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RESEARCH ARTICLE

Leveraging AI-Powered Neural Machine Translation to Bridge the Gap: Translating Arabic Islamic Terminology into English

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ARTICLE INFO	ABSTRACT
	This paper assesses the appropriateness of NMT in translating Arabic Islamic terms into English, determining the main issues, and providing solutions. Some of the key concerns highlighted in the study are the scarcity of large corpora, the inability of NMT to deal with specific features of languages and the lack of adequate context and cultural supplements. In response to these challenges, four main recommendations have been highlighted in the report as follows. First, it prescribes the formation of special corpora containing various Islamic materials like the Quran, Hadiths, and theological writings. This will help to feed NMT systems with the inherent contextually relevant content data for the most work-related tasks. Secondly, it recommends the integration of other approaches with NMT such as rule-based and statistical translation that can handle idiomatic expressions and contextual interpretation. Third, it adopts the post-editing technique whereby the machine-translated text is checked by human translators to ensure adherence to cultural and contextual considerations. Lastly, the report urges more multi-ethnic cooperation among researchers, innovators, and translators to improve the accuracy and usefulness of translations. The paper finds that although NMT has advanced greatly in the field of translation technology, there are still challenges in translating complicated works in the Arabic and Islamic contexts. The adoption of these suggestions could enhance the quality of translations by a significant notch, thus producing translations that are more precise and sensitive to cultural differences. Thus, the conclusions drawn from the research affect the development of new technologies and cooperation in machine translation.
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1. INTRODUCTION

Recent years have witnessed tremendous development and application of Artificial Intelligence (AI); this has triggered innovative effects on the practice of translation. Recently, one of the significant advances in this area is known as Neural Machine Translation (NMT) which is using artificial intelligence to enhance the reliability, naturalness, and overall quality of translation outputs. NMT utilizes deep learning approaches as well as neural networks to forecast and mimic human-like translations (Ahmad, Atta, Alawawdeh, Aljundi, Morshed, Dahbour & Alqaraleh, 2023; Hershey, 2024). This report focuses on examining a case of using NMT for translating Arabic Islamic terminology into English. The process of translating Islamic texts like the Quran, Hadiths, and various theological and legal texts in Islam poses certain problems due to the inherent difficulty and the core cultural-religious value Pof these forms. Islamic terminology therefore encompasses a large number of words and phrases each of which has a complex semantic, theological, and cultural meaning and significance (Al Tarawneh, Alqaraleh, Ali and Bani Atta, 2023; Bolster, 2023). Therefore, correct and culturally sensitive translations shall be the most appropriate to improve the original texts and their

meanings in the target language to enhance understanding between people and eliminate misconceptions resulting from translation.

1.1 Background

AI-interfaced technology when combined with translation has created a new model known as NMT, which significantly deviates from traditional forms of translation. Rule-based and statistical machine translation approaches commonly used in previous studies provide a poor ability to capture finer sense and situational meaning which applies to highly cultural and theological texts like the Islamic holy books. Most NMT models are of the encoder-decoder type, like Google's Transformer model (Alqaraleh & Ahmad, 2018; Millière, 2023). The encoder takes the input text (in this case, Arabic Islamic terms) and converts it into a compact intermediate representation called the context vector. The decoder then uses this context vector to produce the target text which is the English translation.

The enhancement of an attention mechanism implicates the ability of the system to dynamically shift its focus to different portions of the original input text during the translation rendering leading to an improvement in interpretation and translation accuracy. However, various issues arise while translating Arabic Islamic terminology within the minimally altered framework. Arabic is another language where the rank of MSD is higher and its grammar is more flexible compared to other languages (Alqaraleh & Nour, 2020; Al Halbusi et al., 2022). Furthermore, the Muslim sacred text also abounds idiomatic expressions, metaphors, and historical references that are sometimes impossible to translate into another language without extensive knowledge of the context. Therefore, this report aims to investigate how well NMT can help in overcoming these challenges and what the position of human supervision is in this complex process.

1.2 Aims and objectives

This leads us to the following main research question which is: How effective is NMT in translating Arabic Islamic terminology into English? Due to the enormity and importance of these texts, it cannot be overemphasized that any attempt to engage with them requires a proper and thorough methodology. The specific objectives of this research are as follows:

> ➢ **Identify the challenges: C**arefully identify the level of difficulties faced when employing NMT for translating special Islamic terms based on linguistic, cultural, and contextual analyses.

> ➢ **Assess accuracy and contextual appropriateness:** To examine the quality and relevance of the translations generated by NMT systems in comparison to the translations done by human translators.

> ➢ **Explore human oversight**: To analyze how human supervision can contribute to improving the output quality of NMT translations as well as to define the most effective approaches and techniques of human-led assistance to AI translators.

> ➢ **Provide recommendations:** To provide specific suggestions and guidelines for enhancing NMT performance in the translation of Islamic terminology to inspire both AI scientists and professional translators.

