



Artificial Intelligence in Translation: The Menace, Promise, and Response to Technology and Superseded Practice

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Abstract. The integration of artificial intelligence (AI) into translation practice, teaching, and research has transformed the domain of translation. In translation practice, AI-driven tools such as neural machine translation (NMT) systems enhance efficiency, enabling translators to process large volumes of text rapidly and assisting translators in terms of consistency, such as the use of terminologies. However, this integration raises concerns, including issues of quality and sensitive or controversial content, necessitating a balanced approach combining AI capabilities with human expertise.

In the field of teaching, AI introduces opportunities and challenges. Educators can leverage AI tools to make students aware that the field of translation has evolved with the integration of AI, enhancing their understanding of contemporary translation practices. At the same time, educators must equip students with the critical skills to navigate emerging concerns and address the limitations of AI.

The area of research in AI and translation is also evolving, focusing on improving machine translation (MT) ability, delving into immediate concerns, and exploring the potential of AI to augment human translation. Research along these lines study methods to blend AI and human expertise while handling concerns such as ethical issues. AI-translator integration, driven from these research outcomes, promises to maximize the benefits of both, ensuring that AI tools complement rather than replace human translators.

This paper offers responses to the utilization of AI in translation, ensuring that the integration is effective and ethically sound. The ongoing assimilation between AI capabilities and human expertise is crucial in shaping the future of translation.

Keywords: Artificial Intelligence, Translation, Integration, Opportunity, Challenges.

1 Introduction

Artificial intelligence (AI) has gradually become a more significant aspect of everyday life, including the utilization of personal assistants, like Siri, Alexa, and Google Assistant [1] to the use of intelligent search engines which can meet the needs

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for information acquisition, and at the same time improve the quality and relevance of information [2]. These AI applications have revolutionized the interaction of people with technology and how they access information, escalating the materialization of digital culture. Personal assistants not only perform less-principal tasks, like answering trivial questions through voice commands but also learn from users' interactions to provide increasingly individualized experiences. Meanwhile, intelligent search engines leverage algorithms to deliver highly relevant search results, excluding irrelevant information and prioritizing the most pertinent content based on users' intent and behavior.

Amid its widespread integration into various aspects within the digital culture of people's daily life, AI has found one of its most profound applications in the field of translation, revolutionizing communication across languages. This paper considers the growing influence of AI in the domain of translation. Given that translation is a multifaceted field, this paper concentrates on three key areas: translation practice, translation teaching, and translation research. By examining these areas, this paper aims to provide a reminiscent overview of the current trends and challenges in the field of translation.

Traditional translation practices have witnessed a substantial transformation with the advent of tools such as Google Translate and the development of neural machine translation (NMT) technologies. The widespread use of machine translation (MT), driven by the growing integration of AI and deep learning into today's domain of translation, is highlighted by the latest, and arguably alarming, statistical figures [3]. Almahasees stated that Google Translate has around 500 million users on a daily basis, while Microsoft Bing Translator serves approximately 18 million users each day [4]. In addition, in recent times, it is estimated that an overwhelming 99% of all translations are produced by machines. Notably, Google Translate processes approximately 143 billion words each day, equating to an average of 20 words per person [5] [6].

Beyond its role in translation practices, AI has also been integrated into translation education in attempt to enhance teaching methodologies and student learning outcomes. The integration of AI in higher education has revolutionized both the presentation of university courses and reshaped professional environment of scientific and technical translators, who navigate new formats and channels of information in a multi-disciplinary context [7]. In a more focused area, AI technology finds diverse applications in translation teaching, with the most common being voice translation and machine translation [8].

Further, the advancement of AI technology has significantly propelled the translation field, introducing numerous new technologies such as terminology management, translation memory, neural network machine translation, etc., and bringing about transformative changes in translation research. The academic community has integrated AI technologies, particularly deep learning, machine learning, and neural networks, into translation research, which is anticipated to establish a novel perspective known as "translation research under the perspective of artificial intelligence." [9]. Drawing from [10], the implementation of AI in translation studies has sparked considerable debate among various interested parties.

