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العدد الرابع عشر

الاستخدامات المتعددة المتنوعة للترجمة الآلية: دراسة نظرية

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المستخلص :

رغم أن البعض لا يزال رافضاً لفكرة الترجمة الآلية، إلا إنها تستخدم الآن ومن قبل العديد من الناس كأداة إنتاجية وبنجاح واضح. و رغم وجود مجموعة متنوعة من الإستخدامات فعلياً، إلا أن المزيد منها يظهر حين تكون الترجمة الآلية هي الملاذ الأخير. يتناول هذا البحث بشكل عابر الترجمة الآلية تأثيرها على المترجم و الحاجة إلى وجود مستويات جودة مختلفة بدلاً من وجود مستوى ومقاس واحد "يناسب الجميع".

و تتبع الترجمة الآلية الذكاء الاصطناعي واللغويات الحاسوبية التي تركز على تطوير الخوارزميات والأنظمة التي تؤهلها لترجمة النصوص أو الكلام تلقائياً من لغة إلى أخرى. يتمثل الهدف من أبحاث الترجمة الآلية بتمكين أجهزة الحاسوب من إنتاج ترجمة دقيقة ذات طلاقة كتلك التي ينتجها المترجمون البشريون. للترجمة الآلية مجموعة واسعة من التطبيقات والاستخدامات التي تهدف إلى تسهيل التواصل وتبادل المعلومات بين الأشخاص ممن يتحدثون لغات مختلفة من خلال تحسين كفاءة وسرعة مهام الترجمة بشكل كبير هذا إضافة الى تقليل تكلفة خدمات الترجمة. و مع ذلك، هناك أيضاً تحديات وقيود على استخدام الترجمة الآلية و المتمثلة بشكل خاص بالكميات الكبيرة من بيانات التدريب واحتمال حدوث الأخطاء والترجمات المخطئة. لذلك ، تهدف الترجمة الآلية، من خلال استخداماتها المتنوعة إلى تذليل هذه التحديات وبالنتيجة تطوير أنظمة ترجمة أكثر دقة وفعالية.



الكلمات المفتاحية: الترجمة الآلية، استخدامات الترجمة الآلية، المترجمون البشريون .

The Various and Multiple Uses of Machine Translation: A Theoretical Account

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Abstract :

Despite a few remaining naysayers, Machine Translation is used by many people now as a productivity tool, with obvious success. Though there has been already a variety of uses, yet, more of them are emerging where machine translation is the only solution. This paper presents the case for machine translation, describes its impact on the translator and demonstrates a need for customizable levels of quality rather than a 'one size fits all' solution.

Machine translation is a subfield of artificial intelligence and computational linguistics that focuses on the development of algorithms and systems and qualifies them to automatically translate text or speech from one language into another. The goal of machine translation research is to enable computers to produce translations that are as accurate and fluent as those produced by human translators. Machine translation has a wide range of applications and uses that aim at facilitating communication and information exchange between people who speak different languages by improving the efficiency and speed of translation tasks, as well as reducing the cost of translation services. However, there are also challenges and limitations to the use of machine translation, specifically the need for large amounts of training data and the potential for errors and mistranslations. Therefore, machine



translation, through its varied uses, aims at addressing these challenges and accordingly developing more accurate and effective translation systems.

Keywords: Machine translation , Interpretation , Human-machine connection.

Introduction

Machine translation (MT), the process of using computers to automatically translate text or speech from one language to another, has a long and fascinating history. In the early 20th century, MT was first proposed as a way to facilitate communication between different language communities (Nirenburg, McShane, & Raskin, 2004). However, it was not until the 1950s that the first MT programs were developed, with the Georgetown-IBM experiment being one of the most well-known (Jurafsky & Martin, 2000). Throughout the decades, MT technology has continued to evolve and improve. In the 1980s, the development of translation memory systems and the emergence of the internet allowed for more efficient and cost-effective MT (Nirenburg et al., 2004). In the 21st century, MT has become even more prevalent with the widespread use of translation software and the rise of MT in the business, healthcare, and education sectors (Jurafsky & Martin, 2000). Despite the advances in MT technology, there is still a need for human translation in certain situations where accuracy is of utmost importance. However, MT has proven to be a valuable tool in facilitating communication between individuals and organizations having different language backgrounds.