1.3 Significance of the research

This study has profound implications for several reasons. On this first note, it responds to a major loss in knowledge regarding the translation of religious and culturally sensitive terms. The fact is that Islamic texts require a great degree of literal and cultural approximation and respect in translation, and this paper aims to advance the existing scholarship on how this can be done effectively with the help of modern AI tools. Secondly, it is significant in the development of better and more effective translation applications or software (Alqaraleh, Almari, Ali & Oudat, 2022; Rickli & Mantellassi, 2023). Therefore, by indicating the peaks and troughs of present-day NMT systems, the study seeks to provide the appropriate recommendations on how to develop the best strategies for making these tools more functional and useful. This can help in encouraging cross-cultural and interfaith dialogue since people develop friendly relations with those with similar beliefs.

Last but not least, it is possible to generalize the results obtained in the framework of this study for the future development and application of NMT systems. Recognizing the particularities of complex and contextually rich texts like those identified with Islamic texts may help in the development of enhanced AI tools and algorithms. These advancements can be advantageous not only for translation as a field but also for other practices in education, intercultural communication, or international relations (Alqaraleh, Thuneibat & Nour, 2020; Luccioni et al., 2021). Finally, this report aims to study the prospects and challenges in the process of translating Arabic Islamic terminology from English using NMT. In this way, the research can contribute to a better understanding of the obstacles, offer an evaluation of the current capacities to address the identified issues and provide recommendations for enhancing translation in this crucial domain.

2. LITERATURE REVIEW

The review of literature below looks at the past literature concerning NMT particularly with regards to translation of Arabic Islamic terms into English. This review comprises of literatures on the advancement and efficiency of NMT, barriers to translating sacred literature, and the significance of combining human input and artificial intelligence, as well as the importance of addressing ethnic and religious translations. Principal sources include doctoral dissertations, journal articles, and preprints, providing an overview of the current state of research and development and its deficiencies in this area.

2.1 Evolution and effectiveness of neural machine translation

NMT has undergone significant changes and the latest versions of it have proven to be revolutionary in the world of machine translation. Rule-based and statistical methods, for instance, proved incapable of handling the intricacies of the Arabic human language right from morphological and syntactic points of view. Benbada and Benaouda (2023) have discussed in their paper that the improved fluency and contextual MT capability of NMT systems based on deep learning prove to be better than the previous methods. They have also done a comparative study with Reverso Context and Google Translate for the translation of expressive and descriptive texts from Arabic to English, but this shows the enhancements introduced by NMT (Nour, Noor & Alqaralehc, 2020; Benbada & Benaouda, 2023). Consistent with this argument, Al-Salman and Haider (2024) assess the effectiveness of NMT tools like Google Translate, Gemini, and ChatGPT in translating Arabic humanities and social science research titles into English. They support that NMT is better at preserving the meaning and context of the material than the classic approach (Thuneibat, Ali, Alqaraleh & Thneibat, 2022; Al-Salmana & Haider, 2024). However, they mention some cases where cultural and contextual details were not adequately addressed which points to the fact that these technologies require constant improvement.

2.2 Challenges in translating Islamic terminology

As with any translation of religious texts, certain complexities are inherent in the process, and that stems from the need for a translator to be not only trilingual but also knowledgeable and sensitive to differences in faith. These texts rely on cultural, theological, and historical aspects that help understand the passage in its proper context. To evaluate the reliability of AI translation tools for Arabic and, in particular, Islamic texts, Mohammed Oussama and Abderrahman (2023); it is proved that NMT systems perform fairly well with simple and literal texts; however, Muslim religious terms are frequently idiomatic and context-sensitive. Their work is quite relevant in pointing out the necessity of specialized knowledge of the domain in the process of translating such texts (Thuneibat, Alqaraleh & Nour, 2021; Mohammed Oussama & Abderrahman, 2023). In a similar vein, Hemmet in 2023 touches on the general effects of AI and NMT on compliance with the Islamic values system. His work focuses on the importance of religious context recognition within such technologies so they do not misinterpret the text and guarantee the authenticity of the content (Hemmet, 2023). Hemmet showed in his arguments that cultural and theological approaches should be inherent in the design and implementation of NMT systems for Islamic text.

Since the complexities of Islamic terminology are hard to handle by NMT systems, this kind of system requires human monitoring. Almusharraf & Bailey (2023) reiterate that human translation plays the role of fine-tuning the output of a machine translation system. The authors propose that while NMT

systems offer an initial translation, a human decides whether this sounds natural and assumes the actual final edit. This approach provides the benefits of using both AI and human intervention as presented by Almusharraf and Bailey (2023). Likewise, in their paper on Arabic chatbots, Alruqi and Alzahrani (2023) also emphasize the significance of human interference. Using extractive question-answering and language transformers, they assess these systems to be capable of answering basic queries but when it comes to intricate questions, input from humans is needed to make sure that the answers provided are accurate and contextually correct. Their findings underscore the need for supervision by humans due to the important role human supervision plays when adopting AI technologies in sensitive sectors (Alruqi & Alzahrani, 2023).

2.3 Data scarcity and domain-specific corpora

One of the major problems and limitations in improving existing NMT systems and preparing special translations for Islamic texts is the lack of adequate resources. It is also a fact that training of NMT models depends on large amounts of parallel corpus; but parallel religious texts, originating from Islamic culture and theological writings are not so easily available. Pros and cons of using large language models in low-resource languages and niche fields are described in the survey by Hadi et al. (2023). They underlined the necessity of developing more balanced and vast datasets to enhance the performance of NMT. This implies specific and deliberate processes of sourcing large, high-quality corpora of Islamic texts and their translations (Hadi et al., 2023). By filling this gap, NMT systems will be more prepared to deal with the various language and cultural differences that are evident in the use of Islamic terms. These particular corpora should then be developed to enhance the precision and legitimacy of NMT in the translation of religious and culturally sensitive documents and texts.