Aligning their perspective with Asscher's, they further asserted that stakeholders hold differing opinions on AI's potential as a groundbreaking innovation in translation. Some stakeholders are enthusiastic about its future prospects, while others remain skeptical about its ability to fully replace human translators.

Having the ability to translate text at speeds unattainable by humans and automate routine translation tasks, "AI translation has begun to challenge traditional human translation methods, and some even believe that AI will eventually replace human translators in the field of translation." [11]

This paper is intended to be argumentative rather than empirical, with the objective of raising awareness of the existing situation and encouraging the exploration of potential actions to address issues and concerns regarding the increasing integration of AI in the field of translation. Any recommendation can later be empirically tested to evaluate the effectiveness.

2 Artificial Intelligence and Translation Practice

As suggested in [12], MT has seen considerable progress and growing interest over the last few years, bringing with it the benefits and challenges to the domain of translation:

One central advantage is its efficiency; automated translation systems can process large volumes of text within short amount of time, making them highly effective for translating manuscripts, web contents, and texts of different types. This quality facilitates faster communication of messages across different languages, enhancing global interaction and collaboration. Additionally, MT promises expense efficiency by automating the translation process, reducing the need for the involvement of human translators, especially for projects which are recognized as large scale. This provides a cost-efficient option for organizations working with restricted budgets for translation. Another benefit of this tool is its consistency, as MT systems can maintain uniform terminology and style throughout the output it produces, which is crucial for businesses requiring consistent branding. In addition, MT enhances accessibility to multilingual content, shrinking or even eliminating linguistic barriers and making information available to a wider audience.

However, challenges remain, such as producing translation of high accuracy. MT systems often struggle with complex sentence structures, phrases open to various interpretations, idiomatic expressions, and contextual nuances, leading to potential inaccuracies. Domain-specific knowledge and language variations also pose hurdles, as specialized content requires expertise that MT systems may lack of. Consequently, translation produced by MT frequently requires post-editing by their human counterparts to ensure higher quality.

A study was conducted in 2024 with the specific aim of comparing the performance disparities between human translators and AI applications in translating across two languages: English and Arabic. The study's findings reveal that the performance of human translators and AI is relatively comparable, particularly when translating from Arabic into English. In this context, AI applications demonstrated

proficiency, with their translations closely matching those produced by human translators. However, the results also indicate that human translators exhibited superior performance when translating from English into Arabic. This disparity was most noticeable in areas requiring a deeper understanding of linguistic nuances, cultural context, and specialized terminology, where human translators were better equipped to handle the complexities inherent in the source language. The study underscores the ongoing relevance of human expertise in translation, particularly in languages with significant structural and contextual differences, while also highlighting the growing capabilities of AI in specific translation tasks [13].

Meanwhile, another study not only identified the performance disparities between human translation-practitioners and AI applications but also proposed several potential solutions to address challenges in translating scientific texts. Some of these are relevant to the interface between human translators and emerging technologies, particularly AI [14]. Awadh emphasizes that:

- Translators should rely on technology as a help in their job, since it allows them to be faster and, thus, more productive.
- Technology should not be feared, but rather considered as a benefit and a support to humankind. After all, humanity has been facing technological changes since the dawn of time, and it has evolved thanks to technology.
- Continuously updating artificial intelligence applications databases to contain all scientific terminology
- To achieve better translation results and output high-quality translations in the era of rapid development of AI, we have to enhance human-AI partnerships.

These recommendations suggest a collaborative future where human expertise and technological advancements work in tandem, optimizing the translation process and making scientific information more widely accessible across linguistic barriers.

