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Artificial Intelligence in Translation Studies: Benefits and Challenges

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Abstract
Translation studies has evolved rapidly in recent decades due to technological and global changes that make it easier to overcome the obstacles posed by language, culture, and context with Artificial Intelligence (AI) in the forefront of these advancements. However, translation of idiomatic and culturally sensitive expressions represent a significant risk in the use of AI. This paper therefore seeks to critically evaluate the benefits and challenges of AI in translation studies. A scoping review of existing literature suggests that AI tools harness translation processes in numerous ways including translation efficiency and speed, cost-effectiveness, high level of consistency and accuracy, and scalability. However, it is noted that AI translation contains deficiencies and technical issues originating from natural language processing.

The paper concludes that AI incorporation in the study of translation signifies great prospects and obstacles as AI translation tools are the tools that can change the way people interact with one another across cultures and languages. AI removes barriers to facilitating better communication, increased productivity, better scalability and real-time delivery. These tools are effective, especially in business, education, and the interface of international relations. Hence, it is important to state that AI translation helps make international communication more efficient, but it should be improved constantly and about cultural and ethical concerns. As AI is advanced and improved and developers, linguists, and cultural sociologists work in unison, AI could offer more precise translations that are free from bias and prejudice towards people from other cultures hence helping to connect the world.

Keywords: Neural networks, idiomatic expressions, Artificial intelligence, cultural sensitivity.

Introduction

Translation studies as a scholarly discipline, has evolved rapidly in the recent decades due to technological and global changes (Gambier, 2016). Interpretation in the past relied on the human ability to overcome the obstacles of language, culture, and context. Yet the emergence of Artificial Intelligence (AI) has brought certain changes in the process of translation, which can be regarded as positives and negatives in the same turn (Yadav et al., 2017).

The advances in machine learning and neural networks have impacted so many industries among them being the translation industry. There are many professional tools to translate text using artificial intelligence such as Google Translate, DeepL, and numerous others (Lee, 2023). These tools use massive information and precise algorithms to offer translations that at times are nearly perfect. The approach of AI as an effective and fast-working language tool has made it rather valuable for businesses, authorities, and consumers (De Andrade & Tumelero, 2022).

However, AI translation still has some drawbacks. There are a few dilemmas one can encounter while translating the text: translation of idiomatic expressions and content that may be anchored in a culture. Thus, idioms as expressions that cannot have their meaning explained by analyzing the meaning of the individual words used are also problematic (Al-Khawaldeh et al., 2016). Likewise, when these features refer to definite cultural items whose specific context is known only to insiders and requires proper cultural competence, an AI simply operates with symbols which leads to incorrect or at least misleading translations (Fangyuan, 2014).
The present study's objective is to discover how artificial intelligence aids in translation performance and practice; and to identify the issues that AI still experiences, especially about conversational features and idiomatic expressions. Therefore, this research aims to explore both the benefits and challenges of current AI translation tools and the further development of this system to form a relatively fair view of the current status and prospects of AI in the field of translation.

Overview of AI in Translation

AI in translation involves the adaptation of an algorithm that uses machine learning and neural networks to perform translation tasks in texts. The development of artificial intelligence has progressed through four stages to the models used in the translation industry today (Zhang, & Lu, 2021).

First, there was Rule-Based Machine Translation (RBMT), which worked on applying rules defined for the source and target languages. In this respect, RBMT has some difficulties in elaborating a number of rules that could reflect the peculiarities of each language pair; thus, it failed to provide an exact translation of the natural language (Shiwen, & Xiaojing, 2014). SMT was the advancement of RBMT through making use of statistical models drawn from a bilingual text corpus to translate. SMT improved the translation accuracy over RBMT but it could have problems when it came to the translation of phrases that are used contextually or idioms (Béchara, 2014).

The significant improvement in the approach was Neural Machine Translation (NMT) based on artificial neural networks to translate the entire context instead of words (Zhang, & Zong, 2015). The implementation of NMT was effective in enhancing the understanding of context and the translated message's natural-sounding flow. Current developments such as the Transformer networks have even improved the quality of translation making NMT the go-to choice for AI translators.