The current research aims at presenting the varied multiple uses of MT by exploring its current status in MT technology and its potential applications. Additionally, it examines the benefits of using MT in various settings, including professional, educational, and personal contexts. It also investigates the impact of MT on the translation industry and on human translators.



It is hoped that the presentation of such uses may benefit different people who are involved in translation, and more closely with MT, and its relevant tasks in one way or another.

Uses of Machine Translation

Now, MT is most effective in situations where a text needs to be communicated in an easily understandable form of a different language. Although it may not be entirely logical or error-free, the language of the translation can be comprehended. Additionally, the word arrangement can be weird or a single word might have been changed to a peculiar synonym. MT, however, is useful in a wide range of contexts. Next, are some scenarios where MT can be useful:

❖ Accessing New Information

MT systems like Google and Bing have more than anything brought MT to a wider audience. MT brings translation directly to users where they need it. A user, trying to find some information on the internet, comes across a web page in a foreign language, say a German page that addresses the problem he has with his computer—and with a click of a button (translate this page), he gets the content rendered in the language he desires (Figure 2.1).

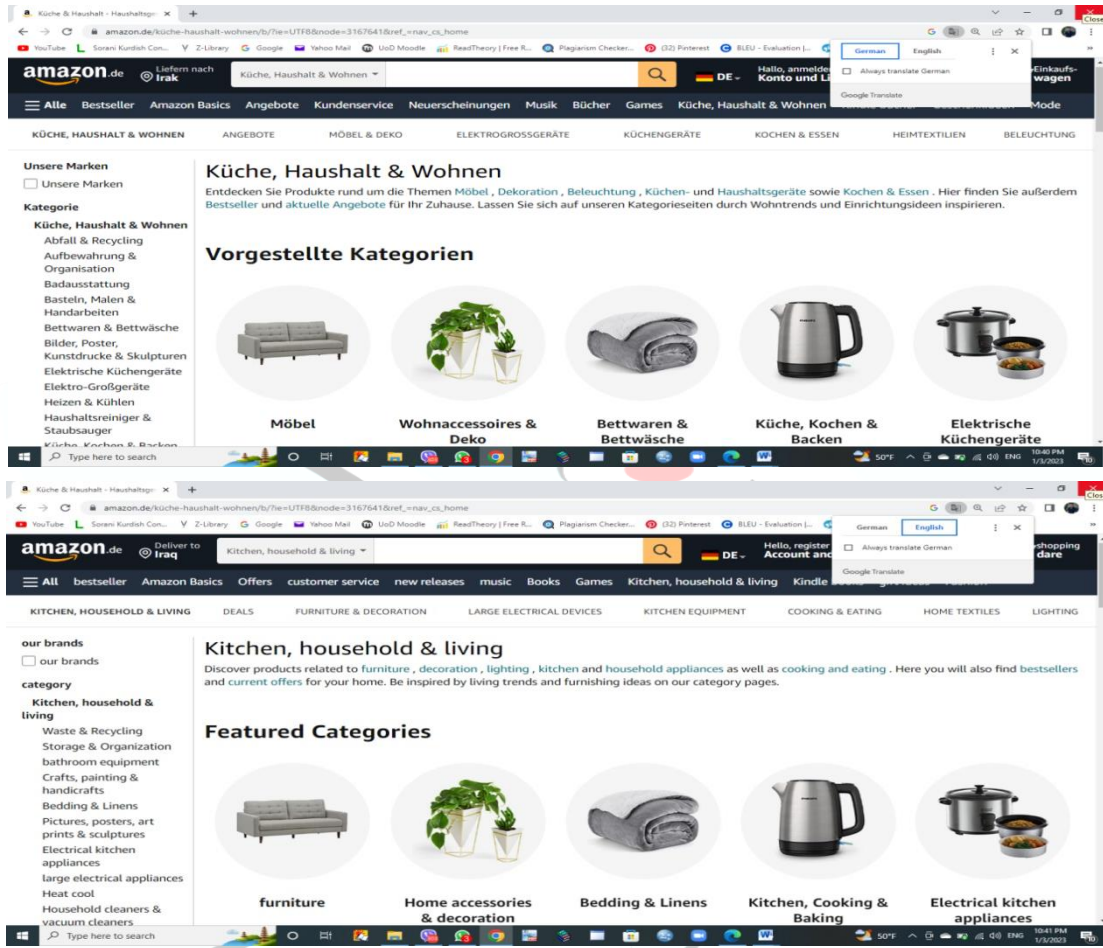


Figure 2.1 Automatic translation of a web page. Offers by Amazon (Germany) website of some kitchenware in German and the machine translation of the same webpage in English. (https://www.amazon.de/k%C3%BCche-haushalt-wohnen/b/?ie=UTF8&node=3167641&ref=nav_cs_home)

According to Desjardins (2021), MT opens up the web across all languages. It is even more valuable for translating English content into other languages since English is still a dominant language on the internet (consider, for instance, the various sizes of Wikipedia), and some highly



valuable content, such as advanced scientific information, is just not available in other languages.

MT for information access is also the driving force behind much of the research funding in the world. In the United States, for example, one of these funding programs (the recent DARPA LORELEI) poses a prototypical challenge: a humanitarian disaster in a foreign country where aid workers need access to life-saving information but do not understand the language that the affected population speaks, writes in, or tweets in (Nurminen & Koponen, 2020).

