The Influence of Speech Translation Technology on Interpreter’s Career Prospects in the Era of Artificial Intelligence

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Abstract. As the advancements in artificial intelligence, discussions on whether machine translation will replace human translation are found in the media and the public, but scholars have rarely explored this in research. This paper first reviews the history and recent progress in speech translation technology, and analyzes its merits and limitations. Then, in view of the history and features of the interpreting profession, the paper discusses the influence of speech translation technology on interpreter’s career prospects. The author holds that even if future speech translation technology is highly sophisticated, it still cannot completely replace human interpreters. Artificial intelligence is considered as both a challenge and an opportunity for the translation industry. The future trends in interpretation will be mainly human-led and machine-aided. After analyzing the trends and challenges to the interpreting profession, the paper proposes suggestions to interpretation teaching, hoping to give reference to interpretation teachers, learners and researchers.

1. The history and development of artificial intelligence

Artificial intelligence first appeared during the 1950s to the 1960s. The term “artificial intelligence” was initially put forward at the Dartmouth Academic Conference in 1956 [1]. During this period, the reasoning and searching capability of computer made great progress to the extent that it could solve problems based on clear rules. But for real life problems, computer was of little help. Therefore, in the 1970s, the development of artificial intelligence entered a period of stagnation. In the 1980s, the embedment of “knowledge” into artificial intelligence ushered a second flourishing period. Through inputting huge amounts of data, the machine can quickly retrieve relevant knowledge to solve a specific problem. In the 1990s, since the emergence of web pages, machine learning technology has advanced rapidly, leading to a third boom of artificial intelligence [1]. Neural network optimizes the function of machine learning by imitating human brain in processing and memorizing information. It possesses the advantage in self-learning and self-adaptation. At present, deep learning technology is widely applied in image processing, face recognition, speech recognition and other fields.

In the era of artificial intelligence, technologies such as big data, deep learning, neural network, speech recognition, and machine translation have exerted huge impacts on the translation industry. In the field of translation, technology companies such as Google, Baidu and iFlytek have invested heavily...
in machine translation. The quality of machine translation is getting higher, meanwhile it also becomes more user-friendly. In April 2018, AI simultaneous interpretation was used for the first time at the Boao Forum for Asia. In July 2019, Baidu announced that the accuracy of DuTongChuan’s Chinese-English translation reached 85.7%, and that of English-Chinese translation reached 86.4%, which is almost comparable to experienced human interpreters [2]. The public is concerned with the relationship between human and artificial intelligence, and some even worried that part of human occupations will be replaced by machine. Kai-Fu Lee once listed “translator” as one of the job positions that are most easily replaced by artificial intelligence. For a while, translation professionals and learners began to worry about the future prospects of the job market. This is particularly notable in the circle of interpreters, which has triggered an upsurge of discussion on the impacts of translation technology on interpreting profession. Driven by artificial intelligence, it is an indisputable fact that the language service industry has undergone a structural change.

2. Speech translation technology and its progress
In AI speech translation, traditional modules include automatic speech recognition (ASR, which converts the acoustic signal of the source language into text), machine translation (MT, which converts the source language text into target language text) and text-to-speech (TTS, which converts the target language text into target language speech) [3].

![Figure 1. The modules and components of AI speech translation.](image-url)

The history of speech recognition technology can be traced back to the 1970s. In the early statistical “Hidden Markov Model” (HMM) framework, speech recognition uses a “noise-channel” model. Acoustic signals obtain different acoustic features through spectral transformation and processing, which are then matched with the acoustic features of known words/ phrases to search for the closest equivalent language. Since the past decades, deep learning models based on neural network have made major breakthroughs in the field of speech recognition. Within this framework, the acoustic signal is directly inserted into the neural network, and the acoustic features are implicitly tagged by parameters without manual intervention, thereby greatly reducing the error rate.

Machine translation has upgraded from Rule-based Machine Translation (RMT) to Statistical Machine Translation (SMT), and to today’s Neural Machine Translation (NMT) [3]. The rule-based system relies on the translation rules formulated by linguists, therefore it has the feature of low coverage and high accuracy. Early statistical machine translation modeled the words and phrases in the source language and the target language to examine the relevance between them. In the neural machine translation model, each word is mapped to a vector in a high-dimensional space. By learning the network...
structure and parameters, the source language context is dynamically analyzed when generating the target text, thus the translation is both coherent and faithful to the source text.