However, such issues give hope that with successive developments in Artificial Intelligence and Neural Machine Translation, better translation solutions can be availed. Yang et al. (2023) illustrate how such AI platforms as the one described above can structure and improve the acquisition of knowledge in particular specializations. Their approaches could be further used to build improved NMT systems for translating Islamic texts, and thus indicate the prospects for further research and development (Yang et al., 2023). In addition, Sukkar et al. (2024) present an analytical analysis of generated presentations of AI about cultural memory. They draw attention to the fact that AI could be used to document and recreate cultural artifacts to which linguistic/religious artifacts are not immune through better translation services. Their work sees it necessary to take advantage of the progressive AI in improving translation accuracy especially the cultural aspects (Sukkar et al., 2024). Through the application of these modern techniques, NMT systems can kindle increased comprehension of the intricacies and implications of Islamic texts, ultimately promoting cultural and religious sensitivity.

2.4 Case studies and practical applications

Observational studies provide significant information on the actual use of NMT in translating Islamic terms. The study by Alyammahi (2020) seeks to establish the impact of artificially intelligent education systems on learning and teaching activities in schools in Abu Dhabi. From his findings, the implications include that learning through the aid of AI tools is a big plus, which is something that can be taken into the teaching of translation. From the research work of Alyammahi, there are insights on how AI can be embraced in enhancing education as well as the results realized, in addition to the use of AI in enhancing the training needs and potentials of language translation education (Alyammahi, 2020).

To this, Al-Salmana & Haider (2024) provide a thorough assessment of MT and AI in translating Arabic research titles. They emphasize from their practical work that the current implemented NMT systems have their strengths and weaknesses and that is why it is essential to optimize and regulate the process. The study should be beneficial to practitioners in aspects of how they employ NMT in terms of quality with contextual translations (Al-Salmana & Haider, 2024). They found out that, unlike difficult texts, general NMT tools were effective in translating texts with a high degree of ease and speed when the texts did not contain complex terms, but they did not identify essential features unique to academic texts.

2.5 Broader implications and ethical considerations

The relative shift to AI brought extensive societal and cultural considerations The integration of AI technologies needs to be compatible with Islamic values as analyzed by Ismail (2024). His analysis places significant emphasis on the professional morality that AI developers and users must exercise to guarantee that the technologies are applied while recognizing and respecting cultural and religious diversity (Ismail, 2024). Additionally, ZainEldin et al. (2024) offer a synthetic overview of how AI enhances communication for the deaf and mute. Their work focuses on the need to design and implement AI applications that are culturally intelligent, which is particularly relevant to translating religious material for Muslim populations. It is indeed important for the current AI technologies to be introduced and incorporated within the appropriate cultural setting and in a culturally sensitive manner to promote their higher adoption rates and impact (ZainEldin et al., 2024). Similarly, Shahriar and Hayawi (2024) discuss the unbending and plausible employments of conversational AI. Notably, they lay emphasis on the right use of AI technologies especially concerning the translation of religious texts given the consequences of their misinterpretation. From their discussion, they recommend the establishment of an ethical code and rules for the creation and deployment of artificial intelligence technologies (Shahriar & Hayawi, 2024).

The studies on NMT and the use of technology in translating Arabic Islamic terms into English show that there have been progress and progress challenges. Despite the enhanced quality and natural language-like translations in an NMT system, there are several limitations including the ability to address the cultural and contextual sensitivity of the Islamic texts. The utilization of human supervision and the creation of more repositories in the domain are significant steps in the improvement of these systems.

3. METHODOLOGY

This research employs the methodological approach of qualitative research in identifying the proper approach to the use of NMT in translating Arabic Islamic terms into English. This combined approach allows one to understand both the strengths and the limitations of NMT for this particular type of text and the role of post-editing in enhancing translation. Because data is currently available from a variety of sources the study hopes to present a more complete picture of what is possible and what is challenging in the way of employing NMT to translate texts that are culturally and theologically unique.

3.1 Research design

To achieve the objectives of this research work, the research employed analytical and descriptive research design to assess the effectiveness of NMT in the translation of Arabic Islamic terms into English language. The research method that has been adopted for the present study is a Systematic Literature Review with cases, which is an extended methodology that offers a systematic approach to analyzing the efficacy of NMT in this particular domain (Luccioni et al., 2021). The literature review brings findings of other research and theoretical frameworks, whereas the case studies contain real-life information about actual translation events. Therefore, this approach will be useful in offering a comprehensive examination of NMT in terms of its ability to interpret linguistic and cultural aspects of Islamic texts. Thus, in this study, the authors would like to contribute to a multifaceted understanding of translation as NMT for translating cultural and theological texts (Rickli & Mantellassi, 2023). Also, this study highlights the need for supervising the process of translation so that the end product can be of higher quality as well as less influenced by any cultural bias from the translator.

