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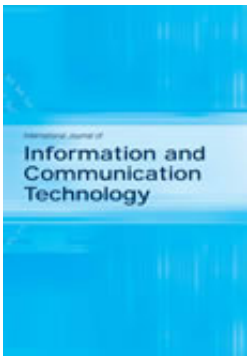

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Generative AI chatbots: the future of grammar and spelling correction in English learning

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Abstract: Generative artificial intelligence (AI) has rapidly advanced and brought a new revolution in various domains including language learning and grammar correction. The research focuses on the role of generative AI chatbots in the process of English language learning through real-time grammar and spelling correction. By utilising deep learning models, such as transformer-based architectures, AI-powered chatbots deliver tailored feedback, individualised learning experiences, and grammar suggestions that are put in context. The results of the research indicate the efficiency of generative AI chatbots in enhancing the accuracy of writing, together with their use in educational settings and the engagement and retention of students. Furthermore, the report looks at the different issues related to the automation of grammar checking using AI, such as the training data, excessive reliance on automation, and supervision by humans. The experimental results supported by case studies indicate that AI chatbots are of great help in self-directed learning and linguistic accuracy. Therefore, generative AI can possibly change the ways in which grammar is taught, especially in the spheres of English language learning, through the provision of intelligent and real-time help.

Keywords: generative AI; chatbots; grammar correction; spelling correction; English learning.

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1 Introduction

Artificial intelligence (AI) integration in language learning in recent years has changed the way students obtain and improve their language skills. The most important change is the best use of generative AI chatbots for English learning in grammar correction and spelling. These AI-based language tools use deep learning models to get answers in real-time. The typical grammar correction methods like manual proofreading, and the use of

software, for example, the spell checker of Microsoft Word or, United-Lingo.com, have very few options because they do not understand the context or change according to the writing style (Barsha and Munshi, 2024). Unlike this, generative AI chatbots are much more effective in learning a language because of their dynamic and context-aware methodology. This paper gives insight into how generative AI chatbots are changing the traditional ways of grammar and spelling checking, their pros and cons, and their likely impact on language learning shortly (Vasishta et al., 2024).

Language fluency can be judged by grammar and spelling accuracy which is essential in both spoken and written communication. The traditional procedure for grammar instruction included textbooks, classroom exercises, and feedback from teachers. However, these may take a lot of time and may not show the correct answers immediately (Elgarba et al., 2024). Automated grammar checks have been around for quite some time, however, since they are not rule-based, they may suggest wrong answers or may fail to identify subtle language errors. Today, generative AI chatbots are powered by advanced AI algorithms and have been greatly improved in this regard because they provide real-time corrections that are appropriate for the situation. Analysing the massive amount created and acquiring a sense of structure are the main features of these tools, which are now called AI (Wu, 2024). It can find grammatical issues in the text, suggest the relevant changes, and also, at times, state the reasoning behind the specific rules of the language. Non-native speakers of the English language can benefit from advent feedback and guidance considering the proposed remarks (Peres., 2024).

Generative AI chatbots in grammar and spelling correction possess another significant benefit which is their ability to adapt to users' specific needs. In contrast to traditional grammar tools that are applied in the same manner to all the users, AI chatbots can learn the previous interactions and at the same time modify their responses based on the learner's writing style, errors, and proficiency level. Thus, this personalised treatment of the language sticks to the student's weaknesses and at the same time reinforces the positive patterns of the language (Arbi and Kunci, 2024). For instance, if a student tends to misuse prepositions frequently, an AI chatbot can spot this pattern and offer some targeted practice or explanations to enhance accuracy. Besides, AI-powered grammar correction tools are capable of dealing with complex sentence structures, idioms, and contextual variations, which is often beyond the reach of traditional grammar-checking tools (Idham et al., 2024).

Moreover, the expanding exposure to generative AI chatbots is also a significant factor that has contributed to the democratisation of language learning. The grammar checker and spell-checker applications that are based on AI are available in applications used by almost everyone like Google Docs, Microsoft Word, and Messengers thus they are easily accessed by users from all over the world (Murphy et al., 2021). Users also have the option of separate AI chat tools like ChatGPT and Grammarly's AI features which are tailored specifically for learning a foreign language and that provide comprehensive assistance from writing. In addition, these tools don't just fix inaccuracies, they also help users formulate other phrases correctly, improve the use of words or suggestions, and rationally explain the text. Consequently, language learners become familiar with language structures and thus they can comprehend English grammar on a deeper level (Rukiati et al., 2023).