Significant milestones in AI translation history include:

- The 1950s and 1960s: The production of rule-based systems, with the actual demonstration of MT achieved through the Georgetown-IBM experiment in the year 1954.
- The 1970s and 1980s: Early work expanding in SMT and a comparative analysis of this approach to the prior methods used in AI.
- The 1990s and 2000s: Increased smoothness of SMT, thus an enhancement of translation quality.
- 2006: Availability of commercially available AI-based translation tools such as Google Translate.
- 2010-present: The transition from Statistical Machine Translation SMT to Neural Machine Translation NMT, occurred in 2016 when Google utilized neural network translation with the use of the new model known as the Transformer.

Current AI translation tools include:

- Google Translator: Hospitals and clinics use it for over 100 languages with the help of neural networks.
- DeepL: It would be highly recommended for translation into European languages; it aims to emphasize the contextual aspect.
- Microsoft Translator: Operates with Microsoft services and implies text and voice translation options.
- Amazon Translate: Business applications which include: The NMT.
- Yandex. Translate: Widely used in Russia, uses both SMT and NMT in various languages.

Benefits of AI in Translation

There are many advantages of the use of artificial intelligence in translation that improve generally the effectiveness, reliability, and availability of translation. Today, translation applications are essential in the lives of individuals, companies, and organizations since they help translate large documents, and messages at a cheaper price than the traditional methods (Doherty, 2016).

Efficiency and Speed

The conventional mode of translating involves a human translator, which is often slow whenever there is a large amount of text that needs to be translated; or when there is real-time translation required (Jakobsen, 2017). AI tools on the other hand are capable, of translating text almost in real time. This speed is desirable mainly in cases where it is required to have immediate access to information and/or materials such as in cases of international purchases and sales, response to disasters, or LIVE broadcasts.

It is worth noting that applications such as Google Translate and DeepL can translate thousands of words per minute, though they are AI-assisted (Liu, & Chen, 2023). This fast processing helps users to translate content on the go, thus helping the user attend to more efficient and enhanced cross-cultural communicative interaction. For businesses that are involved in cross-boundary markets, AI translation tools can make the marketing collaterals, product descriptions, and customer service information translated promptly for the particular country's requirement (Bozkurt et al., 2023).

Cost-Effectiveness

Machine translation as an application of Artificial Intelligence has been categorized by some scholars as an inexpensive way of replacing human-translated services (BENBADA, & BENAOUDA, 2023). The applications of professional human translators are significant because of the special knowledge they possess; at the same time, they can be costly, especially for small firms or individuals. Contrarily, AI solutions typically come at no charge or a considerably lower price than human translators (Brynjolfsson, Hui, & Liu, 2019). This in a way makes the service cheap thus expanding the Market reach and making translation services more usable for more people and businesses.

For example, Microsoft and Amazon have AI translation services for businesses available in the cloud which helps the implementation of translation at a reasonable price for companies (Liu, 2022). This is very advantageous when used in non-profit organizations, schools, and small businesses in instances when cross-lingual communication is needed but the expenses cannot be very large.

Consistency and Accuracy

Another advantage of using AI tools for translation is that such tools do not get tired or distracted, therefore their level of consistency is exceptional. Mechanisms are translations produced by human translators where even though the translators are professional; the translations are not identical since everyone has a different approach to translating (Robinson, 2019). AI tools do not have inconsistencies as they translate following a set of norms and language bids. This is especially important when seeking to ensure that the points you are making to a user in one language are understood in essence by a user in another language because of the consistency of the communication strategy (Bonvillain, 2019).

In addition, there has been a substantial rise in the reliability of generating AI translations with the help of neural machine translation. DeepL is among the applications, which greatly distinguish themselves by the fluency and coherence of the provided translations making them very close to the human-quality ones (Yuan, 2018). These utilize gargantuan datasets and complex neural networks to decipher context, proverbs, and colloquial language processing thereby providing better translations.