Bennett & Gerber (2003) believe there are many commercial use cases along these lines. A patent lawyer needs to keep track of what claims are made in patents published in Chinese. News reporters need to understand developments in foreign countries. A huge fund manager needs access to any information published in any language that affects the profitability of companies.

Even low-quality machine translation may be useful sometimes. It is sufficient to get the general gist of a document to be able to decide if it is relevant or not. Only relevant documents need to then be passed on to a language specialist who can take a closer look at them (Bowker & Ciro, 2019).

Sanders (2014) is concerned about having a big problem with such information access. If any of the meaning of the original text is distorted when it is translated it is up to the user to notice this. This may be possible given clues from bad language and semantic implausibility. But bad translations may mislead the user. Actually, it is a significant concern with neural machine translations when it sometimes completely distorts the output so it loses relation to the input due to favoring fluency over adequacy. The development of confidence scores that indicate how reliable a translation is becomes an important factor if decisions are made solely on the MT.



❖ Aiding Human Translators

Translation in general is a big industry all over the world. However, MT quality is not high enough that customers would pay much for. Professional translators who are native speakers of the target language and, ideally, authorities on the subject are required for a high-quality translation. The bulk of the translation industry consists of many so-called language service providers that often outsource their work to freelance translators (Cronin, 2012).

Though MT cannot compete with professional translators on the basis of quality, it is one of the tools that can be employed by translators to become more productive. The work style of translators, who once relied on pen and paper, had already changed in the 1990s when translation memory tools became common. Think of these tools as searchable parallel corpora. When confronted with a sentence to translate, the tool searches its database of any previous translations to find the best and most similar sentence and presented it with its translation. Professional translators become considerably more efficient when translating repeated information, such as product descriptions, yearly reports, and legal contracts for the same client since such documents contain a lot of reused text (Abdi, 2021).

