Evaluation and Analysis of English Predicate Constructions Incorporating Multiple Linear Regression Algorithms

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Keywords: multiple linear regression algorithms, english predicate constructions, BERT, attention mechanism, predicate verbs, english teaching

Recieved: October 13, 2023

In this research, the multiple linear regression methods, and multiple linear regression matrices and arithmetic rules are used to develop a representation for teaching English predicate construction, while a grammatical property of verbs is examined on regression matrices and logical relations. The qualities of subject verbs as sentence focus points are discussed in this study, along with two methods for recognizing English predicate verbs that are based on attention mechanisms and BERT. The focus mechanism-based method has the potential to improve the dependent verb's recognition performance over the standard approach by extracting the phrase's long-distance semantic dependence information. The BERT-based English predicative verb detection representation advance upon the prior technique by making more effective use of the input corpus. A multiple linear regression-based strategy is suggested for distinguishing predicate verbs that are unique within phrases. Information may be produced in a way that is most productive during the punishment phase and completely conforms to the conditional verb's group identity by establishing the categorization fitting criteria during training. The proposed study has provided a comparison time of 97s.

Povzetek: Za poučevanje angleške predikativne konstrukcije so bile uporabljene linearne regresijske metode, matrike in aritmetična pravila. Gramatične lastnosti glagolov in metode na osnovi mehanizmov pozornosti in BERT so bili uporabljeni za prepoznavanje predikativnih glagolov v angleščini.

1 Introduction

With the fast advancement of information technology, artificial intelligence has become indispensable in living in the open. As an area of artificial intelligence, the processing of natural languages relates to the capability of paces to sequence the form, significance, as well as noise of human language, in addition, to deceive as well as the feedback, outcome, acknowledgment, assessment, and understanding of words, paragraphs, and chapters, all of that have a significant impact on the interplay among machines and human beings. Given today's explosion of information, data processing confronts significant obstacles, making it critical to employ automated tools and approaches to assist humans in processing and analyzing this data (Guell, Gabrieli, & Schmahmann, 2018). Information extraction has evolved in this setting. The primary objective of data extraction means to remove particular information, including structural and semantic data, from processed, semi-structured, or mark-up language, therefore assisting us in classifying, removing, and reconstructing large amounts of material. Entity identification, connection recovery, occurrence identification, and network extracting are the four major tasks in extracting information (Liang& Wang, 2019). The intensity disparity of arbitrary matrix (tail inequality) is an important research issue of the arbitrary matrix that is used to design the achievement of biological ecosystems under ambiguity instabilities in many research areas including such shear perceived

notion, computing, and enhancement. Make meaning and verb meanings engage in the production of lexical semantics; on the one side, the design suppresses the words which enter it, but the verb" which means also impacts the construct's choices of verbs. The employment of no prototypical verbs causes the construct to progressively infer additional meanings depending on the fundamental aim, resulting in a multisensory construct network. Assume concentration phenomena occur in the tail behavior of linear regression volatility. In such a situation, the important system parameters may be monitoredeffectively; making it worthwhile to investigate the focused efficiency of linear regression matrix Conventional regulation and standardized measures premise techniques for verb detection have shown strong outcomes on predicated verb assignments and have been empirically demonstrated to be successful. Unfortunately, predicate verb recognition approaches depend on manually produced characteristics and a plethora of machine learning techniques (Helo, Hao, Toshev, &Boldosova, 2021). Manually features extraction construction in this approach necessitates a high degree of topic expertise. Processing of natural language technologies has developed various restrictions that may create toolsets ineffective throughout the design phase due to poor corpus quality and a narrow reference range. Because of their limited generalization capacity, the models are unable to apply the feature engineering they created when confronted with fresh domain data. All of the previously stated issues have contributed since the conditional word identification job has yet to provide superior results. Deep learning approaches, on the other hand, have produced excellent outcomes for solving natural language processing problems by dynamically acquiring further details about the feature via dimensional operations than standard solving natural language processing techniques. Constructive grammar provides a theoretical basis for grammar instruction. The essential principles of human cognition may also be reflected in linguistic truth (Hagleret al,2018). The mental impression of "comprehensiveness," which is guided by certain cognitive rules such as the "rule of ordering," is compatible with the comprehension of the overall meaning of constructs. The general meaning of constructions is congruent with methods of analysis of success parameters and is guided by cognitive rules as in the "order rule," "pairwise concept," "integration doctrine," and "volume concept." In reality, instructors should forgo the strategy of distinguishing and teaching distinct phrase patterns via subcategories and analyzing word sequences in favor of emphasizing students' comprehension of construction meaning. Constructive language is appropriate for teaching marked constructs, constructions, outside noun structures, remaining alone structures, and conceptual structures such as bidirectional, infinitive, infinitive, derivational, consequential, and double sentential structures (Höder, 2018). Instructors, for instance, do not help pupils comprehend the structure of a double bidirectional construct by classifying the words, studying the topic, the predicated, the object, the object, the afflicted artifact of the receiver, and so on. Alternatively, teachers may inform a pupil of the constructional significance of this construct is "deliberate providing transference," and that every incident of entry into the construct as an explanation of an expression is a mix of the construct's semantic and the vocabulary's meanings. The arbitrary field the optimized has an exceptional capacity for high standard deviation characteristics that increases the English prescriptive verb's effectiveness unique model and allows more precise detection Creating distinct employing prescriptive verbs just a classifier (Seo, Huang, Bassenne, Xiao, & Xing, 2019). The former method is enhanced by the 'Predicative verb recognition model for English using BERT', which maximizes input corpus and improves model performance.