Scalability

AI translation tools are scalable, which means that it is possible to translate a large number of texts using the selected tool with no problem 9 Youdale, 2019). This feature proves to be very essential, especially for large organizations and institutions that require processing and translation of large volumes of text daily. AI systems

can be adjusted in ways that enable an up-scaling of translation, an aspect that translates into efficiency due to non-proportionality of costs or time. Hence, AI translation tools are best suited for large-scale and diverse content requirements for enterprise-level organizations, including MNCs, governments, and media houses (Sin-wai, 2014).

Critical case studies

Today's global players such as Airbnb are using AI translation to deliver relevant content to millions of audiences (Verganti, Vendraminelli, & Iansiti, 2020). Self-translation of property listings, reviews, and customer support materials guarantees users fluent in different languages, a positive experience, thus improving Airbnb's ratings.

The European Commission as part of its commitment to AI uses eTranslation, an AI-based tool for translating official documents/communications in all the EU languages. This service helps to avoid bureaucracy by looking for members and institutions to communicate and share some information. Other than making this process time-consuming and costly, the application of AI translation in this particular regard enables the dissemination of crucial information to the desired groups of people (Burgess, 2017).

On an individual level, students/learners, and educators gain from AI translation tools for learning purposes. Often, students have to learn new languages and foreign texts are quite helpful in this case; the usage of Google Translate helps to translate some text and get an idea of what it says (Bahri, & Mahadi, 2016). LO 2 Teachers can offer materials in more than one language to pupils of a pre-German BME origin hence making a classroom an environment of equality.

Challenges of AI in Translation

However, AI translation contains deficiencies and technical issues originating from natural language processing. Neural networks work on fluency and coherence better yet they have some errors that a human translator would not commit (Tomasello, 2019). Such problem includes Homographs, Paronyms, and Ambigrammatical, which refer to words with the same pronunciation but have different meanings and different syntactical functions and the resultant effect is either grammatical inaccuracy or the production of a word that is alien in meaning to the subject in question.

Challenges with translating idiomatic expressions

Idioms that cannot be derived from the meaning of the individual constituents present a lot of difficulty. These expressions can be traced back to the cultural and linguistic frameworks and often, because of that, confuse AI and result in translating those expressions literally, which leads to rather absurd or misleading material (Gatsiou et al., 2024). There is no question that idiomatic expressions are rather problematic to be translated by AI interpretations as they are primarily calculated in the context of the vital and profound endowment of the culture of people's language (Yesheng, 2024). Another important characteristic is the fact that idioms cannot be translated ''literally'' that is, directly from one language to another. In this section, the author will analyze why idiomatic expressions are problematic for computer sciences and give an example of idioms and some approaches to idiomatic translation.

An idiomatic expression is a phrase or a sentence, the meaning of which cannot be explained by the sum of the deconstructive meaning of all its components. They are usually firmly associated with certain cultural and social realities of the given language, which in turn speaks about its history and traditions (Blommaert, & Rampton, 2015). For instance, the English proverb "spill the beans" is used to convey the meaning of disclosure of information that was supposed to be kept secret but the meaning of the words that make up the proverb does not in any way suggest this.

Currently, idioms and phrases can be translated, though most AI tools fail to facilitate their translation because most idioms are culture-bound and situational (Mahadi, 2022). They were common in generating translations based on statistical patterns and regularly used training data. The first approach, implies analyzing the value of the individual characters to comprehend the meaning of a phrase or a word, whereas it is helpful in the analysis

of literal language; however, it is inadequate in the case of idioms as it does not consider the cultural and figurative context (Cieślicka, 2015).

