset. The APETE-PRGAN-GOA method attains 32.58%, 26.73%, 24.22%, greater evaluation accuracy analysed with existing techniques such as ISM-ETE-CNN, CNN-ETE-IOT and ETE-ARA-SCN respectively.

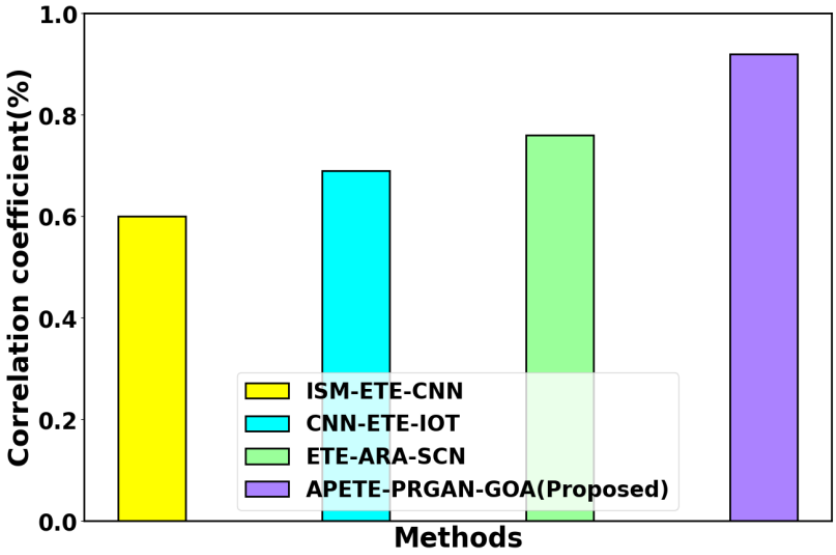

Figure 4: Correlation coefficient analysis

Figure 4 depicts correlation coefficient analysis. It is a statistical scale that quantifies strength, direction of linear relationship among dual variables. It measures ratio to total number of instances in dataset. The APETE-PRGAN-GOA method attains 32.58%, 26.73%, 24.22%, greater correlation coefficient analysed with existing techniques such as ISM-ETE-CNN, CNN-ETE-IOT and ETE-ARA-SCN respectively.

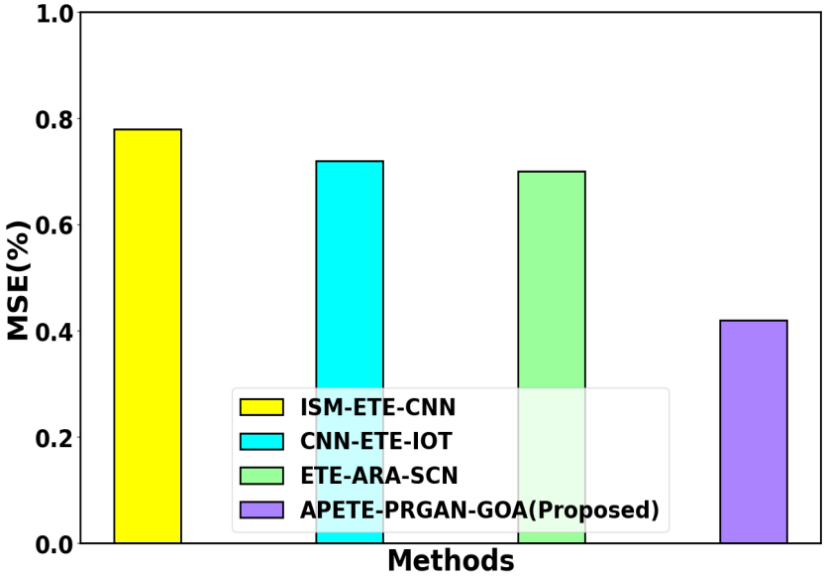

Figure 5: MSE analysis

Figure 5 depicts MSE analysis. In statistical analysis, the mean square error is a metric that measures average of squares of disparities between observed and projected values. The APETE-PRGAN-GOA method attains 26.58%, 20.73% and 19.62%, lower Mean Square Error analysed with existing techniques likes ISM-ETE-CNN, CNN-ETE-IOT and ETE-ARA-SCN respectively.

Figure 6 depicts evaluation time analysis. Evaluation time is a critical phase in assessing performance or outcomes, providing an opportunity to measure the effectiveness of a particular process. The APETE-PRGAN-GOA method attains 26.58%, 20.73% and 19.62%, lower Evaluation time analysed with existing techniques likes ISM-ETE-CNN, CNN-ETE-IOT and ETE-ARA-SCN respectively.