The following is the structure of this paper: Creating an English Predicate Construction Teaching Model (Section 4), creating a Related Works section (section 3), evaluating the Results part (Section 5), and Conclusion section (Section 6).

2 Related work

Table 1: The investigation of the relevant literature

References	Methodologies	Outcomes
(Wang, 2022)	This research proposed vector space and word vector grouping models	The results show significant gains when integrating features based on

	for English composition assessment, based on machine learning. Word2Vec uses statistical data as content characteristics to create test models after word training.	word vector clustering into content text, especially in the maximum entropy model (+0.048) and XGBoost model (0.771 to 0.803). Tested on 100 articles chosen at random, the accuracy percentage is 68%, indicating potential influence on reforming English instruction and raising the standard of higher education.
(Zhou & Liu (2021).	This study used a classification model with a foundation in data mining and machine learning to create an algorithm for correcting grammatical errors in English written for nonnative speakers. It builds a simple corrective model, presents feature extraction techniques, and examines earlier research.	The suggested classification model-based method improves in accuracy as more training data are added. It improves recognition rules, increases correction efficiency, shortens processing time, saves storage space, and simplifies the processing flow, providing useful insights for future study in English grammatical mistake correction algorithms.
(Liu & Wen, 2022)	The random matrix thinking model was introduced in this study, and it was used to examine the grammatical properties of verbs and develop a model for teaching English predicate constructions based on mathematics and random matrix thinking.	The attention mechanism increases long-distance semantic dependence recognition, hence improving predicate verb recognition. The BERT-based model efficiently leverages the input corpus, resulting in increased performance. Furthermore, which optimizes data and achieves higher results by global identity fitting during training.
(Li, 2022)	A suggested intelligent recognition model, based on an enhanced GLR algorithm, is called fuzzy semantic optimal control. This technique generates a large phrase corpus while resolving the constraints of prior approaches.	The suggested technique improves processing efficiency and operating speed in machine translation jobs, outperforming statistical and dynamic memory algorithms with a recognition accuracy of 95%. This gives the area of machine translation an alternative point of view.
(Meng& Wang, 2022)	This study presented a machine learning-based English composition assessment model that makes use of two cutting-edge content representation techniques: vector space modeling and word vector grouping. First trained, the Word2Vec model outperforms	The assessment, carried out on a randomized subset of one hundred articles, results in a 68 percent mistake detection accuracy. By using word vector clustering characteristics, the suggested model shows significant gains in efficacy, indicating its potential to improve

	approaches such as maximum entropy and XGBoost, showing a significant improvement of 0.048 for the former and an increase of 0.771 to 0.803 for the latter.	English instruction and support quality-focused changes in higher education.
(Peng, 2022).	This research promotes improvements using pretrained models in extractive and generative algorithms with a focus on better preservation of global information. These algorithms are used in the suggested joint model to provide summaries that are less repetitive and more logical.	Comparative studies carried out on various datasets demonstrate a significant increase in assessment measures of up to 2.5 percentage points. An automated abstract generating prototype system is used to show the usefulness of the technique.
(Wang, 2022)	The research proposed combining knowledge graph embedding and link scoring techniques to handle missing answers in existing question-and-answer approaches. It creates a question connection while searching for the best response, thereby reducing answer omissions.	The English teaching test system exhibits an 86.85% F1 score in the experimental findings, showing high generalization performance and better response selection without excessive dependence on a priori knowledge.
(Cai& Zhuang, 2022)	This research described an integrative analysis platform for English and American literary resources that used data mining. It makes use of the improved Apriori algorithm to integrate multichannel data via web technologies, resulting in a single, efficient data management system.	The suggested technique computes the grey connection degree while optimizing target data by conveying a value purpose. When compared to previous approaches, simulation results show better data structure simplicity, accuracy and quality, and query performance, as well as higher application and high-quality resilience.
(Жуковська, Мосіюк, &Бук, 2023)	This research used a quantitative corpus-based analysis using the statistical platform R to investigate the register distribution of detached nonfinite/nonverbal constructs in modern English.	The study contradicts popular perception by finding an extended register distribution of these constructs, contrary to popular belief regarding their restricted reach. In studying complicated clause-level constructs, the merger of quantitative corpus linguistics and machine learning proved successful.
(Hu, Tang, Wu, & Zeng, 2022)	This research developed a neural network-based English grammar mistake correcting model. It analyzes distinct feature impacts in article error correction using logistic	The paper investigates efficient feature expression in English grammatical mistake correction, offering two optimization strategies for feature representation. The

