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| RESEARCH ARTICLE

The Role of AI-Driven Systems in Enhancing Translation Competence and Socio-Cultural Mediation

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| ABSTRACT
Artificial Intelligence (AI) has entirely changed the translation industry. Neural machine translation (NMT) and various AI-driven technologies have significantly enhanced translation abilities, resulting in faster, more precise, and more effective translations. Sociocultural negotiation—adapting to arrangements suitable for the culture and context—remains a challenge for AI systems. This paper examines the advantages and disadvantages of this technology, as well as the role of AI in developing translation abilities and sociocultural negotiation. Although AI machines can provide a helping hand in processing and assist with language tasks, they are not yet equipped with the cultural knowledge necessary to produce high-quality translations, especially in sensitive areas such as literary, legal, and medical translation. The paper also discusses the growing role of human know-how and the ethics of AI in translation, with a focus on the collaboration between human translators and AI technology. Incorporating AI devices into business translation activities can yield more professional outcomes without compromising cultural and contextual precision within the original text. In the long term, the future of translation is integrating AI with human expertise.

| KEYWORDS
AI-Driven Translation; Neural Machine Translation; Translation Competence; Socio-cultural Mediation; Machine Learning in translation

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1. Introduction

In recent decades, the translation sector has undergone significant transformations, driven by advances in technology. Specifically, the emergence of Artificial Intelligence (AI) has dramatically changed the way translation is conceived, conducted, and consumed. Innovation in AI-driven systems, such as Neural Machine Translation (NMT), enables translations to be completed more effectively, in a scalable manner, and with greater accessibility to local audiences worldwide. Currently, businesses, governments, and individuals can utilize AI to capitalize on translation technology more quickly than ever before, responding to language differences and supporting global communication faster than ever before.

However, despite the advances in AI, translation is more than the mechanical transference of words from one language to another (Rasouli et al., 2024). Fundamentally, translation is a socio-cultural mediation process, ensuring that the translation is language-accurate, culturally relevant, and contextually sensitive. This is especially true when you consider the social nuances of conversation that AI systems lack; they can process language more thoroughly, but they are unable to comprehend the cultural elements that influence the outcomes of this process.

The study assesses AI as a means of improving translation processes, linguistic accuracy, and cultural awareness. The first section outlines the evolution of AI technology in translation over time before probing into a review of key technological components. In this paper, the crucial role that human translators play in creating cultural translations, while also evaluating the limitations of AI technology for cultural transfer, will be highlighted. This paper also examines the ethical issues related to translation using AI.

2. Translation Competence: A Framework

Translation competence encompasses a broad range of concepts that extend beyond basic language skills. According to Pöchhacker (2004), linguistic, cognitive, and sociocultural competence are the three main components of this concept. Translators should possess linguistic competence in both the source and target languages to ensure the accuracy and reliability of their translations. Analyzing the source and target languages, resolving translation issues, and selecting suitable methods for translation requires cognitive competence. Another aspect in translation is sociocultural competence, which involves awareness and engagement with the cultural context that affects meaning in both languages.

Artificial intelligence translation software significantly enhances translation skills. For instance, a neural machine translation system uses bilingual training data to produce high-quality and accurate translations. AI tools generate translations that are both grammatically and semantically correct; however, they require further development in terms of their cognitive and sociocultural aspects of translation. Idiomatic expressions, proverbs, and cultural references pose significant challenges for NMT systems in accurately translating texts (Baker, 2018).

The human translator suggests linguistic competence, cognitive capabilities, and contextual cultural knowledge to the practice in traditional translation (Rasouli et al., 2024). Cultural distinction becomes essential when translations involve content that targets cultural groups. If the translator is unable to accurately account for cultural differences, a misunderstanding may occur, or the source content may offend the target audience (Aminzadeh & Seyyedi, 2024). AI cannot assess these distinctions. For instance, the idiomatic meaning of "to break the ice" is translated fairly directly in some languages but may require considerable adaptation in others, depending on the cultural context. AI tools struggle in cases like these by translating literally and failing to capture the intended meaning (Baker, 2018).

3. AI in Translation: A Historical Perspective

The initial development of machine translation occurred in the 1950s when first-generation computer technology attempted to process English-Russian language conversions. The first generation of machine translation systems functioned through rule-based machine translation (RBMT), which utilized predefined linguistic rules to transform text from one language to another. RBMT systems represented groundbreaking technology during their time; however, they demonstrated limited accuracy alongside restricted flexibility in their operations. The translations produced by these systems proved to be unnatural, resulting in awkward translations that failed to capture the subtleties of human language.

The advent of statistical machine translation (SMT) marked a significant progress in the 1990s. SMT systems used statistical patterns to analyze bilingual training datasets. Due to the system's ability to recognize linguistic patterns, translation quality improved. Still, SMT faced challenges in translating complex and long sentences.

Deep learning (DeepL) algorithms, which form the basis of neural machine translation (NMT) in the mid-2010s, have revolutionized translation by enabling AI systems to translate entire sentences or paragraphs in context, rather than literal translation (Vaswani et al., 2017). Nowadays, the use of AI has surged due to its ability to translate with fluency and accuracy, and this shift toward context-aware translation has contributed to its widespread adoption. Software such as DeepL and Google Translate mainly rely on NMT and can generate translations that are often indistinguishable from human translations.

Despite these advancements, socio-cultural issues in translation continue to be a challenge for AI tools, as they lack the cultural sensitivity of human translators. This issue is particularly noticeable in the translation of legal and literary texts, where tone, style, and subtlety of meaning are crucial.