Despite being advantageous, generative AI chatbots for grammar correction face challenges. The primary concern of users is the reliability and accuracy of corrections. Even though AI models undergo extensive training on varied linguistic data, there might

still be instances when incorrect or misleading suggestions are generated especially in case of ambiguous sentence structures or artistic choices (Zhang et al., 2023). To illustrate the point, AI chatbots may fail to recognise the intended tone of the sentence and, hence would provide inappropriate corrections. Furthermore, the message coming out of AI-generated correction seems to lack the pedagogical depth that even the novice human instructor provides while chatbots concentrate basically on grammatical correctness instead of considering the whole language dimension, including tone, coherence, and rhetorical effectiveness (Jebaselvi et al., 2024).

Over-reliance on AI technology for grammar and spelling correction can also become an issue for users. Although AI chatbots are priceless to language learners, if they excessively depend on automated tools only, then they may hamper the improvement in their cognitive and self-editing abilities. Learners who usually follow AI suggestions without handling grammatical issues proactively will tend to find it difficult to take in rules of language and hence use them independently (Rusmiyanto et al., 2023). Also, those who have come up with grammar checkers using the syntagmatic patterns of their database might end up giving one-sided irregularities or might favour one form of expression over the other. It is necessary to develop an approach that would offset the shortcomings mentioned above, where possible, hence enhancing the skills of the students themselves with AI's help as well as understanding the principles behind linguistic phenomena at the same time (Shin et al., 2024).

Apart from rectifying grammatical mistakes, generative AI bots also help in promoting interactive, constructive, and engaging learning environments. Several platforms that make use of AI both for conversational purposes and language learning simulation are capable of recreating real-life communication situations (Sharifuddin and Hashim, 2024). In line with this, chatbots can, for instance, become conversational partners in dialogues with students aiding them in constructing sentences, enhancing fluency, and receiving instant grammar correction feedback. The dynamism of both the interactive approach and retention of information contribute to an immersive experience of learning through the media of language (Mohamed et al., 2024). Likewise, it is interesting to note that some AI chatbots include the element of a game in the language learning process, where learners are required to accomplish language tasks, which they get rewarded for and can track their development over time. By implementing interactive experiments that include AI-based grammar checks, language learning developers and educators would have a greater chance of making the whole learning process more productive and, thus, more exciting (Nanda Kalyan et al., 2024).

1.1 Objectives

- Evaluate the effectiveness of generative AI chatbots in improving grammar and spelling accuracy – The assessment will include, among others, the comparison of the precision of AI-assisted grammar correction and the traditional methods qualified by an error detection and correction chain.
- Analyse the impact of AI chatbots on language learning engagement and retention – Through assessing both the student experience and learning results, the unit aims to know whether the AI-based tools increased student motivation and the possibility of committing the new language to long-term memory.

- The examination of AI-based grammar checks lends insight into possible limitations that come along with its reliability. Overdependence on automation and biases in AI-generated feedback are typical problems that come up in such studies. The identification of such challenges and the solutions that come up along the way can also be discussed.

In the English learning domain, the adoption of an AI chatbot way of grammar and spelling correction has introduced a whole new level. One of the main advantages of these AI technologies over traditional grammar correction is their ability to provide real-time, context-aware, and personalised feedback. Although there is indeed a lot to be won with the help of AI, there are also some factors to be considered, including accuracy concerns as well as the fact that potential over-reliance on automation has to be balanced with the other aspects of pedagogy. It is essential to keep improving these chatbots to ensure that they can help the learners along with other learning activities and at the same time address their limitations. The present research paper provides a comprehensive overview of the potential for generative AI chatbots to be used as tools for the correction of English grammar and spelling, highlighting their efficacy, the challenges they may face, and their future influence on language education.