	regression following feature selection.	experimental findings show that the suggested paradigm was successful.

3 Multiple linear regression algorithms

3.1 Data processing and analytics

Database normalization, performed during the pre-processing phase to mitigate the dimensionality effect of variables, is widely regarded as a critical step. This is why the following phrase was used to normalize the input and output variables to the range of 0–1 before any model was developed:

$$y_{NORMALISED} = \left(\frac{y - y_{min}}{y_{max} - y_{min}}\right) \quad (1)$$

The term "min-max" is used to describe this method of normalization. Once normalization is complete, the dataset is split into separate subsets to be used for training and evaluation. Seventy percent of the full dataset is sampled at linear regression to construct the training subset, while the remaining thirty percent is split evenly between the testing and validation phases. In addition, various statistical performance criteria are typically used to evaluate a regression model's efficacy. Coefficient of determination (R2), variance explained (VAF), Root-mean-square-error (RMSE), correlation coefficient (R), and performance index are the five commonly-used statistical indicators calculated to calculate the predictive models in this study (PI). Since the importance of prediction is high for the model, these parameters give a wonderful indication of the excellence of fit. Exact mathematical expressions for the parameters can be formulated as:

$$RMSE = \sqrt{\frac{1}{m}\sum_{j=1}^{m}(L_E - L_B)} \quad (2)$$

$$K^2 = \frac{\sum_{j=1}^{m}(L_E - L_{MEAN})^2 - \sum_{j=1}^{m}(L_E - L_b)^2}{\sum_{j=1}^{m}(L_E - L_{MEAN})^2} \quad (3)$$

$$VAF(\%) = \left(1 - \frac{var(L_E - L_b)^2}{var(L_E)}\right) \times 100 \quad (4)$$

$$PI = adj.K^2 + 0.01VAF - RMSE \quad (5)$$

These indices allow us to compare the performance of each model and check its accuracy and precision; note that for a perfect model, the value of these indices should be equal to their ideal value as stated.

3.2 Multiple-Linear Regression analysis

An important numerical method for examining the complex correlations between predictor variables are often referred to as input parameters and a collection of unrelated variables that the output parameter is the use of multi-linear regression analysis. Equation (6) demonstrates how this statistical technique, which we used in our investigation, reveals the expected linear relationships between the input and output variables.

$$x = \beta_0 + \beta_1 Y_1 + \beta_2 Y_2 + \cdots . \beta_b Y_b \quad (6)$$

The predicted or expected value of the dependent variable is denoted by the symbol x in this equation. Regression coefficients β_1 through β_b quantify the influence of each predictor on the dependent variable, whereas the predictor variables are denoted by, Y_1throughY_b. Significantly, beta β serves as a baseline reference point by indicating the dependent variable's value when all predictor variables are zero.

3.3 Reliability analysis

The estimated safety factor from the aforementioned methods may be subject to a large number of uncertainties and so cannot be used as-is in risk assessment.

$$\beta = \frac{\mu_h}{\sigma_h} = \frac{\mu_K - \mu_G}{\sqrt{\sigma_K^2 + \sigma_G^2}} \quad (7)$$

As the likelihood relies heavily on the mean and variance of the gained factor of safety, we can calculate the reliability index (β) in terms of the factor of safety as follows:

$$\beta = \frac{\mu_L - 1}{\sigma_L} \quad (8)$$

Where μ_L represent the mean and σ_L represents the SD of the factor of safety. The safety factors determined for

various soil deposits can be related to one another and interpreted in probabilistic terms. The probability of failure is proportional to the dependability index (b). If we assume that every linear variable follows a normal distribution, then we can calculate the chance of failure (μ_L) as

$$B_L = 1 - \Phi(\beta) \quad (9)$$

Where $\Phi(\beta)$the cumulative probability according to the normal distribution. Figure 1 is depicting the matrix's construction procedure.