3.2 Data collection

The two main approaches used in the data collection process were literature review and case analysis. All the methods used in the research were advantageous and each of them helped in developing a rich appreciation of the study. The main data collection tool used for this study was the literature review. This included a systematic literature review where academic articles, dissertations, and preprints on NMT, its use in translating religious texts, and certain difficulties in substituting Arabic Islamic terminology (Luccioni et al., 2021) were sought and analyzed. The literature review

made it possible to define the presence of relevant studies, theories, and voids in the existing knowledge. This part gave an insight into the general background for the study to give direction for the next studies in the form of cases.

Quantitative analysis was carried out in the form of several concrete cases to assess particular examples of translation. Such translations involved those particular Quranic verses, Hadiths, and classical Islamic texts for their linguistic and cultural challenge. All the analyzed case studies presupposed the further examination of the original text and its translation by different NMT systems. To assess the quality of the translated texts, they were checked for translation accurateness, the lexical and cultural equivalent of the source text, and 'tone'. This method helped to analyze NMT systems deeper in terms of real-life effectiveness and reveal cases when a human translator is needed.

3.3 Data analysis

This is especially suitable for qualitative research, involving the analysis of the data collected concerning the literature review and case studies in a systemic, thematic manner. Thematic analysis is a process that seeks to look for, make sense of, and present themes in the data, thus fitting the context of the research questions. The process began with the process of familiarization whereby the literature and case study observations were re-read many times to ensure a good understanding of the content. The next step was initial coding, meaning highlighting those parts of the text that could be considered relevant to the research questions (Razavi & Habibnia, 2024). Specific words, phrases, or portions of text were coded and underlined.

After the coding of data was done the next step was that of categorizing these codes into more general themes. These themes contributed to the pattern or focusing issues that came out with the data, giving a systematic approach to viewing the study. All the themes were discussed and modified to reflect the findings from the data in an adequate manner leading to a reduction of irrelevance and enhancement of coherence. Last of all, the themes are named and form a good structure for presenting the results (Solaiman & Cohen, 2024). Employing this systematic approach to thematic analysis of the text made it easier to eliminate such misinterpretations and to ensure adherence to a sufficient database, which made the conclusions made in the study provide a detailed and overall understanding of the practical usefulness and applicability of NMT in translating Arabic Islamic terminology into English. The coding and theme development process which was comprehensive helped the study in enhancing the general reliability and validity of the research findings.

3.4 Ethical considerations

Since the study did not use human subjects, the issue of informed consent did not arise. However, the study complied with the rules set for citation and referencing all sources used in the literature review and secondary data. There were a few concerns with confidentiality since the research did not involve the collection of personal data (Lee et al., 2024). This principle served to ensure that the study did not cause any harm to individuals involved in the research or to the community at large.

Concerning religious texts and issues, while conducting interviews and focus group discussions, caution was taken to ensure that the outcomes of the research did not compromise the text in any way, shape, or form by causing misinterpretations or disrespect. These areas included data honesty and accuracy throughout the research process as one of the most important concerns (Bouteraa, 2024). Measures were taken to prevent the manipulation of data or results to increase the credibility and reliability of the study. To ensure that results reporting was also ethical, clear, and accurate in presenting and discussing the study findings, the following measures were embraced:

3.5 Limitations

Nevertheless, it cannot be denied that this study also has certain limitations, despite the important contribution that it has made in the examination of the appropriateness of NMT in translating the Arabic terminologies used in an Islamic context. It is noteworthy that these restrictions point out directions for further study and mark where the present research might not cover all aspects adequately enough. It is also important to point out that the use of case studies and only seven texts may not fully reflect the richness of texts available in Islamic literature, indicating that an

investigation of more texts can yield further insight into NMT capabilities in this area (Godwin-Jones, 2023). The discussion includes only a set of case studies, and, therefore, it does not cover all the texts that can be assessed. Further research could entail using a larger sample of texts to provide a more accurately representative analysis.

Third, thematic analysis has its fair share of subjectivity since researchers may identify and define the themes in question in various ways, which may cause variability in interpretation. While measures were taken to accurately and credibly assess the participants' experiences, employing mixed methods methodology by cross-checking the study's findings with quantitative data could strengthen the results further (Pathak, 2022). Moreover, this study focused on the translation of Islamic texts; thus, the findings and implications of this study may not generalize to other forms of texts or domains. More studies could be carried out to understand the dynamics of NMT about other aspects to help make more general conclusions on the functionality of the technology.

4. FINDINGS

This section discusses the results obtained from the qualitative analysis of the literature review and case studies on the implementation of Neural Machine Translation (NMT) in the translation of Arabic Islamic terminology into English. Some of the sub-sections highlighted include the benchmark results of NMT translation, the cultural and contextual issues, human intervention and control, and the use of NMT to translate texts in an Islamic context.

4.1 Accuracy of NMT translations

Another key factor in this study revolves around the effectiveness with which NMT systems translate Arabic Islamic terminology into English. According to Benbada and Benaouda (2023), the utilization of NMT systems improves the overall production of fluent and contextually accurate translations in contrast to the previous processes. According to the authors, discussing their findings comparing Reverso Context and Google Translate, they found out that NMT systems were more effective when encountering complex stems and idiomatic expressions than the commonly used traditional tools in machine translation (Benbada and Benaouda, 2023). However, it also reveals that there is still a challenge in the stability of NMT systems to deliver correct translation.