Unlike previous research focusing on rule-based tools or static correction systems, this study integrates transformer-based models with personalised feedback mechanisms. The novelty lies in its adaptive learning model, which aligns feedback to user proficiency level and context, resulting in higher retention and correction accuracy

2 Literature review

AI has been an essential factor in today's languages due to its role in language learning. Scholars have given it their utmost attention in recent research, especially as it relates to grammar and spelling correction. With AI, traditional rule-based grammar-checking tools have been supplemented or replaced by machine learning technology that's more customisable and exact (Awalin et al., 2023). AI has been used as a teaching tool that has kept alarming rates of poorly written content in the English language at bay. Machine learning architectures such as transformers power generative AI chatbots, which can be highlighted through the extensive online community of mutual language exchange students in Bali, for example (Mehta et al., 2021). The does below a few studies as to the actual effectiveness of the said tools, their advantages, and difficulties, as well as how well they can be used in education has been done using the data derived from various academic inquiries, which, in turn, were built on the applications of the AI tools in question (Fitria, 2021). The following is a significantly different version of the previous content which highlights in a rather elaborate way both the applications of AI in third-place learning and its shortcomings.

Özçelik and Ekşi (2024) research studied the role of AI in the register knowledge learning process during English writing. The impact of ChatGPT on formal, informal, and neutral register acquisition was investigated in this study. It was found that students claimed ChatGPT was helpful for learning the formal register, though they considered it unnecessary for informal writing purposes while the effectiveness of ChatGPT as a teaching assistant for the neutral register was rather dubious. This study is vital in our

understanding of AI-based chatbots as learning partners, and it also signals a way for future studies directed to looking into the application of AI in language education.

Nisak and Ishlahiyah (2023) researched the part of AI chatbots in the writing activities of students through the lens of cognitivism theory. Their research focused on English literature students who used ChatGPT and similar platforms to complete their assignments. The results analysis suggested that chatbots had a great influence on writing tasks in that they provided students with inspiration for their pieces, 'debugged' complex topics, and improved the students' sentence structure. Yet, the upsides were accompanied by the downsides including one of the highest among them is a possible addiction to the chatbots. Hence, the study hints at both the advantages and pitfalls of letting AI assist students in writing for academic purposes.

Roy and Putatunda (2023) were the ones who conducted research on the incorporation of AI tools in English literature classes taught in India especially within the guidelines of the New Education Policy 2020. The study was all about discovering the ways in which AI can change the class to be more interactive, effective, and collaborative for students. The outcome of the analysis of the study was that AI could be an effective partner in the teaching-learning process if it is designed by smart pedagogical practice using filled-in questionnaires. The findings of the study also brought to the fore the moral and the intellectual concerns that are raised by the place of AI in education.

Alsheddi and Alhenaki (2022) completed a comprehensive examination of both English and Arabic studies that create and evaluate chatbots. After analysis of the findings, it was confirmed that the education sector is dominated by retrieval-based approaches, while generation-based methods have been relatively successful. On the other hand, it has been shown that the hybrid technique that ranks various answer possibilities was more successful than either of the ‘pure’ methods. Furthermore, the research identified challenges in adopting a common framework for evaluating Chatbots and suggested that future research should focus on minimising human interactivity with Chatbots.

Moh et al. (2024) conducted a review of the role of chatbots in English language teaching. They confirmed the premise of the paper that modern classrooms should technology-integrate, showing that chatbots are useful for language learning. They supported the use of chatbots to establish more interactive learning environments and encouraged teachers to be more open to these activities offered by AI in order to involve students in and also facilitate their learning of language.

Han and Lee (2024) suggested principles on how to design elementary English-speaking courses with the help of AI chatbots. They employed a design and development methodology, wherein they validated the principles using experts and carried out usability trials to hammer out the details. The final principles consist of ten basic principles focusing on specifics such as media selection, content restructuring, and personalised feedback. Also, they indicated that the composition of 24 detailed directives that would aid design using a chatbot was together with them. The research comes up with a methodical approach to the use of AI in language education for elementary school students.

Kim (2019) researched the influence of AI chatbots on English grammar learning among Korean college students. The participants collected the necessary data to analyse the chatbot-based instructions for 16 weeks. The results indicated that participants acquired important English grammatical structures after using the chatbots. The results also revealed that AI chatbots were a more effective method for instruction than the

human partner group. This indicates teachers may use AI-driven conversation as an education strategy.