Text-to-speech can convert any textual information into standard and fluent speech in real time. Text-to-speech relies on semantic, lexical, and phonetic rules, and it also involves natural language processing. Since text-to-speech technology is more advanced than speech recognition, it has been widely applied in scenarios such as voice navigation, audio books, voice assistant, and automatic news broadcast. Thus, text-to-speech technology is not the main factor causing errors in AI speech translation.

3. The merits and limitations of AI speech translation

Artificial intelligence translation has progressed rapidly. At present, it has the advantages of fast speed and high efficiency, hence it can complete the translation of a large amount of texts in a relatively short time, greatly surpassing the speed of human translation. It also has huge storage for technical and obscure words, and can handle multilingual translation, which is beyond the capacity of human brain. In addition, artificial intelligence translation is not restricted by time or space, thereby greatly reducing the cost of human resource [3]. These merits have expedited the advent of translation software and translation products on the market. But currently the quality of AI speech translation is not satisfactory, showing the following limitations:

3.1. Unable to identify highly specialized voice signal and its semantic meaning.

At the Translation Automation User Summit (TAUS) held at Beijing Language and Culture University in 2018, the conference organizer invited several graduate students majoring in translation to do the simultaneous interpretation of the speeches. Meanwhile, they are also connected to Microsoft’s Presentation Translator software. [2] This live interpretation performance made the attendees believed that the current AI speech translation is far from being able to replace human interpreters. The speech recognition module often makes mistakes when decoding the source language speech, and cannot accurately recognize the specialized voice signal and its corresponding semantic meaning. Although speech translation research teams are continually collecting high-quality and wide-ranging speech recognition and translation data, the speed cannot meet the demands. For this reason, the problems of speech recognition and semantic comprehension cannot be resolved properly at present. In addition, speech recognition also faces challenges in complex noise environment and non-standard accents.

3.2. Unable to cope with common speech recognition errors.

Whether the content, domain and topic of machine translation match with the model’s training data directly affects the accuracy of translation. For speech translation, most of the current solutions are to connect two modules in series, so the front-end recognition error is amplified during the translation process. Particularly in verbal communication, there are often modal particles such as “um”, “ha” and other words that indicate pause, repetition or self-correction, which results in incoherent sentences. In this situation, the current serial speech translation model cannot handle the task competently.

3.3. Unable to convey cultural differences and emotions.

Culture is closely related to translation, and translation is an important link in the exchange of different cultures. Due to the deficiencies in AI translation database and the limitations of speech recognition and semantic comprehension, it is currently unable to identify various cultural differences, such as customs, arts and religions. As a result, errors occur in the mode of thinking and expression of emotions during the translation process. Furthermore, the ability of AI speech translation to capture the speaker’s emotions cannot reach the level of human brain, thereby resulting in the loss of emotional meaning in the translation.

4. The history and features of interpreting profession

4.1. The history of interpreting profession
The long history of translation has been written in the legend of the Tower of Babel. The large-scale translating activities recorded in China and the West all began with the translation of religious classics, and the practice of oral interpretation was even earlier [11]. Before human ancestors created words, interpreting had become the earliest inter-cultural communication method between tribes [4]. In its two thousand years of history, the form and method of interpreting were basically unchanged, that is, it is conducted through consecutive interpreting. However, since the mid-1940s, a new method of interpreting—simultaneous interpretation—was put into use on a large scale for the first time during the Nuremberg Trial [10]. In this world-renowned trial, it was the “unprecedented and creative participation of simultaneous interpreters” that made the multilingual trials possible.

4.2. The features of interpreting profession
Interpretation requires multitasking ability and quick response capability, and it consumes great mental and physical energy. It is easy to form the impression that since interpreting is the most difficult of all translation forms, it is also least likely to be replaced by machine translation. But in the author’s view, the situation may be different.

Interpretation, like machine translation, is the product of modern society. Interpretation has a distinguishing feature—the alienation of the interpreter and the audience. In order to improve the efficiency, during the simultaneous interpretation process, the interpreter sits in a soundproof booth and converts the source language heard in the headset into the target language. The interpreter exists between the speaker and the audience in the form of sound. Besides, in interpretation the source language and the target language are synchronized, which means the interpreter must follow the source language closely to ensure that the time interval is within a controllable range. In the interpreting process, the interpreter has no time to re-integrate information and adjust word order, thereby making it difficult for him to mobilize his subjective initiative. The subjectivity of the interpreter is weakened, and to some extent, it reflects the “tool” nature of the interpreter. In comparison, machine translation is a more obvious “translation tool”. Thus, it can be seen that simultaneous interpreters and machine translation have the same premise and purpose. In some degree, they are “homogenized” competitors.

