

The Influence of Generative AI Technologies On Academic Writing in EFL Education

Chuan Tian *

English Language Center, Shantou University, Shantou, China

* Corresponding Author Email: chtian@stu.edu.cn

Abstract. Generative Artificial Intelligence (GAI) has emerged as a power to transform academic writing courses, especially in the English-as-a-foreign-language (EFL) field, offering innovative tools and methodologies that can reshape pedagogical practices. Through a comprehensive exploration, this paper discusses the development of GAI technologies, their applications in natural language processing, and their potential to revolutionize academic writing support. The paper then examines the integration of GAI tools into EFL academic writing pedagogy, showing its benefits for both students and educators. However, the use of GAI is not without challenges. Concerns surrounding academic integrity, potential for plagiarism, data privacy, and the ethical implications of GAI tools underscore the complexities of this integration. Drawing from various studies, this paper argues that responsible advancement of GAI requires a balance between innovation and ethics. Stakeholders must consider potential implications. A measured approach is advocated for future work in related fields.

Keywords: Generative Artificial Intelligence; ChatGPT; academic writing; English-as-a-foreign-language education.

1. Introduction

The rapid evolution of technology has brought about a new era of digital innovation, marked by the rise of Generative Artificial Intelligence (GAI). The advancement in this kind of technology has made it difficult to distinguish between content generated by humans and machines, causing excitement and concern for both the general public and academic circles. Though the word “generative” might give people the implication that every AI tool that generates something could be considered GAI, this term nowadays is reserved for the category of machine learning techniques that enable models to produce original and realistic content by analyzing and learning from training data [1]. This is distinguished from traditional discriminative models, which focus on creating an optimized mapping from inputs to desirable outputs without generating new data points [1]. Some simple examples of discriminative models are logistic regression and decision trees, while generative models are exemplified by the well-known GPT-3.

GAI tools have many applications, particularly in natural language processing and learning. As a cross point of both aspects, English-as-a-Foreign-Language (EFL) learning and teaching face a revolutionary change with the incorporation of GAI tools. For both educators and students, they present both advantages and challenges. On one hand, technology can improve teaching methods, provide language support, and assist in research. On the other hand, it raises significant concerns about academic integrity, data privacy, and original and critical thinking training. In order to provide a balanced perspective on GAI tools in modern higher education, the paper examines the multiple roles of GAI in EFL academic writing pedagogy, exploring its potential applications, limitations, and concerns in the following sections.

2. Overview of GAI Technologies

GAI represents a new and quickly expanding domain in AI research and applications, allowing for the proliferation of products like chatbots, writing assistants, visual generators, and data augmentation tools, which is beginning to revolutionize education and academic writing. Before exploring the

details, it is vital to grasp the notion's exact meaning, scope and potential capabilities. This section will discuss the important developments in GAI technologies, focusing on their application in natural language processing and academic writing support.

2.1. Development and Capabilities of GAI

The origin of generative approaches in the AI realm can be traced back to the 1950s, with examples like hidden Markov models that could be used to produce basic data sequences such as audio signals and time series [2]. The performance of these models was not significantly boosted until the development of deep learning in the 21st century. One pioneering model is the variational auto-encoder, a powerful tool that streamlines complex probabilistic calculations to efficiently learn and generate data [3]. A year later, in 2014, Ian Goodfellow's team put forward the concept of the generative adversarial network (GAN), which was a significant milestone for GAI, and it remains the most widely used technique in the field. GANs employ two neural networks - a generator synthesizing content (such as a human face) and a discriminator assessing its authenticity. By pitting these networks against each other, GANs can continuously refine the generator's creations until the discriminator cannot tell the outputs from real data [4]. GAN-based products can produce incredibly realistic images (e.g. StyleGAN, DraGAN), audio (e.g. GANSynth), and videos (e.g. DVD-GAN).

