

Dirassat & Abhath
The Arabic Journal of Human
and Social Sciences



مجلة دراسات وأبحاث
المجلة العربية في العلوم الإنسانية
والاجتماعية

EISSN: 2253-0363
ISSN : 1112-9751

Importance of Context in Machine Translation.

أهمية السّياق في التّرجمة الآلية

BOUALLOUT Dahbia

Faculty of Information and Communication Sciences, Algiers 3 university/ Algeria

Senior lecturer, Communication and Digital Media Department

dahbia.bouallout@univ-alger2.dz

تاريخ النشر: 2026/10/15

تاريخ القبول: 2025/12/27

تاريخ الاستلام: 2025/09/19

Abstract:

Translation involves to take into account the different aspects of the text to ensure that the final output conveys the meaning of the original content and aligns with the intended objectives and target audience. This would be possible only when the context is taken into consideration. Translation as a process can be realized by humans or machines. Machine translation is a helpful tool for quickly translating large volumes of texts, compared to the human translation which is time-consuming, especially after the advances in the new technologies and artificial intelligence (AI) with its different applications. The present study aims to shed light on the importance of context in machine translation and its quality to determine the effectiveness of MT translation.

Keywords: translation, context, machine translation, human translation, artificial intelligence.

المخلص:

تتطلب الترجمة مراعاة الجوانب المختلفة للنص لضمان نقل المحتوى الأصلي بحذافيره بطريقة تتوافق مع الأهداف المرتقبة والجمهور المستهدف، ولا يمكن تحقيق ذلك إلا عندما يؤخذ السياق بعين الاعتبار. تتم عملية الترجمة عادة بواسطة البشر أو الآلة حيث تعدّ الترجمة الآلية وسيلة مفيدة لترجمة أكبر عدد من النصوص في وقت قياسي وبسرعة فائقة، مقارنة بالترجمة البشرية التي تستغرق وقتاً طويلاً، خاصة مع التطورات الحديثة الحاصلة في التكنولوجيا والذكاء الاصطناعي وتطبيقاته العديدة والمتنوعة. تهدف هذه الدراسة إلى تسليط الضوء على أهمية السياق في الترجمة الآلية وجودتها، كما يهدف أيضاً إلى تحديد مدى فعالية هذه الأخيرة. ولتحقيق هدف هذه الدراسة، تم اعتماد منهج وصفي وذلك باختيار مجموعة عشوائية من الأمثلة ثم ترجمتها باستخدام Google Translate و Reverso Context ثم القيام بتحليل مقارن لتقييم دقة كل منهما بهدف تحديد أي من الترجمات التي أنتجها الذكاء الاصطناعي تتلاءم والمعايير اللغوية والسياقية الدقيقة. توصلنا، من خلال تحليل الأمثلة المختارة، إلى أن السياق عاملاً مهماً وحاسماً في عملية الترجمة حيث يحدد المعنى ويجلّيه، وعليه يجب على المترجم أن يأخذ في الحسبان السياق المحيط بالجملة لضمان ترجمة دقيقة لا يشوبها الغموض، فالكلمة بمعزل عن السياق مفتوحة لتأويلات متعددة.

الكلمات المفتاحية: الترجمة، الترجمة الآلية، الترجمة البشرية، الذكاء الاصطناعي، السياق.

Introduction:

The advent of the Internet has revolutionized our lives as we are living in an increasingly connected world and People across the globe communicate despite their different languages and cultures. As a result, the need to content translation grows at a rapid pace and has become a necessity in a globalization era and the tremendous technological and digital development in the

information communication technologies with the expectation that mountains of content can be translated quicker than ever before. Thanks to this development, the internet is widespread to all fields such as translation since the modern technologies facilitate the translator's task and make him gain time, money, effort and effectiveness by using some programs, applications, websites, databases and translation memories known as machine