4. Heading AI-Driven Systems: Core Technologies and Mechanisms

AI systems utilize various technologies to analyze language data and translate texts. One of the main technologies is Natural Language Processing (NLP). NLP breaks down text into words, organizes sentence structures, and examines the meaning and relationships between words.

Machine learning (ML) is another AI technology in translation. With ML, these systems can continually develop their performance by learning from thousands of data examples. To train their NMT system or engine with a large amount of bilingual data, organizations use deep learning models. In Deep learning, neural networks with multiple layers of interconnected nodes have been used to simulate the human brain's organization and information processing. Each node in a layer analyzes the relationships between previously analyzed groupings of language data to produce consistently improved translation accuracy.

One of the significant advancements in NMT is the integration of transformer models, which process the entire input sentence in parallel at once to identify long-range relationships among words. This results in smoother and contextually precise translations. The transformer model was introduced in the 2017 paper "Attention is All You Need" by Vaswani et al., and it has been the backbone of most modern NMT systems ever since.

Although NMT has remarkable capabilities, these models are socioculturally deficient. AI will never grasp concepts such as idiomatic expressions, cultural references, and social nuances, and its reliance on post-editing only raises the possibility of more questions than answers (Baker, 2018). Human translators possess contextual and cultural awareness, which enables them to produce high-quality translations most of the time, both linguistically correct and culturally appropriate.

5. Enhancing Translation Competence through AI

AI-based translation systems offer several advantages in enhancing translation competence:

Linguistic Accuracy: NMT models and other AI systems have made significant strides in translation accuracy. These systems can produce translations that are both grammatically correct and semantically coherent. For example, Google Translate has made significant strides in recent years, delivering accurate translations for everyday conversations in most languages (Carmichael, 2019).

Speed and Efficiency: Speed is another significant benefit of AI in translation. NMT systems can handle massive volumes of text within minutes, rather than hours or even days, which it would take a human translator to accomplish a similar task. This has proven to be invaluable in applications such as website localization, real-time conversation, and translation of social media content. Speed and scale have also made AI an essential tool for businesses with a global presence.

Quality Assurance : The majority of AI-based systemes have quality control tools, such as translation memory (TM) and terminology management, which provide consistency in mass translation work. Translation memory stores fragments of translation previously performed, thus allowing the system to suggest consistent translation for repeated sentences. This feature is particularly beneficial in legal and technical translation, where consistency is paramount (O'Brien, 2012).

Learning and Adaptation: Current AI systems constantly improve their performance over time by learning from exposure to new data. As they received more translations, they refined their models and improved their ability to predict the most accurate translations. The ability of the systems to acquire and adjust their models gives assurance when using AI-provided translations, as they can adapt and improve as language continues to change over time.

6. Socio-Cultural Mediation in Translation

Modern AI systems deliver excellent linguistic precision, but they cannot grasp cultural elements that are vital for top-quality translation. A translator must perform socio-cultural mediation by understanding the cultural context of the source text before adapting it for the target audience's comprehension. The translation of material containing idiomatic phrases and culturally specific references, together with humor, presents significant obstacles for translators.

The literal translation of "raining cats and dogs" in literary works requires complete rewording to maintain both meaning and tone in the target language. The delivery of humor through translation demands innovative solutions to make an impact on the intended audience. AI-driven systems face difficulties with these aspects because they operate through pattern recognition algorithms rather than genuine cultural comprehension, according to Baker (2018).

The cultural elements needed for proper translation become accessible to human translators because they possess relevant knowledge. Human translators possess the necessary cultural understanding to interpret and modify these elements. The importance of cultural expertise increases significantly when translating legal documents, medical texts, and literary works, as translation errors can have severe consequences.

7. Challenges and Ethical Considerations

Despite the advances made in AI translation, several issues and ethical concerns remain. One of the most critical problems is bias in AI. Machine learning algorithms are only as good as the data used to train them. If the training data are biased, for instance, along gender or racial stereotypes, then the AI system will replicate the bias in the translations (Binns, 2018). For example, an AI model trained on biased data can produce translations that are gender-stereotypical or unable to recognize the richness of different viewpoints in culture.

Another moral concern is accountability. For some professions, such as medical and legal translation, the consequences of a mistranslation could be severe. Accuracy is a vital criterion in the field of translation and should be controlled to deliver reliable translation. However, the most developed AI systems still make mistakes; therefore, human involvement is crucial in diminishing the likelihood of errors.

Moreover, the growing use of AI in translation poses a challenge to the role of human translators in the field, even though AI-based programs improve the effectiveness and efficiency of translation tasks, potentially leading to a decrease in demand for human translators and job losses. However, human expertise remains crucial for translating work that requires moral judgment, cultural sensitivity, and contextual understanding.

8. Conclusion

AI translation has revolutionized the translation process, resulting in significant advancements in both linguistic accuracy and speed. AI systems can process and generate translations based on linguistic data, but they cannot fully comprehend the sociocultural aspects of language. Identifying cultural sensitivity and how the target audience will interpret the source language are also vital aspects of translation that exceed simply exchanging words from one language to another. Despite the limitations of AI in translation, these systems are valuable tools for translation and can provide reliable methods to ensure the quality of translation. Although AI can process most linguistic tasks, in the future, translation may utilize a combination of human expertise and AI to ensure that translations are sound, culturally suitable, and contextually relevant. The role of AI in translation is significant; however, it is essential to note that AI machines cannot fully grasp and understand the complexities of human

culture. While AI software can enhance efficiency in professional translation, human translators remain essential for producing language that is sophisticated and culturally rich.

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