The development of GAI in natural language processing (NLP) follows a different path. In the early stage, the most notable models were N-grams, designed to calculate the likelihood of a word appearing after another specific word and generate the best short sequence of words in the training corpus [2]. In order to solve the problems these models were having with longer sentences, neural networks were also introduced into language processing, such as feedforward neural networks and recurrent neural networks (RNNs). In RNNs, especially, the history was compressed in low dimension, and its length was not restrained, providing the possibility for the models to maintain some form of memory [5]. Afterwards, relevant models such as long short-term memory were developed to mitigate the vanishing gradient problem and retain information over longer sequences. This innovation allowed an extension of context length to approximately 200 tokens, where a token can be a word or a subword unit, representing the smallest units of text that the model processes [6].

Another ground-breaking advancement came with the development of the Transformer architecture by Google, expanding the capture of extensive contextual information across entire sentences or documents [7]. This is the foundation of the Generative Pre-trained Transformer (GPT). In 2018, OpenAI released the first generation of GPT, and the model quickly iterated to the third generation in 2020 and amazed the world with its ability of human-like writing. The impressive generative abilities of GPT-3 are a result of its massive scale of training, which utilized 175 billion parameters and 570GB of text data [8]. GPT-4 takes this a step further. It is a large multimodal language model rather than a transformer model like its predecessor. Moreover, it accepts inputs and generates outputs in the forms of image, audio and text, exhibiting human-level performance on various professional and academic parameters [9]. As these technological capabilities continue to advance, GAI is transforming industries and applications through its ability to automatically synthesize realistic and novel content.

2.2. Main Applications of GAI in NLP Tasks

Applications and software using GAI technologies are revolutionizing the domain of NLP. Innovative platforms and chatbots exemplified by OpenAI's ChatGPT, Microsoft's Bing Chat and Google's LaMDA have demonstrated impressive capabilities in many text-related tasks, including summarization and generation, sentiment analysis, and machine translation.

Automatic summarization is one of the basic NLP tasks for GAI applications. Text summarization aims to provide concise and coherent summaries of a longer text while keeping the crucial and overall meaning of the original work. Text summarization can be done in two ways: extractive summarization, which selects important parts from the original text and reproduces them verbatim, and abstractive summarization, which generates new sentences based on the essence of the original text. While the

former is usually more accurate, the latter resembles more how humans would conduct a summarization task [10]. In the digital age, summarization techniques have also developed to be multimodal and context relevant. Studies have been done in email, blog, and even Twitter short post summarization. Notably, there is also research in the citation-based summarisation of scientific articles. Depending on these studies, there are several tools available on the market, such as GPT-4, which is not only able to consider the text and context but also include the tables and figures in the document, or other summarizers put forward by QuillBot, Scribbr, and Resoomer [9].

Text generation lies at the core of the NLP field for GAI. However, apart from the most widely used text-to-text tasks or document-to-text applications that have been mentioned above, there are also other “to-text” tasks that GAI can accomplish. One example is the speech-to-text technologies that can be used to generate subtitles and transcriptions as well as identify the speaker, the language and keywords [11]. Another notable application is image or video-to-text generation. For instance, the Flamingo family of visual language models have bridged both computer vision and NLP models to provide users with text-only answers [11]. There are also data-to-text and code-to-text models to generate human-readable explanations or documentation structured data or source code, useful in areas like data augmentation and software development.

Another innovative ability of GAI in this field is to carry out sentiment analysis, which is crucial for the models to “chat” with humans. Sentiment analysis, or opinion mining, deals with issues of determining the emotional tones behind words and gathering and examining people’s opinions [12]. It mainly involves tasks like subjectivity classification, sentiment classification, and implicit language detection. Models like GPT-3 can already discern sentiment in text with remarkable accuracy. Later models like GPT-3.5 are even more adept at understanding nuanced tones, sarcasm and irony. Moreover, GPT-4 allows developers and users to customize their AI’s language style [9].

Except for handling the task of a single language, GAI can also facilitate cross-lingual communication by conducting translation tasks. Translation is one of the earliest problems people have been trying to solve with AI. Before the involvement of AI systems, machine translation was predominated rule-based or corpus-based [13]. With the advancement of deep learning and artificial neural networks, other applications of AI used for translation quickly emerged, such as machine translation based on neural algorithms and generative pre-trained large language models, which outperform traditional methods not only in accuracy but also in context awareness and customizability that streamline translation processes through human-AI collaboration [14].