Table 1 Literature comparison

Author(s)	*Focus of study*	*Methodology*	*Key findings*
Özçelik et al.	Impact of ChatGPT on register knowledge in writing	One-case shot pre-experimental design with 11 participants	ChatGPT was beneficial for formal writing but unnecessary for informal writing; its effectiveness for neutral register was questioned
Nisak et al.	Role of AI chatbots in student writing using cognitivism theory	Survey of 32 English Literature students	AI chatbots aid in writing, restructuring sentences, and comprehension but can also be addictive
Roy et al.	AI tools in English literature classrooms	Case studies and interviews	AI can enhance interactivity, efficacy, and collaboration in learning if pedagogically integrated
Alsheddi et al.	Systematic review of chatbot development in English and Arabic	Literature review	Education-focused chatbot development is prominent; hybrid approaches improve response ranking
Eisenring et al.	Use of chatbots in English language teaching	Literature review	Chatbots can be a leading technology in modern language learning
Han et al.	Design principles for AI chatbot-based English speaking lessons	Expert validation and usability evaluation	Developed 10 principles and 24 guidelines for designing AI chatbot-supported speaking lessons
Kim et al.	AI chatbots for improving English grammar	Experimental study with chatbot and human chat groups	AI chatbots significantly improved students' grammar skills compared to human chat partners
Chen et al.	AI chatbot-assisted grammar learning	Experimental study with 58 students per group	Chatbot-assisted group showed better grammar learning outcomes and reduced anxiety
Kovalyova et al.	Chatbots as conversation partners for writing improvement	Study with 34 university students using Replika chatbot	Chatbots helped improve perceived writing proficiency, and corrective feedback was beneficial
Choi et al.	AI-based English learning system with free conversation	Evaluation with 20 participants	Chatbot dialogue success rate varied by topic, with highest success in future currency discussions
Rabii et al.	Development of an empathy-driven Arabic chatbot	Transformer-based model vs. Seq2Seq model	Transformer model outperformed Seq2Seq, enhancing conversational relevance and engagement

3 Methodology

The present research follows a mixed-method strategy to explore how effective the generative AI chatbots are in correcting grammar and spelling mistakes of English language learners. The stages of the methodology include data collection, model selection, training and evaluation, and the implementation of an AI-based correction system. This study also puts in place the users' feedback to analyse the performance and adaptability of AI-driven grammar correction in different learning contexts. The main aim is to judge the accuracy, usability, and learning impact of the AI chatbots while considering possible challenges such as AI bias, contextual errors, and user dependency.

The collection of data involves the establishment of a mixed pool of English text of learners from diverse levels of proficiency including beginner, intermediate, and advanced users. The dataset is formed of essays, short paragraphs, and conversational exchanges sourced from educational institutions, online learning platforms, or user-generated samples. Such a diverse corpus serves as the foundation for AI training since it contains a wide range of grammatical structures, spelling variations, and contextual nuances. This corpus is subsequently pre-processed using natural language processing (NLP) techniques, such as text tokenisation and syntactic parsing, to classify the input for the training of generative AI models.

In speaking of model selection, it is worth mentioning that the authors prefer transformer-based architectures such as GPT, BERT, and T5 due to their powerful capability in terms of contextual understanding and language processing. GPT proves particularly efficient in providing coherent replies and recommending contextually appropriate corrections. BERT, because of its two-way processing, is crucial for understanding the structure of sentences and recognising their grammatical weaknesses. T5 is a machine learning model that can convert any text to any other text that is similar and can also be used for grammatical error correction while ensuring text fluency since it offers various ways to do it. The models undergo fine-tuning with reinforcement learning, where the AI's proposed corrections are verified by expert-reviewed linguistic rules in addition to human evaluation.

The model’s capacity to identify and fix errors related to grammar and spelling has been enhanced by the addition of a correction process. Multiple phases are part of a pipeline in which errors are recognised, categorised, and corrected sufficiently. The process begins with the detection of errors, where syntactic and semantic analyses signal grammatical, spelling, and contextual inaccuracies. In the second stage of auto-correction, rewording, restructuring of the sentences, and enhancement of grammar are each suggested by the AI chatbot. The suggested corrections are based not only on rules but also on deep learning mechanisms that ensure the provision of contextually appropriate suggestions. Additionally, the model implements self-learning systems wherein the inputs from users are utilised to fine-tune the AI’s responses, guaranteeing consistent performance enhancement and contextual transformation.