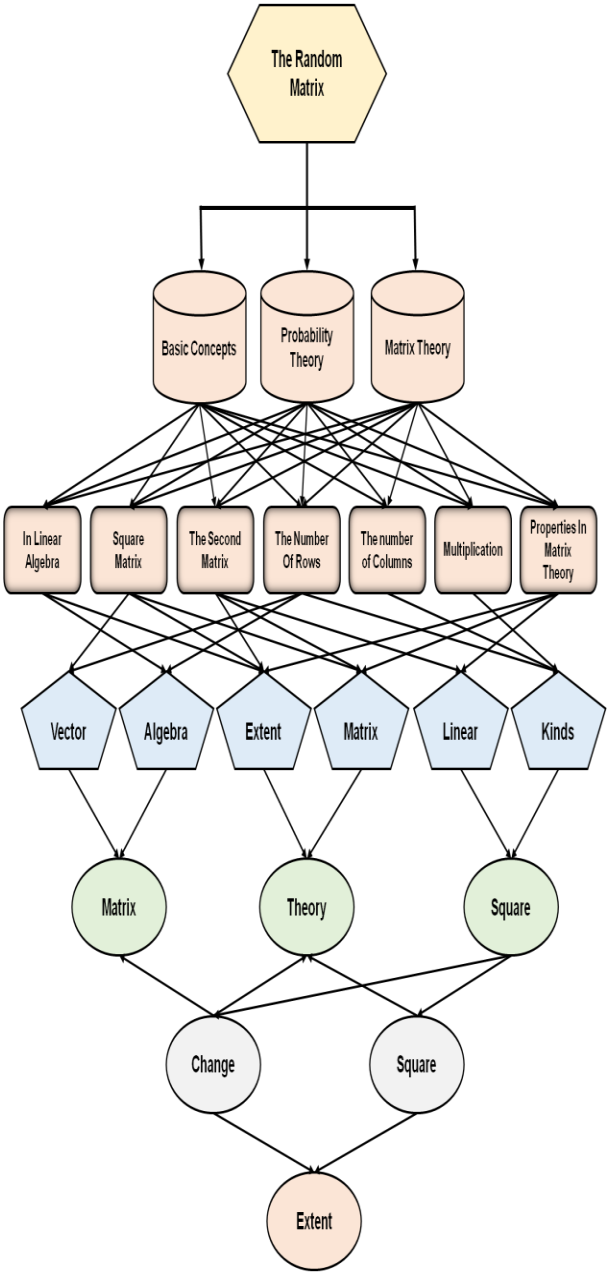

Figure 1: Matrix's creation method

The teacher will guide the class in completing a work that revolves around the learning objectives, finds evidence, and encourages students to think creatively to complete the model construction fast and enhance the teaching effect. Figure 2 depicts the thinking model's organizational structure.

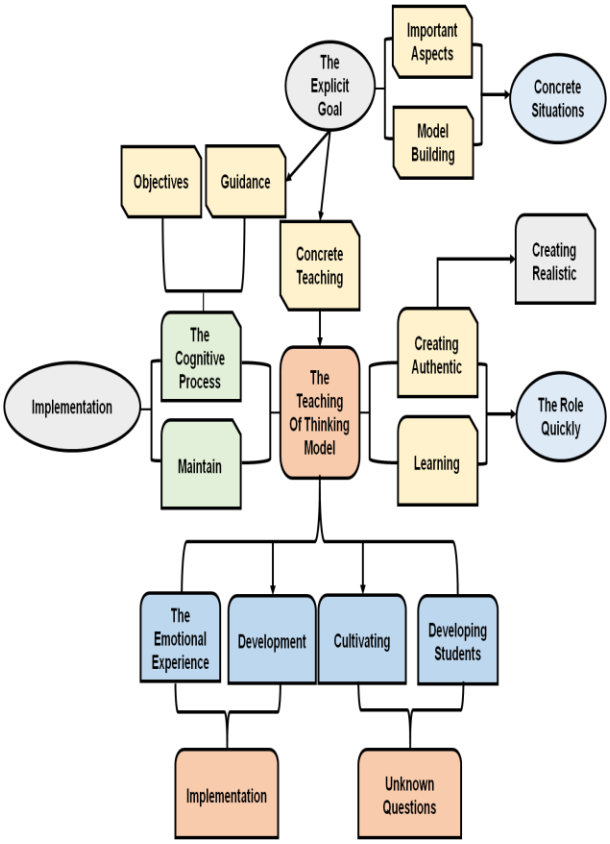

Figure 2: Development of the thinking model

4 Creating an english predicate construction teaching model

The theory of construction methods grammar also takes into account the intricate interplay of constructs and verbs, implying to the extent that the constructional form of the abstract phrase is determined from the paradigmatic verbs that exist in it. When a construction is formed, it modifies the semantic implications of other words non prototypical verbs that appear in it so that they are according to the construction's overall valence; the construction's meaning and the verb's meanings interrelate throughout the creation of the sentence so that the construction has a suppressive effect about the verbs