5. The impact of translation technology on interpreters
Technology often imperceptibly restricts or regulates social development with relatively independent variables and logic, and translation technology is no exception. Information technology has changed the
way interpreters prepare for the work [2]. They adopt professional tools to quickly access relevant materials, and use remote equipment to assist the interpretation, so as to handle complex and sophisticated interpreting tasks. Translation technology has rapidly penetrated into all aspects of interpreting and exerts a great impact on interpreting activities. Based on its significance, this section discusses the impact of translation technology on interpreters and interpretation service.

5.1. The development of interpreter’s capability

Most scholars believe that interpreting capability includes language competence, interpreting skills and encyclopedia knowledge [5]. Other scholars state that interpreters must possess technical capabilities, including information search, terminology database, Internet of Things application, interface integration, and human-machine collaboration [6].

Interpretation is a high-intensity labor, and technical means can greatly reduce the workload of interpreters and improve the translation quality. Translation technology provides interpreters with different forms and levels of assistance before, during and after the interpretation, such as acquiring knowledge in professional domain, capturing semantic information, extracting knowledge about technical terminology, clarifying the logical relationship in the source text, and managing interpretation language assets, etc. Interpreters who are proficient in using translation tools generally have better job performance than those who are not. The capability to use translation technology and tools to solve problems has now become the essential quality of interpreters.

5.2. The service mode of interpretation

The digitalization and automation of technology is creating new working modes [7]. Machine interpretation has opened up brand-new work modes and application scenarios, expanding into areas that cannot be covered by traditional interpretation services. Driven by technology, interpretation has shifted from a traditional single human mode to a human-machine collaboration mode. Using interactive machine translation technology, the speaker’s speech is recognized and displayed in text form on the screen synchronously, and the interpreter’s work mode is switched from “simultaneous interpretation” to “post-listening interpretation+ sight translation” [8]. The receive mode of interpretation changes from a simple earphone channel to the synchronization of voice and text, and to the multi-modal form of multilingua
Translation. Multi-modal interpretation tools such as translation pens, portable interpretation gadgets and mobile apps have led to enormous changes in user groups, consumer markets and service patterns. Using the Video Remote Interpretation (VRI) system, interpreters can transcend the space-time limitation to provide consecutive or simultaneous interpretation service.

5.3. The career development of interpreters

Will machine interpretation replace human interpretation someday? Such topic has triggered heated discussions in the interpretation community. Previous studies attached insufficient significance to interpreting technology and failed to take into account the impact of interpreting technology on the profession. Interpretation tools have expanded the form of interpreting service, exerting a great impact on the interpretation market such as escort interpreting and travel guide. The high quality of neural network machine interpreting poses a threat to the career development of interpreters with uncompetitive expertise. The fast and low-cost service of AI machine interpreting has an impact on the market price of conference interpreting, exhibition interpreting, and it is affecting the survival of interpreters. Scholars expounded on the value and price of interpreting and stated explicitly that “unless interpreters possess absolute competitiveness, there is a risk of unemployment” [6]. At present, machine interpreting technology opens up new application scenarios, serves more customers and provides them with diversified choices. In the future, interpreters who collaborate with interpreting technology will gain greater competitiveness and eventually win the market.

6. The future development of interpreting profession in the age of artificial intelligence

Machine translation assisted by artificial intelligence has brought considerable benefits to the interpretation industry. Yet since machine translation can provide fast and convenient service at low cost, some low-end interpreting professions face the risk of being replaced by machine [9]. According to the principal product manager of Sogou IOT (Internet of Things), based on the technology of voice recognition and image recognition, their product “Travel Translator” can not only perform language translation, but also image translation, providing great convenience for tourists in ordering food and reading street signs. Moreover, the device can handle 18 languages, which is helpful to tourists traveling to non-English speaking countries. It is predicted that low-end escort interpretation may be replaced by machine translation in the next few years.