A closer look at some examples of common idiomatic expressions reveals the intricate AI translation challenges in the following expressions: for the English Idiom: "Break the ice", meaning: to initiate conversation in a social setting. The literal Translation would be "Romper el hielo" (Spanish) or "Casser la glace" (French). In these expressions, the key AI challenge is that a direct translation would make sense only if the reader understands the figurative meaning behind the idiom. Also, consider the Chinese Idiom: "对牛弹琴" (duì niú tán qín), meaning: to address the wrong audience; literally means "playing the lute to a cow." Again, the AI Challenge is that without cultural context, the translated phrase may be confusing or meaningless to non-Chinese speakers. Finally, the Spanish Idiom: "Estar en las nubes", meaning: to be daydreaming; literally means "to be in the clouds." The AI Challenge here is that the literal translation might not convey the sense of daydreaming without additional context. These examples illustrate the difficulties AI systems face when translating idiomatic expressions (Alzeebaree, 2020). The literal translations often miss the figurative meanings, leading to confusion or misinterpretation.

Issues with Cultural and Contextual Translations

AI weaknesses include a lack of understanding of the cultural aspect and context of word usage. Compared to name translations, terms can be abstract and may not have equivalents that have the same connotations in other cultures, thus, translations may be technically accurate but they are culturally impolite or even vulgar (Ferklová, 2014). This shortcoming pertains to marketing information and communal discourses since comprehending funny-related or respectful terminology is vital.

For example, Google Translate turns bad handling of Chinese food and messages on the menu into rude sayings; Facebook's improper translating of Arabic ends with a bad arrest – the tool simply does not understand the culture. Simple misinterpretations like making a slogan of a fast-food chain café culturally undesirable in Chinese highlight that it is possible to change the image.

Implications for Cross-Cultural Communication

AI translation has numerous and far-reaching effects on international communication. Indeed, the advancement of AI companion interpretation tools can reduce barriers that stem from differences in language or culture cumulating relations between individuals (Duéñez-Guzmán et al., 2023). However, it is known that the efficiency of the aforementioned tools depends on the accuracy and sensitivity to perform linguistic and cultural transformations.

AI translator has several advantages concerning the effectiveness of intercultural communication. They are used in making translations as soon as possible keeping the conversation going in different languages (Dingemanse, & Floyd, 2014). This capability is very important in the areas of international business, negotiations, teaching and foreign relations, and travel and tourism. For example, in multicultural business discussions, AI translation may assist the parties in grasping everybody's angle, determining compromises, and synergizing. In learning, AI translation can help students to access a lot of material in a given language that they may not be familiar with hence promoting the international exchange of knowledge (Emara, 2024).

Yet, the ability of AI translators to work with idioms and cultural characters may present themselves as serious drawbacks (Lee, 2023). When a piece of text is translated literally or incorrectly, it leads to confusion, ineffective communication, and in some cases, offense. Thus, any of these issues denies clear and mutual understanding and hence proper cooperation, particularly in culturally sensitive areas.

A rather infamous mistake in translation came with the advent of KFC in China. For example, the ad slogan that has been culturally standardized is the famous 'Finger-licking' good' ad slogan of the company was translated but poorly into Chinese as 'Eat your fingers off, 'which was culturally ill-suited for the Chinese population. Thus, it can be argued that cultural impendence is a vital consideration in translation as the example above demonstrates the outcome of misconceiving it in a particular culture.

Another characteristic of AI translation for cross-cultural communication is that these tools should be constantly improved and developed (Karakas, 2023). To make sure that the translation is not only the most possible linguistic but also culturally acceptable there is a need to augment the cultural relevance of AI translation systems. This continues to entail research and development, the effort of linguists, cultural specialists, and AI engineers.

The second implication is the question related to the extent of human supervision in the process of translation that uses artificial intelligence. Although some elements can be solved with the help of AI, a human translator is the primary option to guarantee the correctness and culturally sensitive translations as stressed by Läubli et al (2020). When it comes to the interaction between humans and artificial intelligence, it can be noticed that the results of translation can be improved considerably, especially in terms of handling challenging or even raw materials that may contain obscene language or gestures. This symbiosis means AI sort of translates first, and then a human can adjust, discuss the subtleties that AI is not programmed to understand, and fix the final text (Burgess, 2017).