are used in it, along with their meanings influences the construction's choice of verbs (Zhou, Duan, Liu, & Shum, 2020). A multisense network of constructions is formed when non prototypical verbs are used because they cause the constructions to gradually infer different meanings based on the central meaning. The "connection problem" conventional grammar framework, in which the consistency of attendees and superficial linguistic forms is assumed to be due to human cognitive (perceptual and attentional) processing, is also taken into account by construal grammar. Figure 3 and table 2 display the variation in verb construction usage across the proficiency levels represented in the corpus.

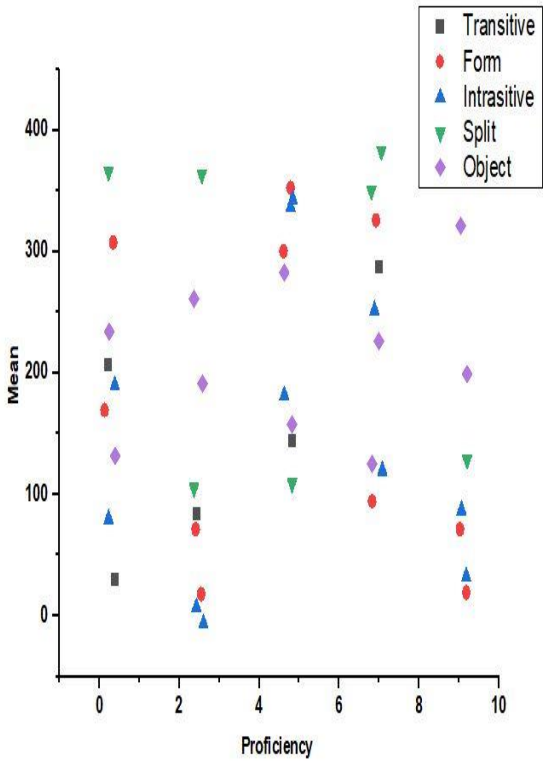

Figure 3: Verb constructs utilized in the corpus by learners at various levels

Table 2: Numerical values for various level

Proficiency	**values**
Transitive	296
Form	99.6
Intransitive	99.8
Spilt	152
Object	351

Pickering and Garrod, utilizing experimental analysis of communicative partners' conceptual agreement, introduced the hypothesis of interaction alignment of discourse, arguing that associations are the concrete manifestation of conceptually equivalent linguistics representational patterns. As can be seen in Figure 4, for a discussion to go off without a hitch, the participants must be able to complete equivalent types of language representation on six different levels: vocabulary, grammatical, ontological, auditory, phonetic symbols, and contextual. When all six of these tiers successfully implement parallel forms of linguistic representation, we have a parallel structure at all six of these tiers.

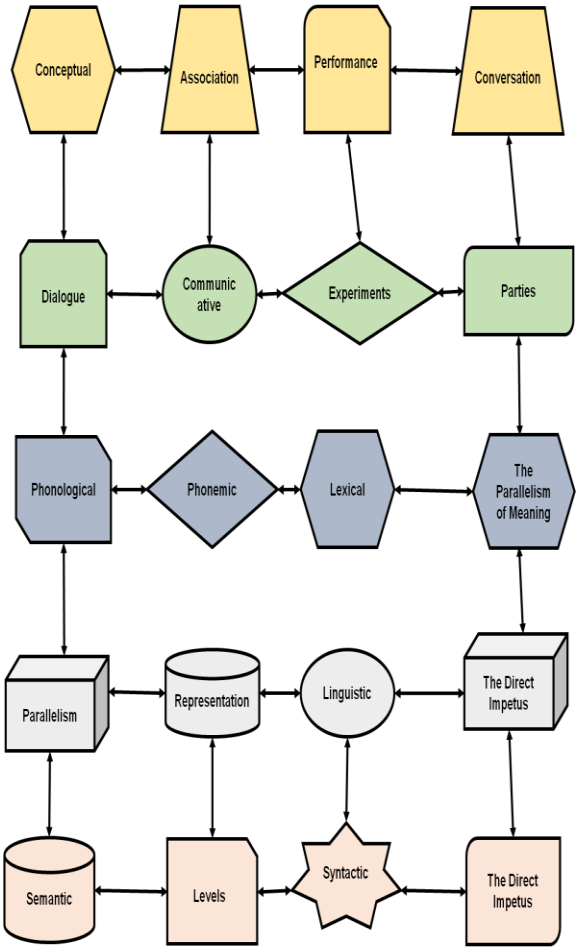

Figure 4: Interaction linkage model

The authors contend that the organization can act as a "trigger" for the organization to occur at a deeper level. Rather than attempting to read someone else's thoughts, the purpose of communication is to create mutually advantageous relationships among all potential language representations. This connection between learning and internalization is especially important for university-level instruction of English grammar. Hence, the