Al-Salmana & Haider (2024) conducted research that showed that NMT tools such as Google Translate, Gemini, and ChatGPT are not quite efficient in translating Arabic research titles in humanities and social sciences to other languages, as they do not capture the totality of meaning with the elegance of Arabic. This means that while NMT helps get an overall understanding of the text, there will often be culture and context that demand an appropriate translation overlooked by NMT. To check the reliability of the NMT translations, quranic verses, Hadiths, and classical Islamic texts were used and the translation check was done with human translation. The study revealed that NMT systems as good as they are can produce translations that are deemed correct but less natural and culturally accurate than human translation (Al-Salmana & Haider, 2024). For instance, the translation of the Quran's verses does not pay special attention to religion and culture which is so essential for transmitting its message. This concluded the line of reasoning stating the need for human intervention to enhance the mechanical translations from the machines.

4.2 Cultural and contextual challenges

Mohammed Oussama and Abderrahman (2023) explained that the complex process of translation in NMT systems makes it challenging to translate idioms and contextualized religious terms. This can be best observed in the process of translating texts, which contain numerous metaphors, historical allusions, and theological terms. The case studies highlighted several cases where the NMT system generated translations that were semantically and syntactically correct but culturally or contextually incorrect (Mohammed Oussama & Abderrahman, 2023). For instance, there are bound to be instances in the Quran where certain Arabic words bear multiple meanings depending on the context and certified NMT systems select the obvious or rather the directly related meaning which might lead to misinterpretation.

Hemmet (2023) noted the need to enhance Cultural and theological awareness when developing the NMT systems to reduce incidences of such mishaps (Hemmet, 2023). Further, the studies on Arabic chatbots reported by Alruqi and Alzahrani (2023) also indicate that human input is required to manage complacent queries appropriately. Their study showed that while basic questions could be answered by chatbots, they were not very good at answering questions with more background information. This finding is also valid for NMT as it shows that even if the machine translations are accurate mechanically, they require a human to assess the appropriateness of the contexts or cultural language usage (Alruqi & Alzahrani, 2023). All these put together emphasize the need to involve human intelligence in the post-editing of the NMT to enhance the suitability of the translations for Islamic texts.

4.3 Role of human oversight

Another important theme to arose out of this study was the need and importance of human supervision in the process of quality control of NMT translations. From the study conducted by Almusharraf & Bailey (2023), human translation is vital in post-editing in machine translation to obtain contextual translation. They also suggested that the NMT systems must work at the most primitive level where it only translates text and then it should be posted and edited by an expert to meet the usability of the end user. The case studies have supported this view to prove that the cases of human interaction improve the quality of translation in NMT. For instance, in the translation of Hadiths, post-editing resulted in achieving perfect accuracy by correcting all the NMT output errors or contextual misinterpretations done by the translators (Almusharraf & Bailey, 2023). Through attributing the structure of this hybrid approach, the AI-powered translations get the advantages from both AI and human experience as well as knowing; this ensures visitors get accurate, culturally appropriate translations that do not distort the original intent.

As stated by Alruqi and Alzahrani in their study conducted among Arabic chatbots in 2023, human intervention is still essential. They learned that while chatbots offered the basic features of delivering simple responses, complex questions necessitated software assistance to deliver proper and relevant messages. This discovery underscores the need for human intervention within NMT especially when translating texts like religious ones, specifically Islamic ones. All these factors add up to suggest the importance of incorporating human intelligence in the process of NMT to ensure the development of good translations that appropriately meet cultural and contextual requirements. The combination of AI with the supervision of human experts helps retain the required deep semantic meanings necessary for Islamic text translations.

4.4 Practical applications of NMT in translating islamic texts

To substantiate the case study and the literature review, considerations of NMT in translating Islamic texts were made. Alyammahi (2020) examined the implementation of AI or learning and teaching environment in schools in Abu Dhabi Emirate, and provided concrete examples of how schools can improve learning and teaching through the use of AI technologies. Based on his work, he postulates in the key points that the interaction of AI as a tool improves learning outcomes by 20-30% This conclusion directly applies to the training of translators (Alyammahi, 2020). In addition to this, Al-Salman and Haider (2024) presented an evaluation of MT and AI solutions to translate Arabic research titles. From their empirical evidence, the authors pointed out the benefits and drawbacks of current NMT systems, emphasizing the ongoing need for development and supervision. About their study, their work provides procedural information on how NMT could be used in universities or any institution primarily for translating academic documents when accuracy and context integrity matter most.

These conclusions outline the future of NMT studies and show how the technology can enhance language translation education more beneficially. Through the effective use of AI applications, educators themselves can improve their teaching approaches, thus creating awareness among the students about issues to do with translating from one language to another. This approach can also be used in professional translation environments where NMT systems can be an essential tool in the translator's toolkit aiding them in processing large amounts of text while still providing translation quality oversight by human operators. Therefore, the incorporation of NMT in teaching and business

settings demonstrates its potential to enhance translation processes while acknowledging the necessity of human intervention to ensure the correctness and cultural sensitivity of translations.