AI, despite its advancements in translation technology, cannot match the abilities of human translators when it comes to conveying culture, emotion, and nuance, as stated in [15] [11] [16]. Translating cultural references requires a multilayered understanding of the source culture and the ability to convey these references meaningfully in the target culture, a matter AI often struggles with. Emotion and nuance in language are subtle and complex, involving tone, context, and even specific phraseology, which machines are not yet equipped to fully grasp. Their human counterparts, with the ability to interpret these layers of meaning, are able to produce translations that resonate on a deeper level with the target audience. This is where AI still falls short, as it lacks the inherent understanding and empathy that humans bring to their considerations and decisions. Other relevant studies suggest that AI does not replace human translators; there are human qualities that cannot be replicated by engineered, machine-based intelligence. [11], [22], [15]

Even though AI has significantly impacted the translation profession, the relevance of the profession remains strong in the modern world. Technology should not be viewed as a threat to human translators but rather embraced as a positive advancement. The concern that technology will replace human translators seems unfounded, as human translators are capable of producing high-quality translations without technology, whereas AI-powered MT still requires human input. Moreover,

the growing use of translation technology by human translators is not due to a lack of skill or confidence, but rather because social and economic pressures often necessitate it. Translators primarily use MT to increase their speed, enabling them to keep pace with market demands, other translators, and deadlines for delivering the final product [17].

Reflecting on the previously outlined statements, human translator has to be the principal agent in the collaboration and AI acts as an assistant. In other words, the translator is the one who carries out the translation process: “analysis, in which the surface structure (i.e., the message as given in language A) is analyzed in terms of (a) the grammatical relationships and (b) the meanings of the words and combinations of words, (2) transfer, in which the analyzed material is transferred in the mind of the translator from language A to language B, and (3) restructuring, in which the transferred material is restructured in order to make the final message fully acceptable in the receptor language.” [18]. The three stages signify—decoding, transfer, and encoding—based on a code model of communication, in which the sender encodes everything intended to convey within the message. Therefore, during the transfer stage, even “implied” elements are included, as they are considered part of the encoded message. Expanding the translation ensures that all the information from the original code is fully reproduced. [19].

The roles of the human translator proposed here are as follows:

- Ensuring Contextual Accuracy and Cultural Relevance

Human translators are essential for interpreting and conveying the contextual meaning of texts, especially when—among others—ethical and sensitive content, potentials of ambiguity, or special use of language are involved. AI may provide surface-level translation, but it often struggles with deeper contextual understanding. Translators must ensure that the translated text accurately reflects the intent and subtleties of the original, making adjustments as needed.

In relation to cultural differences, translations often require cultural adaptation to make them appropriate for the target audience. Human translators bring the necessary cultural awareness to modify content so that it resonates with readers, avoiding cultural missteps or offensive ambiance that AI might overlook.

- Creative Adaptation and Style Consistency

While AI can generate translations quickly, it lacks the ability to creatively rework content to match the tone, style, and voice of the original text. Translators must infuse the translation with the equivalent creativity and stylistic nuances found in the original material, ensuring that the translation reads naturally and maintains the original’s artistic or rhetorical impact.

Human oversight is crucial for maintaining consistency in tone and style, particularly in larger texts or projects where different sections might be translated at different times. Translators ensure that the entire document has a uniform voice, which is especially crucial in some settings, like literature and marketing.

- Critical Decision-Making and Problem Solving

While AI is likely to struggle with ambiguous phrases or sentences that have multiple possible interpretations, human translators are better equipped to analyze and

resolve these ambiguities, making informed decisions based on the broader context and their knowledge of both languages.

Translators also have a task to remain mindful of ethical considerations in the work, such as ensuring that sensitive or controversial content is handled appropriately. AI lacks the judgment required to navigate these complex situations, making human intervention vital.