internalization connection in the development of English grammar should naturally integrate the online tutoring paradigm in conjunction with the online instruction method (Chen, & Liu, 2021). It's safe to say that this mixed-method approach to education should be applied from planning to finishing touches. This is because, on the one hand, it may make use of the abundance of digital instructional materials to eliminate geographical and temporal constraints. It can also leverage traditional classroom instruction to speedily address any issues that may arise in the classroom and provide twice as many successful outcomes with only half the time invested. Institutions and educators need to recognize the benefits of combining the two approaches to education during the specific construction phase. If students are to succeed in online courses, teachers must show them how to practice on their own time. It is common to practice doing offline English grammar lessons through class discussions. Teachers can help their students strengthen their English grammar by guiding them to simulate their local environment when applying grammar rules in a foreign setting. This will reduce the impact of the student's immediate surroundings on the learning process. Figure 5, table 3, and table 3 depict a comparison of various pedagogical approaches.

Table 3: Majority in concentration rate

Analysis	**Majority in concentration rate**
Mock-up	Level 5
Mathematical	Level 1
Mental	Level 4
Semantic	Level 1

Table 4: Outcomes of various pedagogical approaches

Levels	**Mock-up**	**Mathematical**	**Mental**	**Semantic**
Level 1	27	38	28	39
Level 2	38	32	43	26
Level 3	-	-	-	-
Level 4	36	36	44	35
Level 5	41	29	32	26
Level 6	-	35	-	-

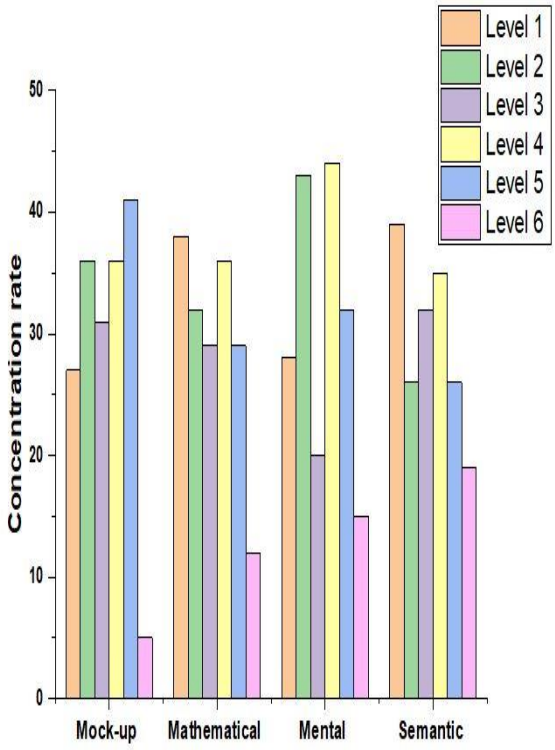

Figure 5: Concentration rate

This model integrates the strengths of both networks to recognize predicate-verb sequences in written English. It is practical and important to incorporate linear matrix theory into English classrooms (Jelodar, Wang, Yuan, Feng, Jiang, Li, & Zhao, 2017). In the next step, the attention mechanism is used to zero in on the abstract aspects of interest. At last, the CRF layer is used to return the optimal labeled path. With the models' primary components are laid out as follows:

4.1 Layer: embedding

The foundation of most computational operations is the requirement to transform obscure symbols into spatial vectors that the machine can understand. To begin, the textual data must have a mathematical and structured representation; for example, sequence information can be fully represented using distributed vectors. When dealing with text in English, words are often employed as processing units before being transformed into word vectors. This is in contrast to the flexible use of the English representation, where a word often contains

numerous meanings, each of which may indicate a distinct meaning.

$$a_j = \int (U^{u-1} \times C^j) \quad (10)$$

4.2 Layer: BILSTM

The first stage in implementing BILSTM is to use the "forgetting gate's" Sigmoid function layer to calculate whether or not a piece of data should be kept or destroyed.

$$a_j = tanh \frac{\sqrt{z_{d-1}+y_d}}{U_{V-1}} - p_v \quad (11)$$

4.3 Layer: CRF

When feeding data into the CRF layer, predictions for each label in the sequence must be included. The maximum output path across the label probability transfer matrix is determined by a dynamic planning technique at the CRF layer.