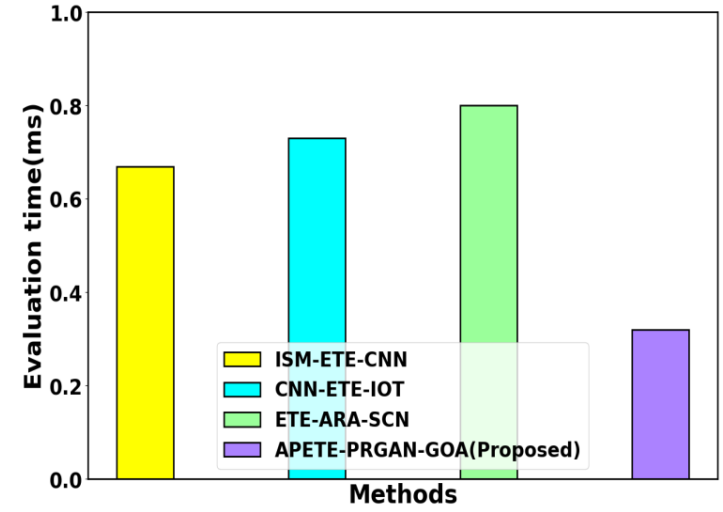

Figure 6: Evaluation time analysis

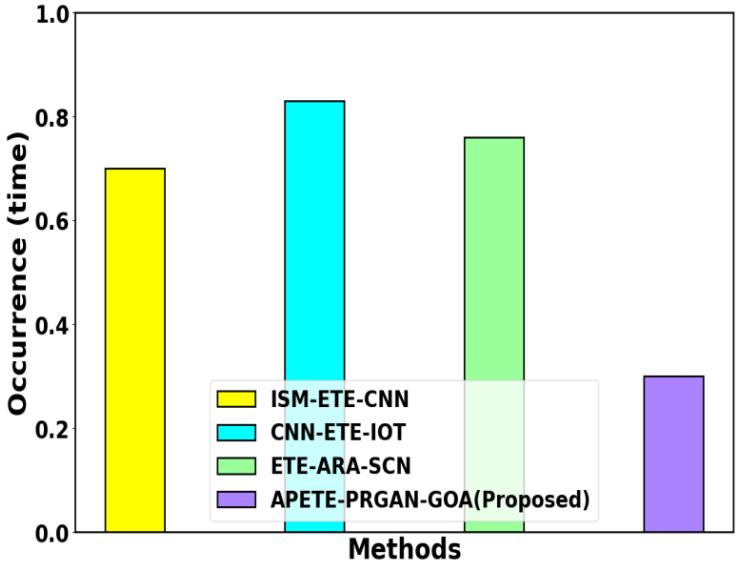

Figure 7: Occurrence analysis

Figure 7 depicts occurrence analysis. An occurrence in time is provide a structured framework for analysing patterns, identifying trends, and gaining insights into the temporal aspects of events and decision-making. The proposed APETE-PRGAN-GOA method attains 26.58%, 20.73% and 19.62%, lower Occurrence analysed with existing techniques likes ISM-ETE-CNN, CNN-ETE-IOT and ETE-ARA-SCN respectively.

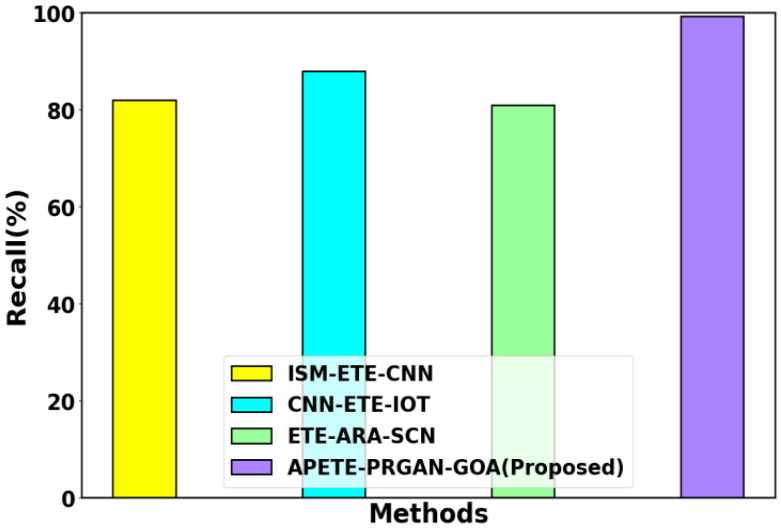

Figure 8: Recall analysis

Figure 8 depicts recall analysis. It is the actual positive cases which are correctly identified. The proposed APETE-PRGAN-GOA method attains 26.58%, 20.73% and 19.62%, higher recall analysed with existing techniques likes ISM-ETE-CNN, CNN-ETE-IOT and ETE-ARA-SCN respectively.

Figure 9 depicts F1-score analysis. It is generally used as metric to evaluate the performance of PRGAN technique. The APETE-PRGAN-GOA technique attains 26.58%, 20.73% and 19.62%, higher F1-score analysed with existing techniques likes ISM-ETE-CNN, CNN-ETE-IOT and ETE-ARA-SCN respectively.