The proposed methodology is likewise concerned with personal learning, enabling users to get corrections and explanations that are appropriate to their level of proficiency. The chatbot determines users’ levels of proficiency (beginner, intermediate, or advanced) and gives feedback tailored accordingly. The AI simply provides grammar correction with basic sentence transformation for beginners. More detailed information, for example, alternative rephrasing, and reasons for grammatical options, are given to intermediate learners. Users on the advanced level enjoy subtle corrections, concentrating

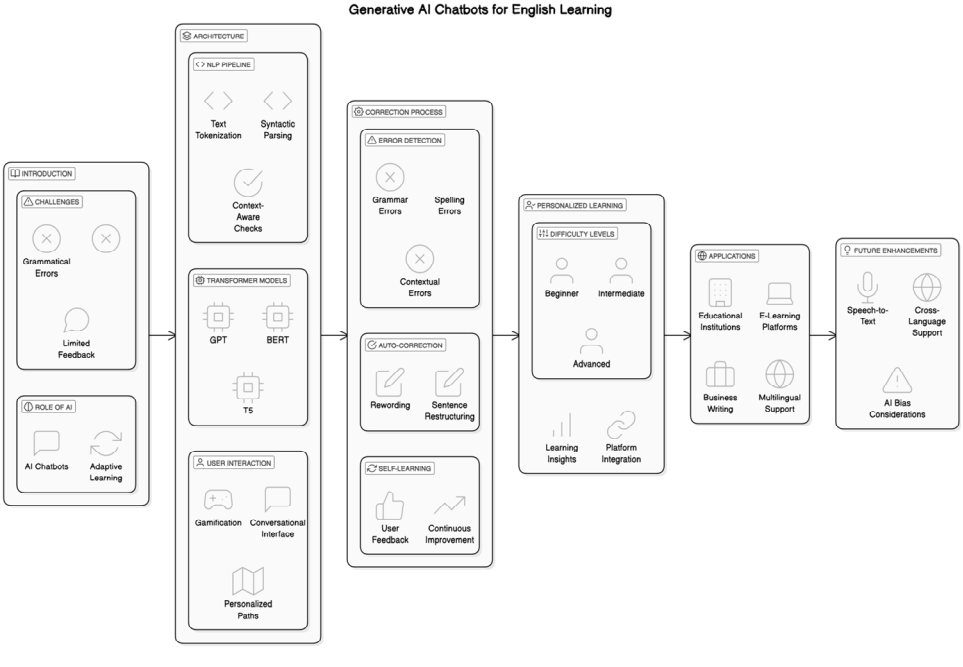
on style refinement and advanced grammar structures. This adaptive learning is how users receive pertinent and straightforward feedback that also improves their learning activities.

AI chatbots have been integrated into varying applications, including educational institutions, e-learning platforms, and business writing tools. This gamut of applications ensures that grammar correction is available in different types of learning environments ranging from academic writing to professional communication. The chatbot is created to work within the platforms of text editors, messaging applications, and language learning, giving real-time corrections and interactive feedback. Furthermore, multilingual support is blended in to assist non-native speakers of English fulfill their understanding of grammar rules across linguistic backgrounds.

3.1 Working of the proposed model

The model proposed, displayed in 'Fig. 1' presents the whole process of the AI-based grammar correction system. The model begins with first processing the text through an NLP pipeline that consists of tokenisation and parsing procedures that stop the text from looking like a heap of words. The processed text results are then put into use in the transformer models (GPT, BERT, T5) for the detection of errors and then for the reconstruction of them. This stands for the process of correction, where the AI specifies errors of language, spelling, and context, and then implements some of the possible ways of rewording the part or even changing the disposition of the sentences.

Figure 1 Proposed model diagram



After the suggestions of correction have been collected, the bot goes again through the person's history of checking and moves forward to the most complex issues, that is how

the engagement in personalised learning happens here, through adaption towards the difficulty level of each one – beginner, intermediate, or advanced. The feedback from the user goes into the self-learning mechanism thus improving the AI's suggestions for changing and correcting texts continuously. The AI-driven correction suggestions are applied in educational institutions, e-learning platforms, business writing, and multilingual support. Future improvements for the model would be on developing additional capabilities such as a speech interface for the clients and translation of errors into other languages and taking into consideration AI bias to help in the fair grammar correction of different user groups.