5 Results and discussion

5.1 Multi-regression analysis tested in teaching English predicate constructions

Quantum decoherenceisn't the only area where regression matrix theory comes in handy; quantum optics, chromodynamics, and even 2D quantum gravity all rely heavily on it. However, the authors' research indicates that only a small percentage of English majors and educators are familiar with the theory of regression matrices. For example, the basics of regression field theories rely only on the replacement of an integrating component in mathematics, the Jacobi determinant in linear algebra, the likelihood function is a concept in chance statistics, the broad concept of special units' shared algebraic features, and so on. This means that a class for English majors would be a natural fit for the introduction of the concept of elementary regression matrices. Consequently, it is reasonable and desirable to incorporate the study of regression matrices within the English curriculum. It is also an excellent way for bright young students of English to contribute to cutting-edge physics studies.

The university's English teaching ecology is not thought to be influenced by or even affected by the social and family contexts outside of it. Teachers and students make up the bulk of the ecological subjects. Humans, being unique entities, display a wide range of characteristics and variations. Both the student's individuality and the instructor's pedagogical approach are tied to the success of the classroom. Similarly to how members of the same species band together in biological groups to increase their chances of survival in the wild, students and faculty members in college English classrooms sometimes work in smaller, more intimate groups to better achieve their goals (Majewska, Mccarthy, Van Den Bosch, Kriegeskorte, Vulić, &Korhonen, 2021). The relationship is more complex, but it is also harmonic, symbiotic, and synergistic due to the presence of competition, cooperation, reliance, and restrictions within and across groups. To conclude, an ecological community is a conglomeration of different groups coexisting in the same physical location and time. Figure 6 and Table 4 display data comparing English courses at universities.

Table 5: Outcomes of data comparing English courses at universities

English teaching data	Data values
R	199
B	198
T	53
B1	19
T1	5

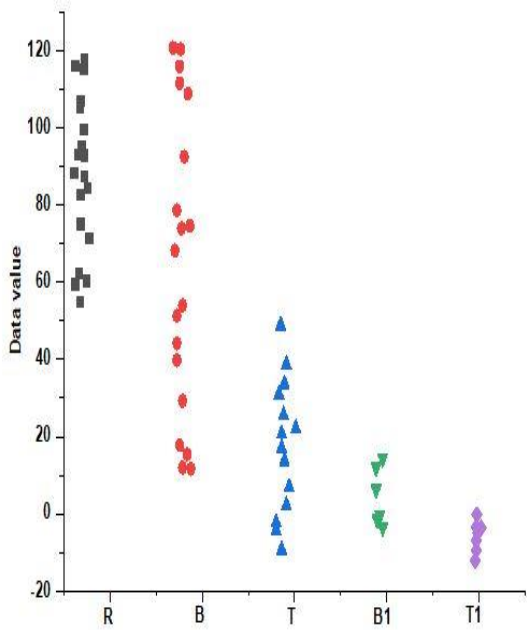

Figure 6: Data comparing English courses at universities.

The growth of ecology as a subject is influenced by the context of any English teaching and learning activity in a college. Because of this, the ecological setting is, together with environmental consciousness, an important part of the ecology of English instruction in higher education. There is the human context, which includes interactions between teachers and students and outside help, the material context, which includes classroom elements like furniture and technology, and the institutional context, which includes the curriculum, its contents, methods, and assessments.

5.2 Predicate constructions in the classroom: A realization

The Chinese predicate verb labeling data set is used in this experiment, with a 6:2:2 split across the training, validation, and test sets. In this experiment, the 'BERT-BILSTM-CRF' representation is subjected to the similar experimental conditions; hence, we will not go into detail. Figure 7 displays the results of the comparative analysis used to fine-tune the model training parameters.