Although artificial intelligence poses a threat to low-end interpreting professions, for a long time, machine translation will not replace high-end human interpretation. In the future, international business negotiation, world leaders’ summit, opening ceremony of international sports event and other official occasions still need people to undertake the interpretation work. Firstly, these interpreting occasions are formal. Yet the speaker’s accent, technical terms and the interference of microphone noise or other environmental sounds: all these factors pose great challenges to AI simultaneous interpretation [7]. In complex language environments, machine translation is currently unable to undertake advanced tasks, therefore interpreters are still in need. Secondly, unexpected situations often occur in high-end interpretation, but even machine translation based on deep learning cannot respond appropriately in a short time. With common sense and rich experience, human can make quick judgements and solve unexpected problems in time. Lastly, high-end interpretation requires high accuracy, but current machine translation is liable to misjudgment when encountering ambiguous sentences and inconsistent grammar. Since machine has no emotion or aesthetic ability, it cannot reach human’s level in translating literary content.

From the above analysis, it can be inferred that in the next few decades, the interpreting profession will not be completely replaced by machine, rather it will exist in the form of machine-aided interpreting. Machine translation based on artificial intelligence promotes the internationalization of interpreting profession and provides high quality services to customers. In the future, intelligent interpretation technology will continue to provide assistance in aspects such as work mode, data management and customer service.
7. Implications: interpretation teaching assisted by AI speech translation

The application of AI translation to foreign language teaching helps increase teaching efficiency and cultivate professional talents that can meet the demands of the artificial intelligence era [3]. At present, some universities still ignore AI translation technology and adopt the traditional teaching methods. Take the interpretation course as an example, though AI speech translation brings challenges, it also provokes rethinking of the teaching design.

7.1. Enrich the materials for interpreting practice.

In interpreting teaching, the collection of online resources not only expands the interpreting materials, but also empowers learners to manage their learning goals and learning methods. Furthermore, the role of interpretation teacher is transformed to a guide who masters educational technology, creates diverse teaching materials, and participates in classroom interaction. Teachers should also stimulate students’ enthusiasm for learning, collect interpreting materials through classroom lectures and group activities, and organize them into a professional interpretation database. In the era of artificial intelligence, the ways people obtain information are diversified. Teachers should strive to seek resources and use AI speech translation to create a teaching environment that keeps pace with the times.

7.2. Utilize AI speech translation machine or software.

In the current interpreting class, the teacher mainly uses slides and multimedia methods to input voice or text information, and the students complete the translation with the help of equipment in a simultaneous interpretation classroom. Afterwards, the teacher checks and evaluates students’ interpreting performance. The extensive use of AI translation tools in the public will inevitably affect students’ future translation practice. Therefore, in the interpreting course, the teacher should guide students to know the merits and limitations of AI speech translation by using it [12]. In this way, it improves students’ learning efficiency and consolidates their interpreting skills. Furthermore, through cooperation with artificial intelligence, students can be cultivated into talents who possess both interpreting skills and proficiency in translation technology.

7.3. Strengthen the training of intercultural awareness and emotion judgment.

Currently, AI speech translation cannot fulfill the function of conveying emotions and intercultural differences. Teachers should attach importance to intercultural awareness and emotion judgment with regard to the weakness in AI speech translation. Interpretation is not only to transmit the literal meaning in the source language, but also to convey the culture and emotions. Teachers should take into account different thinking patterns, values, religious beliefs and other cultural factors when imparting translation strategies (i.e. domestication and foreignization) to students. The teaching objectives should include: to master the interpreting strategies for cultural and emotional content, to accomplish interpreting tasks that cannot be handled by AI speech translation, and to achieve an effective human-machine collaboration in interpretation.

8. Conclusion

Although artificial intelligence has achieved unprecedented progress and reveals a tendency to replace human interpreters, it will only occur in low-end interpreting professions. In the formal and high-standard occasions, human interpreters still possess competitive advantages over machine interpretation. As an interpretation teacher, one should enhance his professional skills and integrate AI translation technology into the teaching. The teacher’s duties should include: adjust the teaching design based on the trends of technological progress; exploit the advantages of AI speech translation to empower foreign language teaching; provide students with a learning experience close to the future workplace; and consolidate students’ command of AI speech translation tools. As an interpreter, one should strengthen the mastery of machine-aided translation technology and be proficient in computer-aided translation (CAT) software, such as SDL Trados, memoQ, iCAT, etc. As an interpreting learner, one should first acquire qualified expertise (i.e. bilingual competence, encyclopedia knowledge and interpreting skills).
He also needs to know the trends of the translation industry and develop machine-aided translation strategies. The advancement of artificial intelligence is both a challenge and an opportunity to the translation industry. The future trend of interpreting is mainly human-led and machine-aided collaboration.

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