- **Quality Control and Final Review**

One of the stages of the quality control process is editing [20], where “the task of an editor is that of a spokesperson of the author and the future readers. The aim of the editor’s work is the creation of such a translation which will be true to the original author’s intent (although not necessary to his every word). The author and the readers must be skillfully defended against any excesses of translators’ misplaced creativity. On the other hand, the editor should always have in mind the readers for whose benefit he should make sure that the final text of the translation simply reads well.” [21]

Even after post-editing, human translators play a vital role in the final quality control of the translation. This includes proofreading, checking for consistency, and ensuring that the translation meets the desired standards of accuracy, clarity, and naturalness.

Translators ensure that the translation is not only accurate but also aligns with the linguistic and cultural expectations of the target audience, providing a final product that is natural and fits for purpose.

3 Artificial Intelligence and Translation Teaching

The advancement of AI technology has significantly propelled the development of the translation market, bringing about a transformative shift in translation practices. In light of this shift, educators must recognize the importance of equipping college students with strong translation technology skills [23]. An additional view is introduced that “driven by both social needs and artificial intelligence, translation major students will be expected to develop not only core professional knowledge but also innovation ability, practical translation skills, and interpersonal communication expertise.” [23]

In recent years, the integration of AI technology in higher education has been on the rise, [particularly in translation between English and Chinese]. AI is increasingly making its presence felt in this specific area of translation [24]. Through their statement, [25] illustrate [the concern on] the integration of AI into translation teaching. With the support of this technology, MT not only surpasses the limitations of its traditional development but also introduces challenges to translation education in higher institutions. For instance, it can induce anxiety among students, affect their motivation to learn, and hinder their progress in translation skills; students may rely too heavily on NMT to complete their translation tasks, particularly those requiring independent effort, thus stunting their overall development in translation proficiency;

moreover, traditional assessment methods in teaching may become obsolete if students utilize NMT to accomplish their translation assignments.

Similar concern arises that students' over-reliance on AI for translation can diminish their autonomy and creativity. When students consistently rely on AI translations without engaging in their own critical thinking, they risk adopting a rigid mindset that hinders innovative translation outcomes. Effective translation requires not only proficiency in one or two foreign languages but also a deep cultural understanding and strong humanistic qualities and research skills. Currently, AI technology lacks the capability to achieve this level of cultural and contextual depth. Excessive dependence on AI, driven by its convenience, can ultimately erode students' translation abilities rather than enhancing them [23].

Challenges also arise on the teacher's side. Those faced by translation teachers in the era of AI extend beyond just adapting teaching concepts and methods; they also encompass the need for enhanced technical teaching abilities. The shift in teaching strategies and methodologies necessitated by AI requires a departure from traditional approaches. Embracing human-computer interaction for educational reform can address the evolving demands of translation talent development. Courses like computer-assisted translation (CAT) in universities merge translation knowledge with information technology, indicating that modern translation educators must integrate expertise in language culture, IT, and industry practices. Teachers in this new era are expected not only to utilize intelligent technologies but also to effectively incorporate them into their teaching practices. This expectation poses a significant challenge to their teaching proficiency [23].

One method of AI incorporation in translation teaching is offered, which is to integrate relevant translation software, such as MT and Computer-Aided Translation tools, into the curriculum. This approach equips students with the skills to effectively utilize the latest technologies in their future work, thereby enhancing both their efficiency and the quality of their work [26].

