

Comparative study of machine translation versus human translation

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Abstract: This study provides a comprehensive and in-depth comparative analysis of machine translation and human translation. In terms of translation quality, human translation excels in accuracy, fluency, and cultural adaptability due to human expertise and linguistic proficiency. Conversely, machine translation demonstrates superior efficiency, particularly suited for large-scale, urgent, or real-time translation projects. In terms of cost-effectiveness, machine translation holds a more economic advantage in long-term, large-scale tasks, while human translation is more cost-effective in short-term, small-scale tasks. However, rather than being mutually exclusive, these methods can complement each other. Machine translation can serve as an auxiliary tool for human translation, offering initial translations and specialized knowledge to optimize results and refine quality and adaptability. Future translation practices should make full use of the complementarity of the two to promote the healthy development of the translation industry.

1. Introduction

In the context of the current globalization, translation, as a bridge between languages, is particularly important. With the rapid development of science and technology, machine translation came into being and gradually became a new force in the field of translation. However, as a traditional translation method, human translation still has an irreplaceable position. Therefore, comparative studies of machine translation and human translation can not only help to deeply understand the advantages and disadvantages of both, but also provide a useful reference for future translation practice. The development process of machine translation and human translation is very different. Machine translation originated from rule-based methods in the 1940s, and experienced the evolution from statistics-based methods to the deep learning-based methods today. Human translation, with a longer history, relies on the translator's language ability and expertise to realize the accurate understanding and expression of the original text^[1]. With the continuous progress of machine translation technology today, human translation still occupies a place in the translation market with its unique advantages. This study aims to compare the advantages and disadvantages of machine translation and human translation in terms of translation quality, translation efficiency and translation cost, and explore the differences and their applicable scenarios. At the same time, this paper will also focus on the role and influence of machine translation and human translation in cultural communication, information communication and other fields. Through an in-depth study of these

issues, we endeavor to provide more comprehensive and objective guidance for translation practice and promote the healthy development of the translation industry.

2. Machine translation overview

2.1. Definition and principle of machine translation

Machine translation is a method of realizing automatic conversion between languages using computer technology or artificial intelligence technology. It uses complex algorithms and models to conduct in-depth analysis and understanding of the source language text, and then generates the corresponding text of the target language. This process involves knowledge and technology in various fields, including natural language processing, computational linguistics, and artificial intelligence. The principle of machine translation is to simulate the human understanding and transformation process of language. Through a large amount of corpus and training data, the machine can learn and internalize the patterns and conventions governing language conversion, thereby achieving fast and accurate translation. With the development of deep learning technology, the performance and quality of machine translation are constantly improving, providing strong support for cross-language communication and information dissemination^[2].

2.2. Technical classification of machine translation

2.2.1. Regular-type machine translation

Regular machine translation is an early form of machine translation, which is translated based on predefined rules and dictionaries. These rules are often written manually by linguists based on the syntactic and semantic features of the language, while the dictionary provides the lexical correspondence between the source language and the target language. In the process of translation, the regular machine translation system will parse and transform the source language text according to these rules and dictionaries to generate the translation results of the target language. The advantage of this approach is the high controllability of the translation results, since the rules are defined by human experts. However, the disadvantages are also obvious, namely, the writing and maintenance of rules require large human and time costs, and it is difficult to cover all language phenomena and translation requirements.

2.2.2. Statistical type machine translation

Statistical machine translation is based on statistical learning, which uses a large number of bilingual corpus to automatically learn the correspondence between the source language and the target language. Unlike regular-type machine translation, statistical machine translation does not rely on predefined linguistic rules; instead, it analyzes large amounts of parallel text data to discern statistical patterns and probabilities of word and phrase translations. The advantage of statistical machine translation is that it can automatically learn translation rules from data without the need for manual writing. In addition, with the continuous expansion of the corpus scale, the performance of statistical machine translation can also be continuously improved. However, statistical machine translation also has some limitations, such as sparse data problems and limited processing power of long-distance dependence^{s[3]}.