2.3. Existing Limitations of GAI

Though very powerful in dealing with NLP tasks, GAI still has limitations. From the perspective of input, these algorithms need a vast amount of training data to perform tasks, and the expansion or revision of their memory is not an easy job. The data and resource dependency of GAI make its computation and training extremely expensive, and this means that customizability in specified fields is possible but not affordable [8]. Moreover, the training data may be explicitly or implicitly inherent, incomplete, outdated or biased, which might adversely influence the capabilities of GAI [15]. Regarding output, a major problem is that GAI is not reliable. They might be subject to “hallucinations”, meaning the AI may generate content that is irrelevant or inaccurate when it comes to specific sources [9]. They might also overgeneralize or oversimplify certain issues when they generate content [15]. Finally, the quality of GAI-generated content is difficult to control. Since unsupervised learning methods like reinforcement learning are commonly adopted in the training process, though scholars are working towards regulating GAI, it can generate biased, harmful, misleading or fake content [9].

In short, GAI is a beneficial tool that can efficiently perform various NLP tasks. However, it has limitations. GAI needs a vast amount of data and resources to be trained and operated, and it may produce content that is inaccurate, irrelevant, biased, or harmful. Hence, it is crucial to use GAI with caution and responsibility, and it should always be accompanied by human supervision and intervention.

Considering advantages and disadvantages of using GAI technologies, it becomes imperative to approach the integration of GAI into educational settings, especially EFL academic writing pedagogy, with a balanced perspective. Ensuring effective use of GAI by educators and students, while avoiding compromise of academic integrity and quality, requires understanding its inherent challenges. This will be discussed in the following section.

3. Integration of AI into EFL Academic Writing Education

Academic writing is a multifaceted process involving reading, finding sources, organizing, writing, reviewing, and editing to share ideas and research with the academic community while focusing on substance, critique, and honesty and varying in style [16]. It is a significant challenge for EFL students due to its stringent requirements for accuracy and structure [16]. Considering GAI's remarkable language processing capabilities, studies have explored innovative applications of GAI tools like ChatGPT to support academic writing and EFL education [17]. While highlighting promising benefits, prospective examinations also shed light on persistent concerns and risks from different roles involved in the teaching and learning process [18]. This section will review potential applications for students as well as educators in EFL academic writing courses, balancing the advantages these technologies may provide against limitations and weaknesses that need consideration.

3.1. Applications for Students

GAI tools have shown significant potential in scaffolding students in different stages of writing. This part will discuss the different functions that GAI can serve in order to provide a complete understanding of the use of such tools in educational settings.

3.1.1 Linguistic Support

Most EFL students struggle with language, which remains one of the biggest challenges in academic writing. GAI tools demonstrate extensive potential to aid EFL students in building academic English proficiency in translation, summarization, drafting, paraphrasing, vocabulary enrichment, grammar correction, and style improvement [19]. For instance, ChatGPT is a platform that enables users to communicate with its large language model and generate diverse texts according to their input. With appropriate prompts, ChatGPT can tackle all of the aforementioned issues in a matter of seconds. Additionally, it can also analyze written content and offer insights into the quality of the writing, such as the use of academic language and the structure of arguments.

However, since ChatGPT is mainly trained in the English language, it sometimes struggles to provide feedback efficiently if the prompts are unspecific, inaccurate or in other languages [9]. In this case, EFL students can also use other GAI tools as efficient translators to help them understand source materials and find better ways to convey their thoughts in English. For example, DeepL is a translation tool that utilizes neural network models to create accurate and authentic translations. It can significantly reduce students' workload in overcoming linguistic barriers.

Additionally, there are other specialized platforms to address particular issues during writing procedures as well. Grammarly, as the name suggests, focuses on identifying and correcting grammatical, punctuation, and stylistic errors. It provides real-time feedback, improving the correctness and authenticity of written content for EFL students. Quillbot is another useful platform that utilizes AI to rephrase sentences and offer vocabulary suggestions, thus enhancing overall readability. These various platforms can be utilized to enhance the quality of written work and improve overall writing skills, and compared to ChatGPT, they are more user-friendly since they do not require specific prompts.