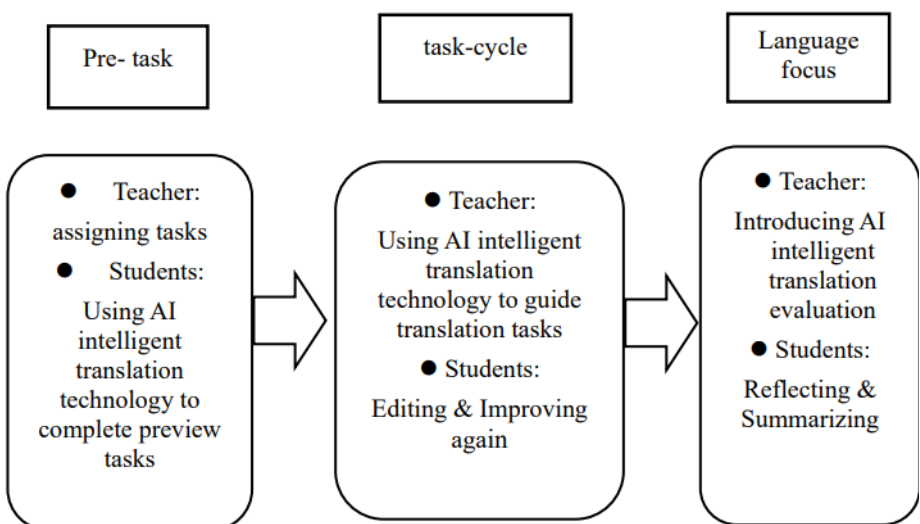


Fig. 1. The AI English translation teaching model [26]

Such assignments can be used to uncover the features and limitations of AI tools. Students can also be assigned tasks that focus more on their translation skills and competencies. One option is assigning them to translate materials with distinctive characteristics, such as promotional content with plays on words. The assignment of translating texts having particular objective and special characteristics encourages students to showcase their contextual analysis and ability to think creatively, where AI tool cannot be counted on in their attempts to produce high-quality translations.

In addition to producing translation having the highest quality possible, students are also compulsory to provide detailed explanations for the underlying considerations behind the decisions they make. This involves rationalizing the diction they use based on factors such as context, nuances, and equivalence of message. By engaging in this kind of activity, students not only reinforce their understanding of principles in producing quality translation but also actively develop and improve their translation competence. This reflective practice is very important in enhancing students' translation skills, as it encourages them to critically analyze and evaluate their work, leading to a deeper mastery of the expertise.

Another variety of assignment for students that cannot be powerfully performed by AI is the one directing them to perform a perceptual evaluation to assess readers' comprehension of the translation that they previously produce. This perceptual evaluation can be seamlessly integrated into a project-based assignment, where students are required to produce a translation and then evaluate its readability through ideal reader's feedback.

The evaluation can take form of a very simple inquiry, involving just one respondent—someone who characterizes the ideal target audience of the translation. The respondent is asked to read and comprehend a student's translation and identify any parts that hinder the respondent's comprehension. This feedback gives students valuable insights into how their translation is perceived by the "actual" audience.

Following the accomplishment of such perceptual evaluation, students can further be tasked with revising their translation to make the level of readability and overall quality higher. This form of assignment is more than simply correcting errors; it is more intricate that it challenges students to refine their work, making sure that the translation not only communicates equivalent message but is also easily understandable by the target audience. The goal of a translator is to produce a piece of translation to the point in which it meets professional standards or even exceeds, making it achieve the author's intent, more natural, target-user-friendly.

Students in this era already have AI as part of their life, as it has become an inseparable part of their daily activities and educational experiences. Educators are unable to—and should not—erase this knowledge and experience, but rather, they should take advantage of it productively. In the area of translation teaching, one point which is crucial is ensuring that students understand the limitations of the performance of AI tools in doing translation task. While the tools can assist in translating large volumes of text in a small amount of time, they are not perfect. These tools often struggle with cultural items, emotional tones of voice, and complex

linguistic structures, resulting in works of translation that may lack accuracy or the features found in the original reading experience. Therefore, students are made aware that AI-generated translations need detailed examination and refinement by human translators to end up with the expected high-quality outcome. Students' awareness of this fosters a balanced approach in which they can make the most of AI tools and at the same time recognizing the irreplaceable value of human touch in the production of a translation.

4 Artificial Intelligence and Translation Research

The advancement of AI that takes place quickly gives significant impact on the field of translation, revolutionizing how information is shared across diverse contexts. Among many AI-powered innovations, NMT is a significant leap forward, offering more refined and contextually-fit works of translation. As AI continues to advance, researchers are more and more concentrated on refining NMT systems to handle the complexities and creativeness of human language, from idiomatic expressions to domain-specific terminologies.