The adoption of MT by professional translators has been a very long slog, which is still not completed. Mellinger (2017) does not consider MT a useful tool for some types of translation jobs such as marketing messages that have to home in on the nuances of the targeted local culture. Other examples are literature and poetry. But for many more conventional translation jobs, MT is able to help.

The crudest form of collaboration between machines and humans is to provide professional translators with the raw output of the machine translation system and task them to correct it, which is commonly known as post-editing. Figure 2.2 presents a study by Plitt & Masselot (2010) that compares professional translators' speed of translation when the output of

MT is post-edited and when translation is done from scratch. In this particular study, productivity increases of 42–131% were achieved. In the multi-billion dollar industry, such productivity gains have enormous impact.

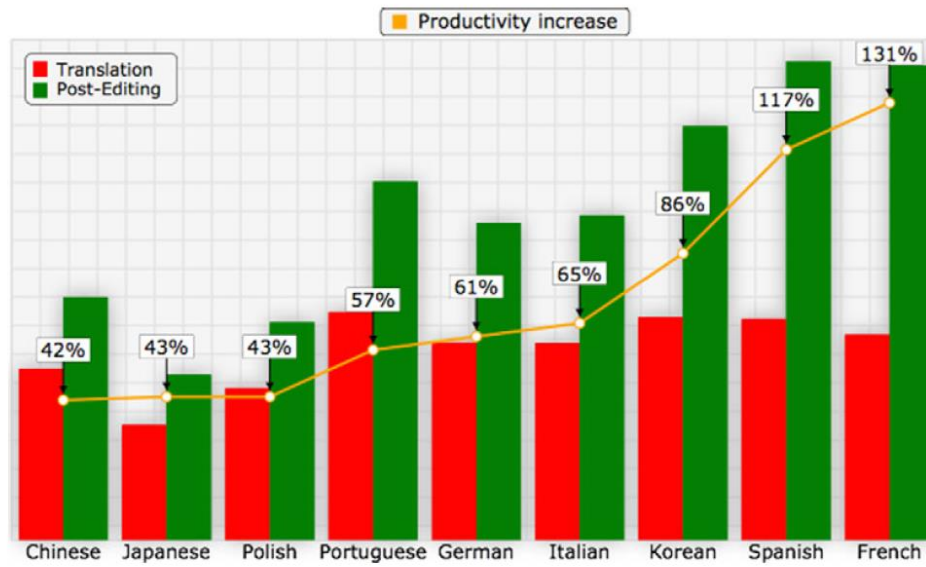


Figure 2.2 Increase in translators productivity when using machine translation (measured in words per hour). A study by Plitt and Masselot (2010) on several language pairs using machine translation

However, the adoption of MT in the translation industry has been very controversial. Much of that has to do with how the cost savings of higher productivity are distributed. Pérez Macías (2020) explores some fears and worries of translators in this regard. He believes that if a language service provider a translator to pay him the half as he will be twice as fast with this MT output then it is not surprising that the translator will react negatively, especially if they have been burned with bad MT and had little benefit from it in the past. High-quality MT requires optimizing machine translation systems to a specific domain, e.g., type of content or style. It is often not feasible for language service providers to achieve optimal machine translation performance due to lack of tools, data, expertise, or computing resources (Kenny, 2022).



❖ Facilitating Communication

A third broad application area for MT is communication. Directly facilitating a dialog between two speakers of different languages poses a number of new challenges. It may be combined with other technologies such as speech processing to fit seamlessly into a natural way of communication. MT for communication also has to be fast. The translation process may even have to start before the speaker ends a sentence to avoid pauses (Pituxcoosvarn, Motozawa, Murakami & Yokote, 2022).

• Applying Social Media

One of the most ambitious projects in this area is the integration of MT into the most famous social media apps such as Skype, Viber, WhatsApp, Instagram, etc. According to Dean (2021), about 61% of the world population (about 7.87 billion people) use social media applications. Of eligible audiences aged above 13; there is 63% are active users. The users can carry on a translated conversation over Skype, for example, maybe he is speaking English and his friend is speaking Spanish.