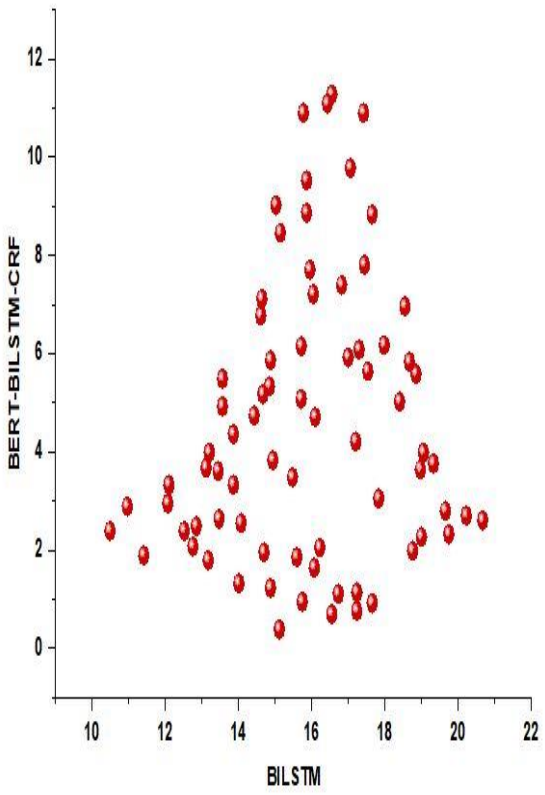

Figure 7: Model training parameters

Predicate verb recognition is improved experimentally by the 'BERT-BILSTM-CRF' model after corpus pretraining. The recognition performance of this model is enhanced to a certain extent by the incorporation of BILSTM and CRF into the pretraining model BERT, which is skilled in a massive volume of data. The experimental results show that the predicate verb recognition problem can be solved and improved upon by fixing the uniqueness issues with the predicate verbs. To begin, the sentence is split down the middle by the annotated predicate verbs. The Ziemba lexical annotation system was used to choose the verbs for these two sections. Figure 8 and Table 6 compare, on average, the training times of different algorithms throughout a single iteration.

Table 6: Comparison of time(s)

Time (s)	Element values
2	0.99s
6	0.98s
10	0.97s

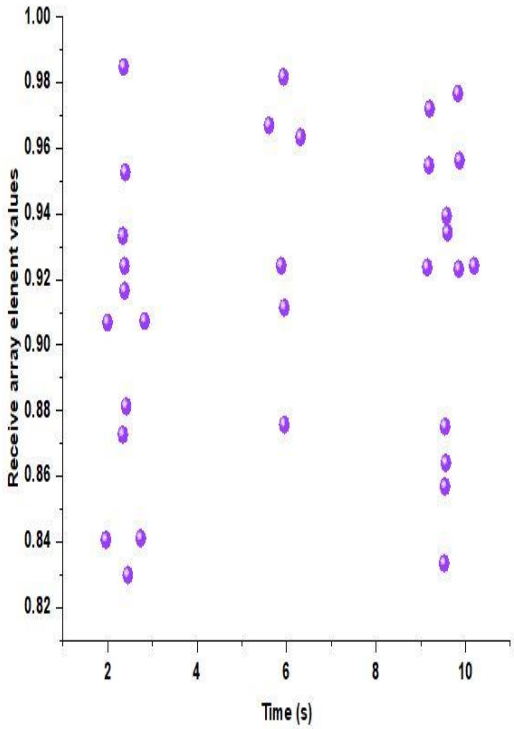

Figure 8: Comparison of Time(s)

6 Discussion

The safety factor predicts reliability of research identified dependability index (β) departures from current techniques, which prompted an additional investigation at simulation assumptions and soil conditions. Despite being consistent with research on the impact of non-prototypical verbs, our English Predicate Construction Teaching Model revealed proficiency-level differences that called as customized instructional approaches. Because few English majors and teachers are acquainted with multi-regression analysis, this novel approach to teaching English predicate structures has to be carefully integrated. The examination of the ecological environment in university of English education results that highlights the complex ways that institutional, material, human elements of shape courses and methods of instruction. The new alignment of the "BERT-BILSTM-CRF" model with existing literature highlights its promise for predicate verb recognition; nonetheless, the sensitivity of its fine-tuning highlights the requirement of careful parameter tuning in the development of natural language processing applications. These parallel create an attention to the slight distinctions between approaches and models, emphasizing the need of carefully taking context into account. Recognizing differences improves this work's application and clarity.

7 Conclusion

College English lays the groundwork for fostering worldwide and diverse abilities that are going to join the society, and its importance has grown in tandem with the expansion of higher education. This means that English majors at universities have greater accountability and duty. Methodological findings reveal the challenge of correctly identifying the predicate verb as the sentence's subject. This research proposes a neural network recognition model, which outperforms the standard machine learning model in terms of recognition accuracy. The predicated verb evaluate and make, which effectively recovers the paragraph's structure and semantics lays the speculative groundwork and technological assistance for subsequent tasks in processing normal language. A mastery of grammar is a prerequisite for fluency in any language. Regression matrix thinking model-based instruction can attempt to address both the specific needs of each student and the implied requirements of college English while teaching grammatical rules. This makes it a perfect option for use in an English classroom where the goal is to develop and enhance students' ability to apply English extensively.

- **Implications**
  Theoretical understanding of the intricate connections between predictor and irrelevant factors, adding to the body of knowledge. In practical terms, reliability is improved by the implications of the linear connections for well-informed risk assessment and safety factor determination of decision-making.
- **Future Work**
  Future study might expand on this work by validating results using a more varied dataset, investigating nonlinear correlations, and taking other important aspects into account. Examining how external influences affect dependability indices will increase knowledge and guarantee for future advancements in the area.

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