The potential developments of using AI translation in cross-cultural communication also require the discovery of modern technologies and practices (Shadiev et al., 2018). For instance, combining AI translation with AR and VR brings the ability to create believable computer-translated environments for multilingual interaction improving collaboration in virtual environments. Also, the creation of improved AI systems that take into account the cultural background and, to some extent, context, can enhance the efficiency and cultural relevance of translations.

Moreover, there are ramifications of AI translation seen in society as a whole. When these tools are deployed consistently, they bring about more inclusiveness and openness, where people who speak such as different languages can be quite active in global discourse according to Jacquemet, (2015). This can assist in eradicating the language barriers and hence enhance international relations and cooperation.

At the same time, ethical issues with the use of AI translation also need to be considered. Preserving the confidentiality and integrity of the data is paramount and this is because, in the use of AI, most of the datasets are private and contain personal information argued by Curzon et al (2021). Such realization and others can be addressed by the adoption of proper data protection measures and compliance with privacy laws. Moreover, the problem of preconceptions in translation algorithms must be identified and resolved to guarantee the equality of translated information. These biases can be from the training data or from how the algorithms are set and hence; they promote the formation of biases or prejudiced translations (Savoldi et al., 2021). When creating such training data sets, one should be free from bias and ensure that there is a built-in fairness check within the creation of those datasets to minimize such biases.

Another important aspect is the transparency of the mechanism by which the translations are produced. Recipients of AI translations must know how these systems operate, where the learning data comes from, and what possible shortcomings of the translations may be (Kenny, & Doherty, 2014). Integrating transparency makes users trust the AI tools and have important information in their decisions about using them.

Therefore, it could be said that with the help of AI translation, the relations between people from different countries, who consider different languages and follow different cultural standards, could be improved by providing inter-culture communication according to Rodríguez Arancón, (2015). Of course, it is still possible to identify some considerable difficulties in further improving the effectiveness of these tools, first of all, referring to the complicated problem of idiomatic expressions and cultural peculiarities However, it is impossible not to notice the constant development of both AI technologies, and their cooperation with the users (Korteling et al., 2021). Dissecting these issues and outlining further research possibilities can enable AI translation to enhance an individual's global connectedness and interaction, which ultimately enhances society's total connectedness.

Enhancing the AI Translations

In response to such hurdles as mentioned above, an increase in AI training sets that include idiomatic expressions and diverse cultural environments is vital (Mohamed et al., 2024). Thus, there is interest in the so-called hybrid models that interlace the speed of AI with vigilance by humans. Through AI, translations can be provided from other languages, and updated by human translators, which will be accurate in culture and context, making the language used precise and proper (Khasawneh, 2023). This would be based on AI optimization and human language understanding for extensive translation.

Thus, considering the context of a phrase or a paragraph and even of an entire text creates the potential for improving the outcome of idiomatic expression transformation (Liontas, 2019). Essentially, knowledge about the other words in the vicinity can help AI systems deduce the meaning of idioms in the said context. The use of AI with translators can lead to a richer expression of idiomatic translations that is accurate. The first stage of the translation can be made by AI, but then translators can look at the translation, making sure idioms will be translated correctly (Weisz et al., 2021). Besides, cultural differences, this interaction contributes to higher quality by combining efforts to ensure the translation is accurate and contextually correct.

The transmission of new statistical phrase-based translation models that use entire phrases rather than single words will also help in better treatment of idioms (Macketanz et al., 2017). The latter can contain and reproduce the idiomatic expressions that are commonly used, therefore giving more precise translations.

Furthermore, the creation of idioms' dictionaries integrated into AI translation systems may serve as a useful source of idiomatic expression translation. Some of these dictionaries would contain idioms, their contextual meanings, and translations so that the AI systems could generate better and culturally sensitive translations (Zemni, Awwad, & Bounaas, 2020). To gain a better approach to analyzing cultural differences AI needs to be taken to the next level and this will call for the incorporation of higher-order cultural analysis algorithms (Cheng, Varshney, & Liu, 2021). This means that if an AI language processor translates text while considering a cultural context, then it is likely to perform a better translation job due to precision on the connotations of the language.