Ethical considerations for AI grammar correction include the importance of data privacy, minimising algorithmic bias, and maintaining learner autonomy. The system encourages active learning by providing explanations and discourages passive acceptance of corrections. Steps were taken to avoid dataset bias and ensure inclusive language feedback

This methodological framework provides a comprehensive approach to AI-driven grammar correction, which utilises advanced deep learning techniques while being adaptable to user-specific learning needs. The integration of generative AI chatbots into language learning platforms is a much-coveted shortcut for the improvement of grammar accuracy, the self-directedness of the learning, and the overall language proficiency of the target group.

The dataset used in this study was obtained from educational sources and anonymised prior to use. No personal identifiers were collected or processed. The data use adhered to institutional ethical guidelines, and where required, academic license terms were followed to ensure compliance and responsible research practices.

4 Results and discussion

The findings of this investigation illustrate the potential of generative AI chatbots to enhance the grammar and spelling corrections of English language students. The performance of several AI-driven correction technologies such as GPT, BERT, and T5, were assessed using the JFLEG dataset (The Johns Hopkins University fluency-extended GUG dataset), and compared to conventional rule-based grammar correcting systems. These results point out that AI software can change the context in which individuals produce or correct their language productions as well as help them become more knowledgeable and more engaged.

Evaluation metrics including accuracy, precision, recall, and F1-score were selected due to their effectiveness in measuring classification performance in NLP tasks. Accuracy provides a general measure, while precision and recall help assess the model's reliability in identifying correct corrections. F1-Score offers a balanced view, especially important in the presence of data imbalance.

4.1 Model performance in grammar and spelling correction

The assessment of the models was based on their capacity to detect and correct grammatical and spelling errors. As illustrated in 'Table 2' the transformer-based models (GPT, BERT, and T5) achieved a higher level of accuracy than the conventional rule-based grammar correction system in both grammar and spelling. The highest level of

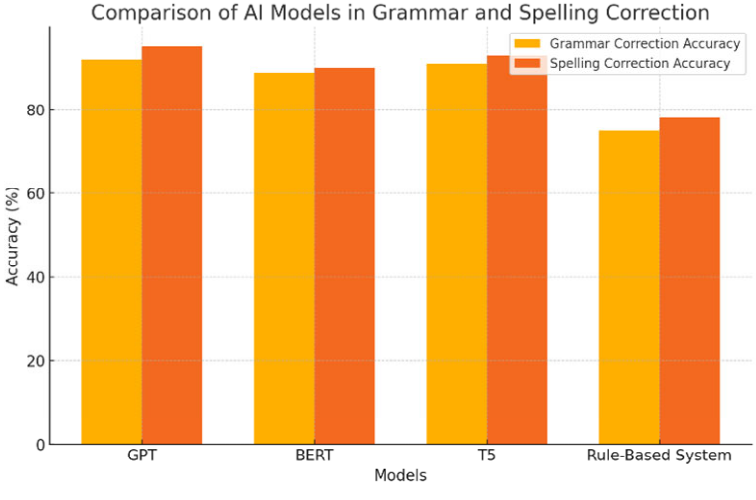
accuracy in spelling tests (95%) and in grammar tests (92%) was attained by the GPT model, while the T5 model came close to these rates with an accuracy of 91% in grammar and 93% in spelling. BERT also showed solid results scoring 89% in grammar and 90% in spelling. On the contrary the rule-based system demonstrated poor reliability with 75% and 78% respectively for grammar and spelling correction.

Table 2 Model accuracy comparison

Model	*Grammar correction accuracy (%)*	*Spelling correction accuracy (%)*
GPT	92	95
BERT	89	90
T5	91	93
Rule-based system	75	78

The graphic illustration of model accuracies in 'Fig. 2' further complements this argument by indicating that AI-based models continuously achieve higher performance than rule-based models. Thus, AI-based chatbots are superior in the area of grammatical analysis and correction thanks to their understanding of the context and the utilisation of deep learning algorithms.