The speech is already being passed through computers, so they can do additional processing. Looking closely at this problem reveals that there are three distinct steps: (1) speech recognition of the input utterance, i.e., transcription into text; (2) machine translation; and (3) speech synthesis of the translation. Ideally, speech synthesis would also reproduce the emphasis and emotional aspects of the original speech, maybe even in the voice of the original speaker. However, for most practical applications in this area, speech synthesis is often completely dropped. It is easier to read an often imperfect translation as text on a screen, rather than to listen to it (Koehn, 2020).

Spoken language typically has a smaller vocabulary than written language. However, there is a mismatch between readily available parallel corpora of text translation and the type of language used in communication: the much more frequent use of pronouns I and you and corresponding verb



inflections, more frequent questions, ungrammatical utterances with disfluencies and restarts, more colloquial language, use of slang, and so on. Developers of spoken translation systems found it useful to use the Open Subtitle corpus (Lison and Tiedemann, 2016) which contains translations of subtitles for movies and television to train their models.

- Translating Chat Texts

Communication does not necessary imply speech. MT has also been successfully integrated into chat forums, where users type in their questions and responses. Chat forums range from free-flowing entertainment to customer support. Still, most of the concerns about different language use apply here too. Chat text has additional quirks, such as emoticons, slang acronyms, and frequent misspellings (Flanagan, 1997).

In terms of quality demands, the bar is not as high as for MT for publication according to Gopi, Sajini, Stephen, and Bhadhran (2015) who explained that even if the MT system makes mistakes, the partners in the communication will likely spot it and try to clarify what was meant.

- Working as Travel Translator

The need for translation becomes immediately obvious when you travel to a foreign country. Today's tools are typically a handheld device or maybe just a phone app. The actual technology needed to power such a device is similar to the speech and chat applications discussed earlier. Finch, Song, Tanaka-Ishii, & Sumita, (2011) state that if the device does speech translation, a useful feature is to also show the spoken original language text on the screen, so the speaker can verify if he or she was correctly understood.

Given the imperfections of the technology and the added problem of noisy environments and limited computational resources on a device (computing in the cloud is an option but adds additional delays), the most robust versions of a travel translator work on a text basis, with speech recognition only as an add-on (Koehn, 2020).