2.2.3. Neural network machine translation

Neural network machine translation is a new machine translation technology emerging in recent

years. It realizes automatic translation from source language to target language based on deep learning and neural network language model. This approach is to construct a large-scale neural network model that can automatically extract feature representations between the source and target language, and generate high-quality translation results. Compared to traditional machine translation methods, neural network machine translation has stronger representation learning ability and higher translation quality. In addition, with the continuous development of deep learning technology, the performance of neural network machine translation has also been greatly improved, and it has become the mainstream technology in the field of machine translation^[4].

3. Human translation for an overview

3.1. Definition and characteristics of human translation

The definition of human translation is relatively direct, that is, translation activities by translators with professional language ability. It is characterized by the complexity of the translation process and the accuracy of the translation results. Because human translation depends on the language ability and expertise of the translator, it is able to handle a variety of complex linguistic phenomena and cultural contexts, ensuring the accuracy and readability of the translation results. In addition, human translation also has the characteristics of flexibility and creativity, which can be flexibly adjusted and processed according to different translation requirements and scenarios. In human translation, the role of the translators is crucial. They need not only to have a solid language foundation, but also a deep understanding of the cultural background of the source and target language. In this way, they can accurately understand the meaning of the source language text, and express it in the target language, while maintaining the integrity of the original meaning. Therefore, the results of human translation tend to have high confidence and readability^[5].

3.2. Process and method of human translation

The process of human translation typically comprises three main stages: the preparation, translation, and proofreading stages. In the preparation stage, the translators need to carefully read and analyze the source language text to understand its meaning and context relationship. At the same time, they also need to consult relevant information and literature to ensure an accurate understanding of the text. In the translation stage, the translators should choose the appropriate translation methods and skills for translation according to the content and characteristics of the source language text. Factors such as cultural background and linguistic conventions of the target language are considered to ensure the fidelity and readability of the translation. In the proofreading phase, the translators need to carefully review and refine the translated text to eliminate grammatical errors and ambiguities, and compare the translation with the original text to verify accuracy and completeness. There are various methods of human translation, including literal translation, liberal translation, transliteration and so on. Literal translation means to translate the text according to the literal meaning of the original text and keep the form and structure of the original text as much as possible. liberal translation refers to the flexible translation according to the meaning and context of the original text, and it is not confined to the form and structure of the original text. Transliteration refers to translating the proper nouns or special words in the original text according to their pronunciation. Each of these methods has advantages and disadvantages, and translators need to choose and apply them according to the specific situation^[6].

4. Comparative analysis of machine translation versus human translation

4.1. Comparison of the translation quality

In terms of accuracy, human translation usually has higher accuracy. This is because human translation relies on the professional knowledge and language ability of translators, who can accurately understand the meaning of the text in the source language, and accurately express it with the target language. While machine translation has significantly improved in accuracy in recent years, it still has some limitations in dealing with complex contexts and specific fields. In terms of fluency, human translation also has advantages. Translators can adjust and process flexibly according to different translation requirements and scenarios, resulting in smoother and more natural translations. Machine translation remains to improve in processing language fluency, especially in dealing with long sentences and complex sentence patterns. Cultural adaptability is another area where human translation excels. Translators can adjust according to the cultural background and expression habits of the target language, ensuring that the translation aligns with the reading habits of the target language readers. Machine translation, on the other hand, is relatively weak in cultural adaptability, occasionally producing translations with improper literal or idiomatic expressions..

4.2. Comparison of translation efficiency

Machine translation uses advanced algorithms and powerful computing power to process large amounts of text data in a very short time to achieve fast translation. This efficiency is critical for handling urgent tasks, large volumes of documentation, or real-time translation requirements. However, the speed advantage of machine translation can sometimes compromise translation quality, especially when dealing with complex linguistic structures and specific cultural contexts. In contrast, human translation, although slower, is generally of higher translation quality. The translators are able to deeply understand the meaning and style of the source text and accurately communicate it to the target language readers. Human translation performs well in handling complex, professional or culturally meaningful texts, ensuring the accuracy and fluency of translation^[7].