4.5 Data scarcity and domain-specific corpora

A major limitation in improving NMT methods for the translation of Arabic Islamic content is the limited availability of specialized datasets. In their survey on large language models, Hadi et al. (2023) outline what their authors consider the issues and drawbacks of using these models in low-resource languages and in technical niches. They highlight the requirement to create larger and better samples that would significantly enhance NMT efficiency. The results suggest that systematic attempts to gather and select big, clean, lexical corpora from Islamic texts and their translations are essential to improve the NMT performance (Hadi et al., 2023). Thus, the development of such corpora can foster an improved handling of such issues by NMT systems, particularly about Islamic terms and their contexts. This can ultimately help improve the quality of translations, as well as the suitability of translation for specific contexts.

4.6 Advancements and future directions

However, continuous developments and new techniques in Artificial Intelligence and Neural Machine Translation recommend hope for better translation products of language. Automating knowledge acquisition in specialized fields: Yang et al. (2023) show how expertise in AI platforms can support complex learning processes. Their methodologies could be applied to build better NMT systems for translating Arabic texts, indicating the potential research and development directions (Yang et al., 2023). Moreover, Sukkar et al. (2024) give an analytical assessment of AI-constructed portrayals under the domain of cultural assets. They underscore possibilities of technological application in the preservation and representation of history, culture, language, and religion which can be extended to the literal and religious preservation through enhancing translation proficiency. Their work has highlighted the significance of AI's continuing development to improve the accuracy of translations whilst maintaining cultural relevance (Sukkar et al., 2024). By applying these high techniques, NMT systems can be improved for understanding the difficulties and peculiarities of the Islamic texts. This can lead to enhanced appreciation of different cultural and religious backgrounds, therefore improving cross-cultural and interfaith relations.

4.7 Broader implications

Some of the issues that arise from the use of AI in translation include ethical and cultural concerns. Ismail (2024) also mentioned the mismatch between AI technologies and Islamic values where the possible social and economic repercussions of such developments are tackled. According to his argument, the makers and users of AI must adhere to the right moral standards to ensure that these artificial intelligence solutions are implemented in a manner that is culturally and religiously sensitive (Ismail, 2024). Additionally, ZainEldin et al. (2024) offer a thorough literature study regarding the role of AI in enhancing communication for the deaf and mute. Their work is significant to focus on the need to incorporate diversity and culture into AI applications; an area of high interest to the translation of Islamic texts. It is thus vital to promote AI technologies that are inclusive and culturally sensitive as the means to make these technologies more effective and mainstream (ZainEldin et al., 2024). Furthermore, Shahriar and Hayawi (2024) delineate the possibilities and challenges that are related to conversational AI. They emphasize the proper use of AI-related instruments concerning translation, including religious texts, misinterpretation of which has potentially fatal consequences (Shahriar & Hayawi, 2024).

5. DISCUSSION

The discussion section links the work of this study with evidence from other researchers as part of how to determine the effectiveness of NMT in translating the terminology of Arabic Islam to English. The discussion is structured into several sub-sections, each addressing key themes identified in the findings: Translation correctness and quality, interference by human translators, usability, data aspects, versatility, data aspects, and problems.

5.1 Translation accuracy and cultural sensitivity

In cases where positive outcomes of NMT translations are observed in the quality of translation done, then it means the objectives set have been achieved to some extent although there are still some drawbacks. Benbada and Benaouda (2023) pointed out that current NMT systems like Reverso Context and Google Translate can translate text into more fluent and accurate translations than the earlier rule-based and statistical MT systems. These improvements are attributed to the fact that NMT can learn the high-level contextual semantics of the languages and therefore, capture idiomatic and other complex constructs. However, these studies indicate that NMT systems are not there yet when it comes to fully comprehending the intended meanings and implications of original Arabic Islamic texts (Benbada & Benaouda, 2023).

Al-Salmana and Haider (2024) also mentioned that tools like Google Translate, Gemini, and ChatGPT although more efficient than traditional practices, are far less sensitive to the cultural and contextual implications. This loss is more significant where translations that can retain the essence of the text as provided by the author are critical for example, in Islamic texts. For instance, through the case studies we established that while NMT systems are capable of translating a simple meaning and understanding as general interpretations of Quran verses, and Hadiths, NMT systems failed to grasp the profound religious and cultural meanings (Al-Salmana & Haider, 2024). This is why there is a constant struggle to enhance NMT methods to work with religious and culturally rich texts.

Culture and context play important roles in the social exclusion of Islam translation and come with numerous impediments. In 2023, Mohammed Oussama and Abderrahman observed that the NMT systems are ineffective in recognizing the conventional idiomatic and contextual features of religious language. This is evident when it comes to the comprehension of texts that involve the use of metaphors, historical references, as well as religious issues. For instance, some of the Arabic terms used in Quran translation word have several meanings and due to NMT, the primary meaning or the direct sense is translated which dilutes the affiliated meaning (Mohammed Oussama & Abderrahman, 2023).

According to Hemmet (2023, p. 11), oversight like this could be prevented by taking cultural and theological sensitivity into consideration while developing NMT systems. This was evident from several examples presented in the case studies where NMT systems delivered technically accurate translations but were culturally or contextually insensitive. Such findings inform the understanding that while NMT can provide a primary translation, it fails to provide cultural and contextual interpretations to make the translation meaningful in its entirety for a correct translation of Islamic texts (Hemmet, 2023). Therefore, integrating cultural and theological knowledge into NMT systems is relevant in improving the efficiency of the Translation of religious texts.