While NMT systems have shown considerable progress, an ongoing debate remains, regarding their performance compared to human translators, particularly when it comes to nuanced texts and culturally sensitive materials. This has inspired a growing number of research dedicated to boosting the capabilities of NMT systems, for example [27] [28] and deliberately comparing them with the capacity of human translator to understand their strengths and limitations, e.g. [15] [29].

In this circumstance, two key research paths have emerged: the ongoing optimization of NMT models to improve contextual-understanding accuracy and adaptability, and comparative research assessing how these systems measure up to the mastery of their human counterparts. These areas of study are deeper than only seeking to advance the technology but are also parts of the attempts to map out the most effective roles for AI and human collaboration in the field of translation.

Extensive work was and is continuously done to enhance NMT models, making NMT more powerful and capable of coping with complex linguistic items, idiomatic expressions, and elusive contextual cues, those which are often proven to be challenging for AI. Improvements are invented to bridge the gap between machine-generated translations and those crafted by adept human translators.

Alongside these advancements, there exist significant research assessing the quality of translations produced by AI and comparing it with that of translations done by human translators. These studies reveal and often highlight the superiorities and limitations of NMT systems. While AI can manage translation of large volumes of text in a short time, human translators generally surpass AI in handling nuanced meanings, cultural references, and non-literal, connotative language that automated tools often miss. Research focused on this area seeks to pinpoint where AI can be most productively utilized and where human quality remains indispensable.

- Post-Editing

As the technology linked to MT continues to evolve, the synergy between AI and human translator has become even more pivotal. MT systems, particularly NMT, have achieved major achievements in generating translations of high-quality at staggering rate. However, these come with flaws, often requiring human intervention to revise errors, improve fluency, and assure that translations accurately reflect the intended meaning.

This is the point where Post-Editing (of Machine Translation) comes into play. Post-editing has emerged as an essential research domain, concentrating on the process of making machine-generated translations equal to translations meeting professional standards through editing by human. Researchers are deeply studying ways to optimize this kind of collaboration between AI and human translators, intended to leverage the speed and efficiency of MT while maintaining the equivalence in message, cultural sensitivity, style, and other qualities that are exclusive to human editors.

The growing body of research investigating post-editing attempt to addresses various challenges, including the development of tools and methods in which human translators accurately detect and correct errors generated by machine [30]. By amalgamating the superiority of AI and human expertise, post-editing research aims to optimize the overall quality of translations, ensuring that they meet real-world, applied standards and effectively convey the original intended message. One common research area is the integration of AI-generated translation and human translation, with the emphasis on AI-generated translations post-editing. This collaboration aims to integrate the speed of AI with the ability and qualities of human translators. for instance [31].

- Ethical Considerations

At a root level, machines lack inherent ethics because machines are not accountable for actions except if they are directed by humans. However, the unpredictability of text generated by more advanced NMT systems adds the complexity to this perspective. These advanced models have the qualities to generate content that goes beyond their training data, resulting in novel and unpredicted ideas. In the realm of NMT systems, humans bear a substantial share of the responsibility in relation to these ethical concerns, possibly reaching 80%. Yet, in case of NMT system functions autonomously without human supervision, determining ethical responsibility for the resulting output turns to be more challenging. As the use of tools like NMT systems continues to expand, it is critical for the next generation of developers to prioritize creating models that are ethically responsible and promote fairness. The starting point of this effort is thorough education during training, where they are taught to deal with ethical challenges in the development of AI. [32]

As AI tools, such as NMT, become ever more complex and autonomous, increasing number of research is being conducted to tackle the ethical issues associated with translation generated by AI. Many studies are designed to focus on the responsibility of developers to invent and develop models that not only avoid bias but also promote fairness and accountability. These research efforts underline the

need for extensive education and ethical training to ensure that AI and machine learning translation tools are effective and ethically appropriate, reflecting the broader societal values which they are engineered to serve.