With different GAI tools, EFL students can concentrate more on effectively conveying their ideas rather than worrying about technical language aspects. These tools not only provide immediate solutions to common linguistic problems but also offer opportunities for students to learn and improve their English proficiency. As a result, academic writing becomes more enjoyable and less stressful while enhancing the quality of their writing.

3.1.2 Research Assistance

AI-powered tools are also incredibly helpful in scaffolding students' research procedures. They can assist in gathering and organizing information as well as explaining concepts and providing examples, increasing the interactivity and accessibility of academic research procedures [19]. When it comes to searching for literature, Microsoft's Bing Chat is an excellent resource. It provides up-to-date information from the internet and links directly to relevant sources. This reduces the time it takes to check the validity of the retrieved information. Bing Chat can even summarize and organize research results to make them more logical and sensible.

Furthermore, there are tools available to help students gain a deeper understanding of a single reading material. Scribbr, a website that can provide academic assistance, has summarizer and paraphraser functions that can help students understand long and complicated passages. On top of this, platforms like ChatPDF, on the other hand, allow users to upload files and answer all kinds of questions based on the file content, from summarizing the context to the definition of a concept. ChatPDF also has a reverse prompt mechanism to help users think up relevant questions about the file in order to do a deep dive into the text.

In addition to text analysis and manipulation, the latest AI model, GPT-4, is capable of analyzing pictures and tables [9]. It can process large amounts of data rapidly and effectively and generate preliminary analysis swiftly, allowing students to work directly based on the results.

Therefore, GAI is transforming academic research and writing by making it more efficient, interactive, and insightful. They not only save time but also ensure the validity of information. With their ability to explain complex concepts in a simple manner and provide relevant examples, GAI tools are beneficial for students who are just starting to learn the academic research process.

3.1.3 Cognitive Support

The use of GAI tools can alleviate students' cognitive load from making repetitive or machinic efforts, thereby facilitating the optimization of their focus on crucial tasks that demand intellectual exertion, such as critical thinking, discussion, and ideation [20]. In the planning phase, GAI models demonstrate aptitude as aids for creating, linking and organizing ideas [21]. These chatbots allow students to engage in dialogues to work through vague initial thoughts and make connections between concepts. Writing assistance platforms like HyperWrite also have brainstorming tools, which allow the students to input their problems and get a list of relevant ideas quickly and adjust the complexity or length of the list by clicking on different buttons. This has the potential to help students form coherent outlines and logical structure, providing a solid foundation at the initial stage of their writing. During the actual writing process, GAI tools can offer personalized learning journeys by accommodating the unique learning styles and paces of students, as detailed in [20]. These tools can acquire individual learner's personal inclinations, strengths, weaknesses, and use the information to provide instant feedback and recommendations for improvement, which in turn can enhance the learning motivation and outcomes of students.

In conclusion, the integration of GAI tools into the academic writing process has revolutionized the way students approach their writing assignments. These tools offer a plethora of benefits, such as improved productivity, enhanced writing quality, and personalized assistance. Therefore, by utilizing such tools, students can effectively streamline their writing process and achieve better academic outcomes.

3.2. Potential Instructional Applications for Educators

GAI's transformative influence is not limited to students but extends to educational settings at large. Though currently there is limited literature specifically focusing on this area, it is still possible to see from studies in related areas that the integration of GAI into the pedagogical landscape offers opportunities for enhancing instructional methods in EFL academic writing courses [22,23]. This section explores some potential uses of GIA in aiding educators from various aspects, such as lesson preparation, student engagement, collaborative writing, and assessment.