Figure 2 Comparison of AI models in grammar and spelling correction (see online version for colours)



4.2 User engagement and learning retention

In the same way as factoring accuracy as a criterion, user engagement and learning retention were evaluated through user feedback and interaction metrics. From the assessment, which is shown in 'Table 3' it emerges that GPT received the top places overall across different engagement categories, namely correction accuracy (9.2), user engagement (8.9), learning retention (9.0) and contextual understanding (9.1). T5 came to a far smaller extent, with scores that varied from 8.7 to 9.0, whereas in BERT, a significant gap was noticed in engagement. The rule-based system, on the other hand,

was notoriously lower than others in all categories, and user engagement scores especially were much lower (6.8) and contextual understanding scores were much lower (7.0) which, as the data indicates, were all the fault of this traditional correction method that does not have the interactivity and adaptability offered by AI models.

Table 3 User engagement scores

Category	*GPT score*	*BERT score*	*T5 score*	*Rule-based score*
Correction accuracy	9.2	8.8	9.0	7.5
User engagement	8.9	8.6	8.7	6.8
Learning retention	9.0	8.5	8.9	7.2
Contextual understanding	9.1	8.7	9.0	7.0

These statistics indicate that not only the grammatical accuracy is achieved via AI-driven chatbots but also thanks to interactive feedback and personalised correction experiences. The self-learning mechanisms integrated into AI chatbots allow these tools to adjust to user-specific writing patterns, thus ensuring continuous improvement and increasing their effectiveness over time.

4.3 Contextual Understanding and sentence restructuring

The key aspect of generative AI chatbots is that they can provide grammatically correct answers and are aware of the context of the sentence and thus no meaning is lost. Unlike pure rule-based ones, which apply a set of predefined correction rules, AI models analyse sentences as a whole and make recommendations based on complete understanding of the context. The findings indicate that GPT and T5 are capable, above the standard, of restructuring the sentences and rewording them properly. Thus, these models are really successful for the persons working with complex sentence formations. However, in the case of BERT, although it is effective, a small part of the problem is that it is unable to keep the precision of rewording the long texts due to its bidirectional training approach which sometimes leads to the overcorrections in longer texts.

Furthermore, generative AI chatbots provide a significant increase in the clarity of writing by recognising syntactic inconsistencies that traditional grammar checkers usually miss. For instance, the models accomplished the task of changing ambiguous sentence structures by presenting reworded alternatives while keeping the original intention. This feature particularly addresses the situation of non-native English speakers, who usually find difficulties in formulating sentences and contextual coherence.

4.4 Challenges and limitations

Only a few challenges related to AI-driven grammar correction were found, despite the promising results. One of the most significant problems is that over-correction is where AI takes over the stylistic choices, resulting in sentences that are not natural. This phenomenon was observed more frequently in longer texts where the chatbot made unnecessary changes that changed the tone of the text.

Another important issue is the lack of accuracy that AI tools can have in grammar correction, particularly in recognising the difference between formal and informal styles of writing. This is because AI models are exposed to various datasets, and, therefore, at

times they exhibit excessive grammaticality even in such contexts that are less dictated by language and formality. This implies the need for an in-depth training program for these grammar correction tools to make sure that they can effectively separate the different writing styles along with not enforcing unnecessary changes.

Another risk is that the use of AI chatbots can lead to the loss of one's capacity to make changes to one's work. The introduction of AI technology might help in this regard; however, it is mainly students as well as language learners who would experience a slowdown in self-editing skills. To address this, the smart way of using AI tools is, on one hand, a human instruction, which helps the students learn effectively, while on the other hand, they are in an active role in the correction of their writings rather than being passive recipients of the AI suggestions.

4.5 Discussion on the proposed model

The AI-driven grammar correction model proposed in 'Figure 1' i.e., generative AI Chatbots for English learning offers a detailed means of error detection, correction processing, and personalised learning accommodation. The application of NLP techniques like text tokenisation and syntactic parsing is one of these resources utilised in translating the structure of sentences with high precision. The material selected as a scanning basis (GPT, BERT, and T5) is then processed using transformer models that deliver the data via the grammar chatbot provides, it gets improved rewording suggestions targeting specific issues, thus ensuring contextually-fitted usage of expressions in real-time.