5.2 Human oversight and practical applications

The study further revealed that when human input is incorporated the quality of NMT translations stands to improve. In simple terms, Ismail (2024) called human translators vital in fine-tuning and situating the translations produced by machines. They proposed an NMT system where the initial translation is done autonomously and is corrected by posteditors when deemed necessary. This approach combines the use of AI with human input, providing accurate translations that also take into account the nuances of the original text. The outlined case studies provided additional support to the idea that human supervision highly enhances the quality of the NMT translations. For instance, in the case of translating Hadiths, human translators were able to decide whether the errors noted in the NMT output were significant and fix them to obtain both accurate and semantically sensible translations (Ismail, 2024). Alruqi and Alzahrani (2023) also pointed out that humans had to intervene in dealing with questions and answers while conducting their research on Arabic chatbots where this kind of chatbots was efficient for simple questions while complex questions needed human intervention to generate proper meaningful responses. Overall, these findings highlight how the need for a human touch in NMT is essential, particularly when handling texts like those in Islamic literature.

This research focused on describing how NMT can be used in translating Islamic texts based on case studies and previous literature. Alyammahi (2020) studied the augmented use of artificial

intelligence for learning and teaching processes observed in schools in the Abu Dhabi Emirate where real-life examples were given on how to innovate and apply artificial intelligence in enhancing learning-teaching practices. Based on the findings of his study, it would be pertinent to argue that the implementation of AI technologies can greatly benefit the process of education as a whole and the practice of translation in particular. This has demonstrated that NMT can aid in delivering more efficient and extensive language translation education (Alyammahi, 2020).

Besides, in the context of MT and AI probes in translating Arabic research titles, Al-Salmon and Haider (2024) provided a systematic and in-depth review. Their works have presented the benefits and drawbacks of the present-day NMT systems, which is why it is crucial to develop this approach and have it monitored by specialists in linguistics. Based on these studies, the credibility of NMT is asserted to benefit both the educational and professional translation spheres. With AI tools, it is possible to enhance ways and modes of teaching in schools to ensure students acquire a better understanding of the difficulty levels of translation (Al-Salman & Haider, 2024). Therefore in this professional capacity, these NMT systems could serve as helpful tools for translators by processing more texts quickly but still having the human translator review them periodically.

5.3 Data challenges and advancements

Hadi et al. (2023) described the problems and pitfalls of fine-tuning large language models for low-resource languages and specific domains. They highlighted the necessity of compiling more elaborate and diverse corpora to train NMT models. It is especially true in the case of Islamic texts where specialized knowledge and contextual considerations are especially necessary (Hadi et al., 2023). The results suggest that targeted initiatives to collect and ensure large, high-quality corpora of Islamic texts and their translation are essential to NMT's improvement in terms of accuracy. The creation of such specialized corpora may facilitate the improvement in the performance of NMT systems when it comes to the CE "sector", involving specific language and culture Islamic terminology. By addressing this gap, the researchers and the developers will be in a position to increase the quality of translation of texts; with a view of making them accurate as well as fitting into the intended social context (Almusharraf & Bailey, 2023). Such an endeavor entails the involvement of both artificial intelligence researchers focused on Islamic texts and linguists and scholars of cultural history and Islamic studies to create tools that convey the depth and richness of the Islamic corpus.

However, the continuous development of new frameworks in AI and NMT is expected to bring better solutions to the translation. Yang et al. (2023) provided a scenario, which confirmed how the state-of-art AI systems can effectively structure and improve learning within subject-specific domains. The methodologies used by both could be adopted to design more efficient NMTs for translating Islamic text as future research and development avenues. Utilizing these features, the NMT systems are better positioned to address the challenges and intricacies of Islamic texts (Yang et al., 2023). In a conceptual analysis carried out by Sukkar et al. (2024), AI-generated representations were evaluated for their contributions to cultural heritage. Such insights outline the need to merge AI development with the desired goal of improving the precision and relativistic approaches of the translations (Sukkar et al., 2024). Through the application of these best practices, the researchers can help create NMT systems that meet the requirements of translating Islamic texts to help promote better understanding and tolerance of cultural and religious differences.

6. RECOMMENDATIONS

The following are the recommendations for the improvement of Neural Machine Translation (NMT) in translating Arabic Islamic terminology into English in light of the findings of this study. These recommendations are concerned with the creation of specialized corpora, utilization of both monolingual and bilingual approaches, human supervision, and international cooperation.

1. Develop specialized corpora:

As highlighted in this research, the absence of general corpora in some areas continues to be one of the major disadvantages present. This is because Arabic Islamic texts have diverse theological, cultural, and historical contexts and accurate parallel corpora which call for improvement. To this end, it is relevant to create new corpora containing all sorts of texts concerning Islam, including the

Quran, biographies of the Prophets, theological treatises, fatwa, and literature (Kannan et al., 2023). Constructing such corpora is a collaborative task that tropes scholars, linguists, and other professionals in artificial intelligence. This particular effort should therefore involve the gathering, selection, and indexing of large numbers of datasets that better capture the heterogeneity of texts that belong to the Islamic tradition. By enabling NMT models to have more contextual and broader training data, the models can indeed capture the detailed patterns and contexts of the Islamic terms. This will ultimately improve the general quality of translation, and make it as precise, culturally sensitive, and contextually relevant as possible.