3.2.1 Lesson Design Support

EFL teachers are under tremendous pressure to provide students with instruction that meets the diverse needs of their students from different majors. Customizing the course materials used by EFL instructors to align with the diverse backgrounds, varying levels of proficiency, and unique learning preferences of their students is of great importance. However, the endeavor necessitates a substantial investment of time, dedication, and specialized knowledge, potentially diverting their attention away from other pivotal aspects of language teaching. In this case, GAI tools that can help design EFL academic writing courses would be highly beneficial under this circumstance. They can help teachers design academic writing lessons by providing suggestions for class activities and materials instantly. A study has shown that ChatGPT can help alleviate this pressure on EFL teachers by outlining lesson plans and discussing details with the teachers, resembling a teaching peer, to better help with the unique needs of the class [24]. It can also produce customized written passages centered around a particular subject, aligning them with a specified proficiency level as determined by an assessment framework. Moreover, ChatGPT can transform texts by merging various sets of vocabulary, thereby optimizing the usefulness of the content it generates. This adaptability in modifying materials simplifies the creation of a wide array of resources. With the massive power of information retrieval and text manipulation, GAI tools can help design class activities and organize course materials, including syllabi, lesson plans, and rubrics, with remarkable efficiency.

3.2.2 GAI-incorporated Writing Courses

Apart from how teachers prepare the courses, GAI also has the potential to transform instructional methodologies in EFL academic writing courses. By integrating GAI into actual teaching, educators can cultivate an effective learning environment that is both dynamic and personalized. A study focusing on the integration of ChatGPT within an argumentative writing course explored the potential of chatbots in the preparation of outlines, revising content, proofreading, and engaging in reflective processes post-writing based on automated writing evaluation systems [22]. This study has proposed a structured approach comprising four stages: 1) instructors provide rubrics for students to write outlines, utilizing ChatGPT for feedback and revisions; 2) ChatGPT enhances writing quality based on specific requirements of the rubrics; 3) teachers provide individual learners with detailed feedback and input it into ChatGPT, and this goes through ChatGPT multiple times for consistency; 4) students maintain interaction history for electronic portfolios, reinforcing comprehension through review.

Through this framework, the paper tested the conceptualization of ChatGPT as both a writing evaluator and a virtual peer. Building on a similar notion, Han et al. have initiated the development of a new language learning platform named “RECIPE” that integrates ChatGPT with EFL writing, including intermediate and advanced writing for undergraduate students and scientific writing for graduate students [25]. This platform has a writing exercise interface with two windows to edit and interact with ChatGPT. Students can revise their previous essay on the left window and consult ChatGPT on the right. The platform also provides two prompts: a hidden one for ChatGPT to act as an English writing teacher, and an open one for students to initiate a dialogue efficiently. When using the platform in class, students would usually be given a topic, which they would write about and then edit several times during the course, and the essays or papers are stored in the platform as digital files for further reflection and study. The authors have also introduced ChEDDAR, a dialogue dataset that captures the interactions between EFL learners and ChatGPT in a consequent paper, which can be used in prompt recommendation, learning analytics, and misuse detection [26].

Though an excellent attempt at integrating GPT into academic writing practice, Han et al.’s study also acknowledged several aspects that need developing based on the interview with “RECIPE” users, including improvement of prompting, personalization, automatic grading and interface [25]. Furthermore, the platform's current design primarily focuses on individual interactions with the chatbot, overlooking the collaborative and interactive nature of classroom learning, highlighting a direction for future enhancements. On top of this, incorporating collaborative learning tools that enable real-time collaboration, allowing students to co-write, edit, and provide feedback on each

other's work, may foster a even more interactive and authentic learning atmosphere and writing experience.

3.2.3 Automated Assessment

GAI can revolutionize another area of academic writing pedagogy: evaluation and assessment. In fact, before the rapid development of GAI, efforts had already been made to make the time and physically demanding process of grading essays an automatic procedure. Grammarly, for instance, has a simple rating system that can give each text input into its system an overall performance score. However, similar systems are often not easily customizable or still rely on human efforts to provide accurate and detailed feedback. Therefore, it is unsuitable for direct use in a formal and comprehensive assessment. The integration of GAI, on the other hand, has the potential to enhance the efficiency, accuracy, and objectivity of evaluating students' writing outcomes.