4.3. Cost-benefit comparison

In terms of labor costs, machine translation has significant advantages. Once established, the machine translation system can be used for a long time without additional human input. Human translation needs to pay the salary and welfare of translators, and the labor cost is high. In terms of time costs, machine translation also has its advantages. Machine translation can complete the translation task in a short time, saving a lot of time cost. However, human translation takes a long time for translation and proofreading, and the time cost is relatively high. In terms of economic cost, the cost-effectiveness of machine translation and human translation varies from case to case. For long-term, large-scale translation tasks, the economic cost of machine translation may be lower, because large labor costs and time costs can be saved. However, for short-term, small-scale translation tasks, human translation may be more cost-effective, as there is no need to invest heavily in building and maintaining machine translation systems^[8].

5. Complementary study of machine translation and human translation

5.1. Application scenarios of machine translation-assisted human translation

In practical translation work, machine translation can be used as an auxiliary tool to help human

translation to enhance the efficiency and quality of translation. For example, when dealing with a large amount of repetitive text, machine translation can quickly generate initial translation results, and human translation can proofread and modify on this basis, thus saving a lot of time and energy. In addition, in translation tasks involving professional terms or specific fields, machine translation can provide a terminology base and expertise support to help human translation more accurately understand and express the original meaning.

5.2. Strategies and methods for optimizing machine translation

Human translation plays a pivotal role in enhancing machine translation effectiveness. Firstly, it serves as a crucial step for proofreading and refining the initial machine-generated translations, addressing grammatical errors, unclear expressions, and other issues. This process significantly enhances the accuracy and readability of the final translated content. Secondly, human translation can supplement and improve the limitations of machine translation in specific fields or context, so as to make the translation results more in line with the culture and conventions of the target language. In addition, human translation can also provide the modification opinions and suggestions to the machine translation system through the feedback mechanism, helping the system to continuously learn and improve the translation algorithm, and enhance the quality of future translation. In the process of optimizing machine translation, human translation needs to master certain strategies and methods. For example, they can use terminology base and professional knowledge base to improve the accuracy and consistency of term translation; they can also use translation memory tools to manage and reuse historical translation data to reduce duplication; in addition, they can use various translation options provided by machine translation to compare and analyse the most appropriate translation results^[9].

5.3. Mode and practice of machine translation and human translation working together

The mode of machine translation and human translation can be flexibly adjusted according to specific requirements and scenarios. A common pattern is machine translation as a preliminary translation tool, generating preliminary translation results after being proofread and revised by human translation. This model is suitable for scenarios demanding high translation quality with tight timeframe. Another mode is to work with machine translation and human translation in parallel to complete the translation task together. In this mode, machine translation can provide rapid translation support, while human translation focuses on dealing with complex contexts and domain-specific translation problems. This pattern is suitable for scenarios with high requirements for both translation quality within limited time. In practice, the collaborative work of machine translation and human translation has achieved remarkable results. Many translation companies and institutions have adopted this collaborative working model to improve the efficiency and quality of translation. For example, when dealing with large projects or emergency tasks, they can use machine translation to quickly generate preliminary translation results, which are then finely proofread and modified by human translators. This mode not only ensures the translation quality, but also significantly shortens the translation timeline, improving overall efficiency^[10].

6. Conclusion

After a comparative study of machine translation and human translation, we find that each approach possesses distinct advantages. Machine translation is fast and efficient, and suitable for handling large-scale text; while human translation is accurate and flexible, better at handling complex contexts and cultural differences. Looking forward to the future, machine translation and human

translation will show a development trend of integration. With the progress of technology, the quality of machine translation will continue to improve, providing increasingly valuable support to human translation. At the same time, human translation will focus more on the high-end and professional fields, and give full play to its unique value. For the translation industry, we suggest making full use of the complementarity of machine translation and human translation to improve the efficiency and quality of translation. In addition, we should pay attention to the development trend of technology, strengthen talent training and technological innovation, in order to cope with the challenges and opportunities of the future translation market.

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