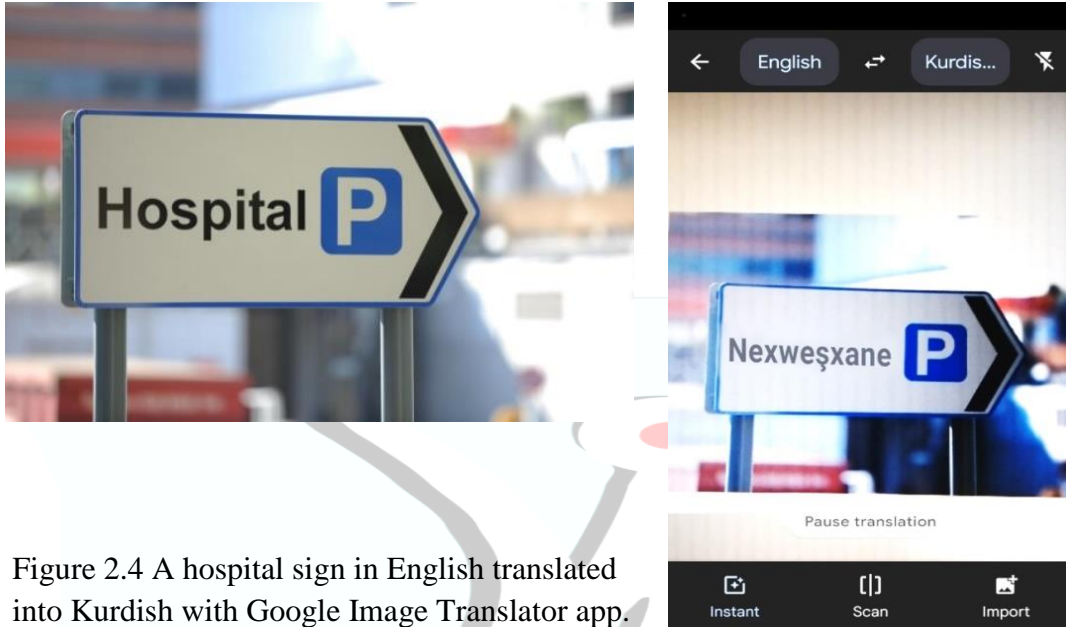


Figure 2.4 A hospital sign in English translated into Kurdish with Google Image Translator app.

Paul, Okuma, Yamamoto, Sumita, Matsuda, Shimizu, & Nakamura (2008) mention an extra interesting angle for a travel translator: image translation. Imagine you are in a foreign country and looking for a hospital and just found a sign but you want to make sure that it is a hospital sign then all you have to do is to launch the app of Google Translate on your mobile phone and use the camera for translating the text in the captured image into your language. The earliest versions of such a phone app were quite simplistic in their translation component—they just used a dictionary for translation but had nice added gimmicks, such as mimicking the font of the original text in the translation (Figure 2.4).

- Working as Lecture Translator

On the topic of speech translation, the earliest efforts aimed at translating speeches or university lectures were deployed at the Karlsruhe Institute of Technology (Fügen, Waibel, and Kolss, 2007; Dessloch, Le Ha, Müller, Niehues, Nguyen, Pham, Salesky, Sperber, Stüker, Zenkel, and



Waibel, 2018). It had to address all the main challenges of chaining speech recognition and machine translation as well as assume better acoustic conditions and a more formal speaking style.

In these efforts, first attempts were made to not just pass on the speech transcript to the machine translation component but to aim at a closer integration, such as encoding other possible paths of recognized utterances. The machine translation system then can use additional context to disambiguate uncertainties inherent in the speech signal. Not too much has come from this work. Just processing the 1-best transcription is often as good as it gets and keeps the processing pipeline simple (Müller, Nguyen, Niehues, Cho, Krüger, Ha, & Waibel, 2016).

Some of the other interesting integration challenges is that written text contains punctuation that needs to be inserted at some point or dropped from the input text for machine translation systems. In the text, numbers are written as digits (e.g., 17) while speech recognition will detect the actual spoken words and write it as “seventeen” (Dessloch et al., 2018).

- Working as a Sign Language Translator

A final interesting translation challenge to mention in this context is sign language translation. Deaf communities spontaneously develop hand gestures and facial expressions to match what can be communicated with spoken language. There are several broadly accepted standards such as American Sign Language (ASL). Sign language has interesting properties such as pointing to a point in space and then later referring back to that point as means of establishing co-reference. Morrissey (2008) argues that translating sign language from a video is an interesting challenge that goes well beyond machine translation and requires complex image recognition. He believes there has been some successful work in translating written forms of sign language, but overall this is still an exciting open problem.



Conclusion

In conclusion, machine translation has a variety of uses and has proven to be a valuable tool in many different fields. It has the potential to greatly improve communication between speakers of different languages and facilitate the translation of large volumes of text quickly and accurately. Current uses of MT include, but are not limited to, accessing new information, aiding human translators, facilitating communications and the use of social media apps, translating chat texts, helping travelers in foreign contexts, translating lectures, and finally assisting people who are deaf or have hearing impairments. However, it is important to note that machine translation is not a perfect solution, and human review and editing are often necessary to ensure the accuracy and fluency of the translated text. Despite its limitations, the use of machine translation is likely to continue to grow and evolve, and it will play an increasingly important role in our increasingly globalized world.

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