Using ChatGPT, teachers can feed the chatbot with specific rubrics and then ask it to assess students' writing assignments based on the rubrics, providing feedback on grammar, coherence, and argumentation [25]. By integrating similar GAI tools into the assessment process, teachers can obtain a deeper understanding of each student's learning progress and adjust their teaching strategies more efficiently. Additionally, since subjective factors do not influence GAI algorithms as humans do, they can provide a more unbiased evaluation of students' performance compared to human graders. This is particularly useful in large-scale assessments where maintaining consistency and fairness is a challenge. Some scholars have even claimed that GAI tools have the potential to be used in crucial exams, including IELTS and TOEFL, and many researchers are working to include AI in their evaluation system [24].

While GAI can help the assessment, it cannot completely replace human teachers' expertise in evaluating learning and especially writing outcomes. As is shown in previous section, these tools are still struggling with accuracy issues and overly generic responses at times. should be regarded as a complementary aid instead of an independent rater.

To sum up, the integration of GAI into EFL academic writing courses can bring significant benefits to both educators and students. It can enhance lesson preparation, facilitate student engagement, promote collaborative writing, and assist in the assessment process. However, more exploration is needed to uncover the full potential of GAI in this field and overcome the challenges associated with its use.

3.3. Concerns and Challenges

The rapid development and spreading of GAI tools, such as ChatGPT, have led to an urgent need for educators to address the implications of these technologies, especially in social science subjects, which are considered more vulnerable to their influence. While GAI offers promising methods for enhancing EFL pedagogy, it also raises severe academic, pedagogical and practical risks. From an academic perspective, one of the most pressing concerns is the potential for misuse and plagiarism. A comprehensive review of Sullivan et al. on this issue has pointed out that there were already cases where students have been caught cheating with ChatGPT, and this has also led to discussion on the detection methods [27]. Some educators believe it is easy to differentiate students' writing from AI's works even without technological assistance, while some doubt the accuracy of the tools and software that some universities are using to detect AI-generated texts, such as Turnitin. There are also scholars who approach the problem from a different angle, considering how to define "plagiarism" more properly in an era with GAI tools. Simply drawing a line based on the percentage of the text in students' essays that has been generated by AI might not be a very effective and comprehensive way to define such kind of academic dishonesty [28].

From a pedagogical point of view, schools and educators may have to consider changing their course designs, syllabi, or assignments to embrace the convenience that has been brought by AI tools as well as counter their misuse. Students need to be taught how to use ChatGPT and similar tools ethically, fostering critical thinking rather than outright banning them [27]. This is especially relevant to academic writing courses, where critical thinking is the core. However, it would be a great

challenge since some academics have pointed out the potential over-reliance on technology, diminishing analytical skills that academic writing aims to develop [25]. Instead of grappling with complex topics, forming original thoughts, and articulating them coherently, students might be tempted to take shortcuts, relying on GAI outputs without critically engaging with the content [29].

The practical concerns of AI tools are mainly focused on the limitations of the tools themselves and the accessibility to these tools. An inherent shortcoming of these tools is that GAI might produce information that sounds plausible but needs to be corrected [9]. This would be particularly misleading and confusing to EFL students who do not have a solid background in the English language or academic research. Also, while GAI tools can assist in language learning and translation, they may struggle with different accents or inaccuracies in spelling, resulting in misinterpretations or communication problems [22]. Another concern is that different students might have different levels of accessibility to GAI and different levels of knowledge on how to use them, resulting in inequalities in educational settings, especially in writing courses [18].

Apart from these primary concerns, other risks have also been put forward, like the possible leak of data privacy and the potential misuse of personal, academic and innovative information, especially in arts and social science disciplines, as well as the challenge posed on the change of social values and student-teacher relationships [22]. Institutions and educators need to find a balancing point between taking advantage of the benefits of these tools and safeguarding academic standards.

4. Conclusion

The application of GAI will undeniably start a transformative phase in the domain of EFL academic writing. Its abilities range from offering linguistic and cognitive support to students to helping educators in lesson design and automated assessment. Platforms like “RECIPE” have already showcased the innovative ways in which GAI can be integrated into academic writing practices, offering students a dynamic, personalized learning environment [25].