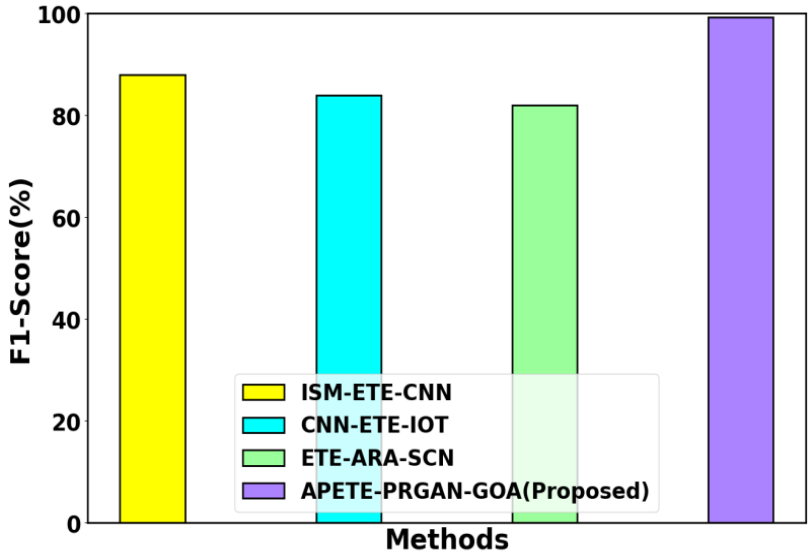

Figure 9: F1-score analysis

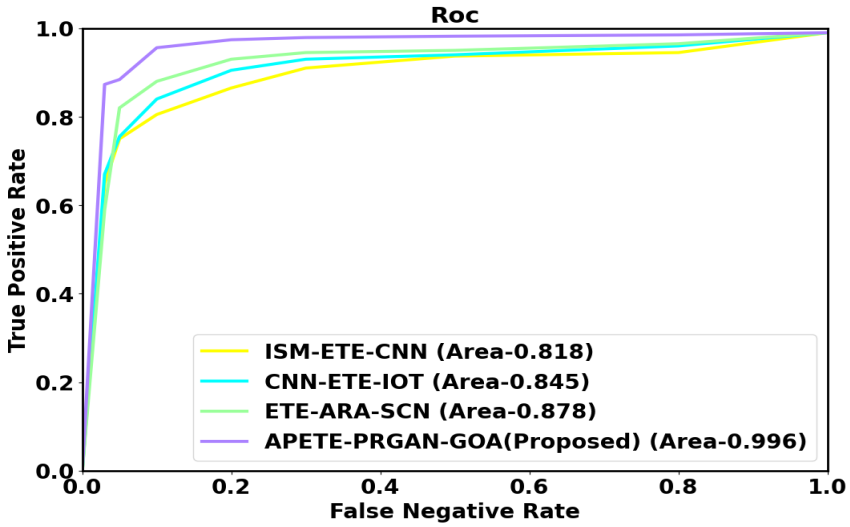

Figure 10: ROC analysis

Figure 10 depicts ROC analysis. It is graphical representation utilized to evaluate performance methods across different discrimination thresholds. The proposed APETE-PRGAN-GOA technique attains 32.30%, 30.92% and 27.37% higher ROC analysed with existing techniques likes CNN- ILPD -LDC, DNN-ILPD-EDL and KNN- ILPD-LDC respectively.

C. Discussion

In the teaching process, assessing English teaching proficiency is very crucial. Here, proposes an intellectual evaluation technique of English teaching ability depend on enhanced Progressive Recurrent Generative Adversarial Network to increase accurateness, efficacy of English teaching evaluation. Gazelle Optimisation Algorithm optimizes the support vector machine's parameters, completing construction of English teaching quality rating method. It has also been confirmed by case analysis that this approach may accurately and successfully assess quality of English instruction provided in colleges, universities, a positive assessment effect. As training times rise, MSE until it reaches 0.1 after 70 iterations. Simultaneously, evaluation time of English teaching quality is lesser than 150 ms, accuracy of the assessment is 95%, and the results have a 0.95 correlation coefficient. To increase the adaptability of the assessment of English teaching quality, evaluation index scheme

modified in accordance with the particular circumstances. After investigation, develop investigation sample utilize it other aspects of English subject to develop scope of application of this technique.

V. CONCLUSION

The evaluation of English teaching ability is more significant in teaching. To develop accurateness, efficacy of English teaching evaluation. Here, Assessment and Prediction of University English Teaching Effect Using Progressive Recurrent Generative Adversarial Network (APETE-PRGAN-GOA) was successfully implemented. The APU-ETE-PRGAN method attains 30.58%, 28.73% and 25.62%, higher evaluation time, 20.48%, 24.73%, 29.32% higher occurrence and 30.98%, 26.66% and 21.32% higher recall, 26.78%, 34.47%, and 22.86% higher Correlation coefficient analysed with existing techniques like ISM-ETE-CNN, CNN-ETE-IOT, and ETE-ARA-SCN respectively.

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