Drawn from the insights of scholars, ethical concerns dealing with MT encompass various facets, involving stakeholders particularly translators, developers, and clients. One major concern is the automatic evaluation of MT systems, where according to some views, it is unethical to compare machine to human translation quality based entirely on efficiency. Additionally, concerns raise regarding confidentiality, especially in legal translations, where the utilization of MT could disclose sensitive content. The fact that NMT has autonomous nature brings ethical challenges likewise, particularly those related to the quality of translations and the moral rights of content producers. In addition, human translations training machine models without proper consent poses fundamental ethical questions, highlighting the demand for legal agreements. Transparency and trust among clients and translators are also pivotal, with calls for clear guidelines on the way MT is used to guarantee ethical practices. The issues previously presented highlight the complex ethical landscape related to AI and MT, requiring thoughtful consideration of social and non-social dimensions. [33]

It is proposed that future research investigating AI and translation should also be designed to center on gaining a profound understanding of how non-expert (general) users, or laypeople, perceive translations generated by AI and place trust in them. Unlike experienced translators, laypeople users may lack the intellectual translation knowledge or linguistic capability to evaluate in-depth the quality of AI-generated translations. Investigating these perceptions involves examining how non-expert users engage with AI-assisted translation technologies in common contexts: casual conversations, personal correspondence, or even in professional contexts where levels of necessitated precision vary. Additionally, making sense of how these users build trust in AI systems—based on prior experience, the perceived authority of the technology, or the offered convenience—could provide significant understandings into how AI tools are incorporated and relied upon by more inclusive public.

Non-experts may thoughtfully consider AI-generated translations with a level of trust that is potentially problematic, as they may not be entirely conscious of the boundaries of AI technologies. Such trust can result in an injudicious belief that the AI-engineered translations are without flaw, which can have serious consequences. Without the requires linguistic expertise or captious awareness, users with this nature might overlook flaws that AI systems are often unable to avoid. This over-reliance on AI's perceived accuracy can give rise to misunderstandings, especially in domains where precision is indispensable. Consequently, there is a risk that the widespread use of AI-generated translations could unintentionally strengthen the misconception that they are comparable in reliability to human translation, when in reality, translations of this type still require careful review and, in many cases, major rework.

Additionally, it is proposed that studies also prioritize endeavors to educate the public on the shortcomings of AI tools' performance in translation. This could involve crafting approaches to raise awareness of stakeholders—from clients and providers of translation service to educators and students—that, while AI is a powerful tool, it cannot independently guarantee refined translations, particularly in multifaceted or

sensitive contexts. With the efforts to focus research on educational and awareness-raising efforts, the field of study can advance in a way that enhances AI functionalities while ensuring responsible and informed use of AI tools. This balanced approach is necessary not only for practical application in translation commercial venture but also for incorporating AI tools effectively within the area of translation teaching.

5 Conclusion

Interwoven in the digital culture, the integration of AI in the domain of translation is no longer a possibility but it is an ongoing situation. AI technologies have already reshaped translation practices, teaching, and research, enhancing efficiency, and expanding the scope of what is achievable. While this shift offers groundbreaking prospects for evolution and advancement, it introduces challenges, including concerns over accuracy (equivalence), the role human translators play, and ethical considerations.

To leverage the advantages of AI in translation, it is highly necessary to embrace this technological advancement with strategic outlook. Translation practitioners, educators, and scholars ought to focus on harnessing AI tools to supplement human proficiency, ensuring that the technologies are applied to enhance rather than displace human translators and prepare (by means of translation teaching) technologically-agile future translators. By means of this, stakeholders can lead the way in shaping the future of translation, ensuring that AI acts as a potent collaborator in the advancement of translation theory and practice.

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