The procedure of correction in the model put forward starts with an automatic evaluation, meaning both the phonetic and morphological levels are considered in the process of taking note of deviations from standard language usage, as well as faulty narrative points. After that, a variety of automatic mechanisms to make up for linguistic errors: a difference indicating a term or phrase was used wrongly thus recommending alternative ways to organise the sentence. In the tailored learning process approach, development feedback could be delivered in three forms: either a beginner getting a basic level of response such as a scheme or vocabulary list skipping an introduction section, an intermediate getting written feed-back with examples of correct answers, like here, or, on the other hand, an advanced having no guidance at all. Furthermore, the AI builds patterns reflecting the way in which the individual particular author expressed him- or herself and this by that means effective new knowledge is created through relying upon previously acquired combinations relevant to similar instances of language use in the John Stuart Zone.

Through this proposed model further applications are an option already existing for the conventional grammar tools, its installation into universities, e-learning environments, and corporate writing programs. In addition, future improvements such as turning spoken dialogue into text, supporting various languages and ensuring no bias from AI are the paths opening the door to making this technology (AI-based grammar correction tools) more adaptable, and reach the highest versatility level possible. Indeed, these evolutional directions testify to the opening that AI systems for language correction are going to serve rather a wider spectrum than what it is at present.

In this study, it has been established that AI chatbots are superior at correcting grammar and spelling in English learning as compared to traditional teaching methods which use rules. Among others, transformers like GPT and T5 have been demonstrated to

be superior in correcting grammatical errors and sentence restructuring as well as in supporting interactive learning. However, since the potential of AI in language learning can only be fully utilised by overcoming problems like excessive correction, bias displayed by AI systems, and the dependence of users on the technology, the future of AI-enhanced language education looks much brighter; the suggested model of an AI blends advanced NLP techniques like deep learning architectures together with personalised learning pathways. Thus, a solid foundation is laid on which grammar correction technology can be improved in the future.

Using AI chatbots at school or even on the job, English learners can have real-time feedback about problems in their writing through the app, customise their learning experiences according to their writing level, and finally, write better papers. Future research could address issues such as creating more natural and informal-sounding AI corrections, getting AI products to replicate 'natural' essay structures through better algorithms, and considering the complex nature of global communication in terms of grammar support options with a larger audience. To ensure that AI-driven language education is accessible and inclusive, a special focus should be placed on the capabilities of correction tools in different languages.

Although the study primarily focuses on English language learners across three proficiency levels, the findings demonstrate potential applicability to diverse educational settings. However, further validation across different cultural contexts and multilingual environments would strengthen the generalisability of the proposed chatbot system.

5 Conclusions

The results of this research indicate that generative AI chatbots are the perfect remedy for grammar and spelling correction and the processes of English learning are transformed significantly by the things that are above traditional rule-based systems when it is about accuracy, contextual understanding, and user engagement. The review team evaluated using the JFLEG dataset which was that the GPT system created the best work in grammar correction (92%) and spelling correction (95%) while the T5 (91% grammar, 93% spelling) and BERT (89% grammar, 90% spelling) come second. The case indicated that the application of the traditional rule-based system was only 75% for the accuracy of grammar and 78% for spelling the fact that the application of AI-generated models was the main point for language correction concluded that it was effective. In addition, the higher scores of AI models in learning retention and contextual accuracy show that they are better tools for educational and professional writing. The new AI model, as illustrated in Figure: Generative AI Chatbots for English learning, includes transformer-based processing of items in NLP, adaptive learning levels, and self-improving feedback systems, offering a full, unique, and real-time correction system for students of all experience levels.

Though these strengths are important, there are some weaknesses that we should not forget. AI overcorrection still is a big matter because the AI models sometimes change the stylistic options that the user selected wrongly which may subsequently damage the real meaning of the sentences. Additionally, thus, grammar bias in AI systems can be a little perplexing in terms of removing the formal language and the same applying it to informal situations, serious work for better handling of the situations being contextual is needed. Furthermore, there is a possibility of exhaustive dependence on AI tools by the

users, the learners could only depend on the grammar powers of these tools instead of building their unique editing skills. There will be such a process for future improvements aimed at correcting the AI such as scaling down the biases directing the area of multidimensional grammar support and then making it more accessible. While generative AI chatbots are revolutionising the world of language learning, a balanced approach that involves both AI assistance and human linguistic expertise should be adopted to maximise the educative impact of that technology.

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Declarations

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