However, GAI’s capabilities have also raised significant concerns. The issues of academic integrity, the potential for plagiarism, and the challenges in detecting AI-generated content have shown the complexities of integrating such tools into the academic framework. Furthermore, it is crucial to consider the ethical implications of integrating GAI, especially concerning data privacy. There is a real risk of data breaches, misuse of personal and academic data, and the wider implications this has for arts and social science disciplines [22]. Additionally, the potential for GAI tools to inadvertently perpetuate inequalities in educational settings, given the varying levels of accessibility among students, adds another layer of complexity to this issue [18].

It is crucial to adopt a comprehensive approach. Schools and universities must prioritize training for both educators and students, ensuring that the use of GAI tools is academically integral, responsible, and aligned with ethical values. Collaborative efforts between AI developers, educators, and policymakers are essential to create robust guidelines and frameworks for GAI’s integration.

References

- [1] F. J. García-Peñalvo and A. Vázquez-Ingelmo, “What Do We Mean by GenAI? A Systematic Mapping of The Evolution, Trends, and Techniques Involved in Generative AI,” *International Journal of Interactive Multimedia and Artificial Intelligence*, vol. In Press, no. In Press, p. 1, Jan. 2023, doi: 10.9781/ijimai.2023.07.006.
- [2] K. Knill and S. Young, “Hidden Markov models in speech and language processing,” in *Text, speech and language technology*, 1997, pp. 27–68. doi: 10.1007/978-94-017-1183-8_2.
- [3] D. P. Kingma and M. Welling, “Auto-Encoding variational Bayes,” *arXiv (Cornell University)*, Dec. 2013, doi: 10.48550/arxiv.1312.6114.
- [4] I. Goodfellow *et al.*, “Generative Adversarial Nets,” *Advances in Neural Information Processing Systems*, vol. 27, pp. 1–9, Oct. 2014.