2. Adopt hybrid approaches:

Based on the results of this study, it is apparent that there is a lot of room for improvement in terms of the efficiency of NMT for translating texts that require higher levels of sophistication such as those involved in Islamic literature. Although NMT systems proved to bring substantial enhancements in terms of MT, they are normally considered too weak for dealing with idioms, metaphors, and context-sensitive equivalents. To overcome these issues, some advise that it is best to integrate NMT with other forms of translation (Razavi & Habibnia, 2024). A combination of all the above methods makes use of the positives of all the translation methodologies. For instance, the integration with rule-based and statistical approaches can help improve the overall performance of an NMT model in dealing with linguistic issues. This approach also has advantages in that the strengths of one method would be able to offset the disadvantages of another method (Solaiman & Cohen, 2024). When NMT is used together with traditional approaches, translators enhance the effectiveness of translation and maintain the shades of meaning in Islamic texts.

3. Ensure human oversight:

To enhance the machine-generated translations human intervention plays an important role in modeling and defining the translations. The findings indicate that there is a need for an expert to intervene to keep track of the translations and ensure that they are accurate and culturally appropriate. Human translators also introduce an immeasurable amount of cultural, theological, and contextual knowledge that is still lacking in most NMT systems today (Lee et al., 2024). The human factor can also be incorporated into the NMT process through a post-Editing Model where NMT conducts the actual translation then human editors go through the output to correct the mistakes. This model helps to avoid situations where a translation is perfectly correct from a grammatical point of view but does not reflect the context or is appropriate for the specific culture. People's input assists in comprehending and fixing mistakes, clearing up obscurity, and ascertaining that the translation is correct in meaning (Bouteraa, 2024). Such cooperation between AI-based tools and human translators can provide a huge improvement in the quality of translations, especially for complicated and highly-difficult texts.

4: Promote cross-cultural collaboration

The translators, academicians, technologists, and other experts working together can enhance the credibility and relevance of the translations by NMT. Validating words and messages translated from Islamic texts need a crucial understanding of both the source and target contexts and theologies and histories. Cross-domain work may catalyze the innovation of better and more effective NMT systems (Godwin-Jones, 2023). This cooperation can appear more broadly in the form of interdisciplinary research, academic conferences, and published articles. This is because by getting a big team from different disciplines, new solutions and approaches that might not have been thought of before can be formulated to challenge the process of translation of text from the Islamic context especially when it is a religious text. Technologists can use the knowledge of culture and theology scholars and, in turn, scholars could apply new developments in AI to their translations (Pathak, 2022). Such crossover of knowledge and skill may result in more accurate, contextually relevant, and culturally appropriate translations.

7. CONCLUSION

This study assesses the feasibility and difficulty of translating Arabic Islamic terms using Neural Machine Translation (NMT). From the presented synthesis of perspectives, findings, and evidence

derived from literature research, case studies, and empirical concepts the following insights and suggestions may be outlined. In comparison to the improved stand taken by NMT in the realm of translation technologies translating Islamic texts, specifically those that are intricate and complex, have their own issues. Some of the examples discussed in this paper include the misuse of religious terms, different meanings these words hold according to usage and culture, and idiomatic expressions. This is clearly seen from the case studies and literature reviewed, where various problems affecting NMT systems when processing Islamic texts or texts with theological, historical, and metaphorical overtones are often cited. One significant conclusion is that it is highly desirable to develop special corpora with a focused purpose. The absence of large and thoroughly annotated parallel corpora for Islamic texts currently presents challenges to the NMT models.

Building such corpora is crucial for building better models for understanding and translating the emotions implicit in the text of Islamic literature. This is acknowledged as the collective effort of scholars, linguists, and AI researchers in the gathering, curation, and annotation of texts as comprehensively as possible. The report also focuses on such strategies as the significance of composite plans. It is crucial to understand that NMT systems are rather authoritative but not devoid of errors. Substituting NMT with other methods like rule-based and statistical can improve translation quality since none of the approaches has any weaknesses on its own. It means that the translation process can be less generalized and thus more effectively meet the task demands presented by the Islamic texts. Another factor that can be identified as an important aspect in enhancing the efficiency of translation is human supervision. Human translators offer contextual and cultural interpretations that are not easily built into NMT systems at the moment.

The combined approach, in which NMT creates the first translation and translators adjust them, allows for achieving both translation quality and compliance with context. Now, it is essential to encourage the cooperation of scholars, technologists, and translators from different cultures. Such collaboration can result in improved levels of NMT systems and enhanced translation practices. Synergy across disciplines can pave the methodological way toward making more effective translations that can respond to the complex task of conveying the perplexity of Islamic texts. In conclusion, it is possible to state that despite its perspectives of translating Arab Islamic terminology, NMT still has certain limitations that require further examination and the use of complex strategies. In emphasizing the method of specialized corpora, the hybrid approaches, human involvement, the cross-cultural collaboration, the field of machine translation will be capable of making considerable advances to offer representative of the Islamic language and its spirit of translation.

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