Even though the input of human translators introduced earlier as a means of fine-tuning can help to enhance precision and cultural awareness of translations. Higher quality is achieved by more involvement and cycle interactiveness between humans and AI where human expertise can also improve the AI translations (Heer, 2019). Cultural aspects in language about everything that has to do with tradition, culture, customs, norms, and humor as well as allusions. They impose a considerable influence on how language is applied and comprehended; thus, translating it becomes cumbersome (Harrison, 2014). AI translation tools are unable to correctly interpret such figurative implications appropriate translations in those languages are often doubtful and may lead to misunderstandings and mistakes.

Hence, those aspects are vital when it comes to translation because they represent culture. These elements are not the direct meanings of the words but the nuances and other significances that are part of a culture's experience and essence. For example, humor is always tied to cultural context and puns, which implies that translations tend to encounter significant difficulties in this regard (Chiaro, 2017). While using statistical models and training data, AI tools, more often than not, miss out on the finer cultural nuances, which are substantial for making the best of these legal flexibilities.

Note however that, the assessment of cultural sensitivity is an important issue where humans and AI can show good synergy. AI translation should be continuously controlled by human interference so that it can incorporate more effective interpretations that reflect the cultural aspect of the language (Plyth, & Craham, 2023). This can involve two stages the first is the computer translation and the second is where the human is allowed to edit the translations. Compiling holistic reference databases about culture that AI systems can engage during translation can improve the analysis of cultural aspects (Kulesz, 2018). Such databases would consist of data on the culture, norms, history, and idioms of the population under study. Furthermore, this way, AI systems can be designed for updating as well in regards to the current cultural contexts as well as language usage so that improved results will be provided in terms of the translations (Läubli et al., 2020).

Unaddressed, several possible future lines of research will help strengthen the AI translation of cultural constituents even further. A proper understanding of cultural aspects and a better focus on cultural phenomena helps in enhancing the method of translating them while better AI models can provide an improvement in this aspect (Hatim, & Munday, 2019). Such models would be designed to not only understand but also take Cultural Intelligence further by implementing Cultural Analysis formulas. Activities such as involving representatives from cultural communities in the development of artificial intelligence translation systems can be helpful as they can help in offering help in the improvement of the translator as well as offering culturally sensitive translation. Developing AI translation apps where the user has an opportunity to rate the translation and give suggestions and corrections will go a long way in improving the viability of cultural translation (Weisz et al., 2022). These tools would be trainable to improve the frequency with which they can address other cultural issues.

Conclusion and Future Directions

AI incorporation in the study of translation signifies great prospects and obstacles. AI translation tools are the tools that can change the way people interact with one another across cultures and languages by removing barriers to facilitating better communication, increased productivity, and better scalability and real-time delivery. These tools are effective, especially in business, education, and the interface of international relations.

This type of information is important because still, AI still has issues with idiomatic points and cultural references. Comical language differences are partly ingrained in cultural differences, and this makes AI translation quite challenging, as observed in the case of KFC where the translation of "finger-licking good" was "Open up my legs, beauty" in China. To tackle them, the improvement of the training sets by incorporating cultural information, employment of culture-friendly algorithms, and integration of the human factor into the AI system. The effort of human translators is so important to edit translations produced with the help of AI to make them correct and culturally sensitive. Therefore, it can involve the formation of cultural knowledge bases and implementing machine learning into AI for better interaction with idioms and other cultural factors.

The prospective trends involve the usage of AI translation alongside the AR and VR experiences for realizing multilingual spaces and constructing AI systems with enhanced cultural perspectives. Hiring cultural consultants may help in the proper translation to avoid offending the audience culturally. Several ethical issues should be handled including the following; data protection, avoidance of bias, and the provision of details. To address these concerns, one can use accurate data protection, diversity in the training data set, and fairness testing.

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