- [5] T. Mikolov, M. Karafiát, L. Burget, J. Cernocký, and S. Khudanpur, “Recurrent neural network based language model,” *Interspeech*, vol. 2, pp. 1045–1048, Sep. 2010, doi: 10.21437/interspeech.2010-343.
- [6] U. Khandelwal, H. He, P. Qi, and D. Jurafsky, “Sharp Nearby, Fuzzy Far Away: How Neural Language Models Use Context,” *arXiv*, Jan. 2018, doi: 10.18653/v1/p18-1027.
- [7] A. Vaswani *et al.*, “Attention is All you Need,” *arXiv (Cornell University)*, vol. 30, pp. 5998–6008, Jun. 2017, [Online]. Available: <https://arxiv.org/pdf/1706.03762v5>
- [8] A. Radford, K. Narasimhan, T. Salimans, and I. Sutskever, *Improving language understanding by generative pre-training*. 2018.
- [9] OpenAI, “GPT-4 Technical Report,” *arXiv (Cornell University)*, Mar. 2023, doi: 10.48550/arxiv.2303.08774.
- [10] A. Nenkova and K. McKeown, “Automatic summarization,” *Foundations and Trends in Information Retrieval*, vol. 5, no. 2, pp. 103–233, Jan. 2011, doi: 10.1561/15000000015.
- [11] R. Gozalo-Brizuela and E. C. Garrido-Merchán, “A survey of Generative AI Applications,” *arXiv (Cornell University)*, Jun. 2023, doi: 10.48550/arxiv.2306.02781.
- [12] W. Medhat, A. Hassan, and H. Korashy, “Sentiment analysis algorithms and applications: A survey,” *Ain Shams Engineering Journal*, vol. 5, no. 4, pp. 1093–1113, Dec. 2014, doi: 10.1016/j.asej.2014.04.011.
- [13] W. J. Hutchins, “Machine Translation: A Brief history,” in *Elsevier eBooks*, 1995, pp. 431–445. doi: 10.1016/b978-0-08-042580-1.50066-0.
- [14] S. C. Siu, “Revolutionizing Translation with AI: Unravelling Neural Machine Translation and Generative Pre-trained Large Language Models,” *SSRN*, Jul. 04, 2023. <http://dx.doi.org/10.2139/ssrn.4499768> (accessed Sep. 27, 2023).
- [15] P. P. Ray, “ChatGPT: A comprehensive review on background, applications, key challenges, bias, ethics, limitations and future scope,” *Internet of Things and Cyber-physical Systems*, vol. 3, pp. 121–154, Jan. 2023, doi: 10.1016/j.iotcps.2023.04.003.
- [16] M. Campbell, “Teaching academic writing in higher education,” *Education Quarterly Reviews*, vol. 2, no. 3, Sep. 2019, doi: 10.31014/aior.1993.02.03.92.
- [17] T. Wang *et al.*, “Exploring the Potential Impact of Artificial Intelligence (AI) on International Students in Higher Education: Generative AI, Chatbots, Analytics, and International Student Success,” *Applied Sciences*, May 2023, doi: 10.20944/preprints202305.0808.v1.
- [18] W. M. Lim, A. Gunasekara, J. L. Pallant, J. Pallant, and E. Pechenkina, “Generative AI and the future of education: Ragnarök or reformation? A paradoxical perspective from management educators,” *The International Journal of Management Education*, vol. 21, no. 2, p. 100790, Jul. 2023, doi: 10.1016/j.ijme.2023.100790.
- [19] Y. Dong, “Revolutionizing Academic English Writing through AI-Powered Pedagogy: Practical Exploration of Teaching Process and Assessment,” *Journal of Higher Education Research*, vol. 4, no. 2, p. 52, Apr. 2023, doi: 10.32629/jher. v4i2.1188.
- [20] J. Reyna, “The potential of artificial intelligence (AI) and ChatGPT for teaching, learning and research,” *ResearchGate*, Jun. 2023, [Online]. Available: https://www.researchgate.net/publication/371310638_The_Potential_of_Artificial_Intelligence_AI_and_ChatGPT_for_Teaching_Learning_and_Research
- [21] C. K. Y. Chan and W. Hu, “Students’ voices on generative AI: perceptions, benefits, and challenges in higher education,” *International Journal of Educational Technology in Higher Education*, vol. 20, no. 1, Jul. 2023, doi: 10.1186/s41239-023-00411-8.
- [22] Y. Su, Y. G. Lin, and C. Lai, “Collaborating with ChatGPT in argumentative writing classrooms,” *Assessing Writing*, vol. 57, p. 100752, Jul. 2023, doi: 10.1016/j.asw.2023.100752.
- [23] C. Liu, J. Hou, Y.-F. Tu, Y. Wang, and G. Hwang, “Incorporating a reflective thinking promoting mechanism into artificial intelligence-supported English writing environments,” *Interactive Learning Environments*, pp. 1–19, Dec. 2021, doi: 10.1080/10494820.2021.2012812.
- [24] O. Koraishi, “Teaching English in the Age of AI: Embracing ChatGPT to Optimize EFL Materials and Assessment,” *Language Education & Technology (LET Journal)*, vol. 3, no. 1, pp. 55–72, May 2023.

- [25] J.-Y. Han *et al.*, “RECIPE: How to Integrate ChatGPT into EFL Writing Education,” *arXiv*, Jul. 2023, doi: 10.1145/3573051.3596200.
- [26] J.-Y. Han *et al.*, “CHEDDAR: Student-ChatGPT Dialogue in EFL Writing Education,” *arXiv (Cornell University)*, Sep. 2023, doi: 10.48550/arxiv.2309.13243.
- [27] M. Sullivan, A. Kelly, and P. Mclaughlan, “ChatGPT in higher education: Considerations for academic integrity and student learning,” *Journal of Applied Learning and Teaching*, vol. 6, no. 1, Mar. 2023, doi: 10.37074/jalt.2023.6.1.17.
- [28] D. Yan, “Impact of ChatGPT on learners in a L2 writing practicum: An exploratory investigation,” *Education and Information Technologies*, Apr. 2023, doi: 10.1007/s10639-023-11742-4.
- [29] Z. Bahroun, C. Anane, V. Ahmed, and A. Zacca, “Transforming Education: A Comprehensive Review of Generative Artificial Intelligence in Educational Settings through Bibliometric and Content Analysis,” *Sustainability*, vol. 15, no. 17, p. 12983, Aug. 2023, doi: 10.3390/su151712983.