translation (M.T) which has become very popular in the recent years. In computers, we experience a new kind of intelligence different from ours, on the one hand it is more powerful and on the other much more limited. The idea of using computers to translate natural languages was first proposed in the 1940s and the first investigations begun in the 1950s. Although relying on human translation offers more accuracy and fluency, human translation is of limited efficiency and it is challenging to meet the needs of long texts translation. This limitation stimulates the search for new approaches to translation such as MT. It is clear that any translation depends on the context as the latter plays a major role in determining the meaning of a sentence. Contextual understanding remains a major challenge leading to translations errors and misinterpretations. Based on the aforementioned, the formulation of our research problem is as follows: **how does context influence the accuracy and fluency of MT?**. In other words we will try to understand at which extent is the MT able to recognize the appropriate context of a sentence?. To answer this question problem, the following hypothesis can be suggested: contextual cues can significantly enhance the accuracy and fluency of machine translation enabling the system to clarify the meanings and produce more coherent translations. In this research paper, we will discuss how the context is important in machine translation.

1-Definition of machine translation:

Machine translation is a natural language processing, it is a subfield of computational linguistics which is a subtype of applied linguistics. It draws ideas from linguistics, computer science, information theory, artificial intelligence and statistics. It can also be defined as:

‘Machine translation (MT) is the use of software to translate texts from one language to another. The term spans a variety of tools, with differing levels of maturity-from free, online translation tools to custom built, industry-specific translation engines (Paper,2021 :4). The aim in MT is to feed into the computer a written passage in the source

language (called the input) and to receive a grammatical passage of equivalent meaning in the target language (the output).

House suggested another definition to machine translation: ‘a translation must give the words of the original and ‘a translation must give the ideas of the original; a translation should read like an original work and a translation should read like a translation; a translation should reflect the style of the original and a translation should reflect the style of the translator and so on’(House, 2015: 9).

El Hamidan defined machine translation as follows:

"يُمثل اصطلاح الترجمة الآلية الآن الاسم المعياري والتقليدي المتفق عليه للتعبير عن مثل هذه النظم الحاسوبية المسؤولة عن انتاج ترجمات النصوص من إحدى اللغات الطبيعية إلى لغات أخرى، سواء كان ذلك بمساعدة الإنسان أو بدونها" (الحميدان، 2001: 9).

‘MT is a normative and traditional term used to refer to the computational systems introducing text translations from one natural language to another, either with human assistance or without it’ (our **translation**). It is also known as ‘mechanic’ translation or ‘automatic’ translation.

2-Types of MT: there are different types of MT

2-1- Machine-Aided Human Translation: produced by the human translator assisted by the computer and its different applications using translation memories, dictionaries, and terminology banks.

2-2-Human-Aided Machine Translation: produced by the machine and assisted by the human translator who post-edit the translated text.

2-3- Human translation: it is that translation realized by humans relying on their competences.

2-4-Machine Translation: it is the translation performed by the machine, without any human interference, using dictionaries, terminology bank and thesaurus.

We can also classify MT according the process the translator follows as:

- 1-Grammar based method
- 2-Translated sentences based method

3-Statistical translation based on a set of translated texts.

4- Deep machine translation learning (رشوان والسعيد، 2019: 60)

3-Machine Translation Approaches: there different approaches in machine translation:

3-1-Rule-based machine translation: the first approaches for MT were based on linguistic rules. Such approaches are appropriate to translate between closely related languages (like French & English). The rule-based machine translation methods include dictionary-based MT, transfer-based MT, and interlingual MT.(Dumebi,2024:160)

3-2-Example-based machine translation: it is based on the idea of analogy. You search for analogous examples of sentences pairs in the source and target languages. It was created by **Nagao Makoto** in 1984.(vanlalmuansang, 2018:144)

3-3-Statistical machine translation: it was a dominant approach over the past 20 years, but it is not equally successful for all language pairs as highly inflectional languages (such as **Arabic**) are hard to process. It is based on statistical methods. It also belongs to corpus-based approaches. It is applied on large bilingual corpora. It uses statistical models generated from the analysis of either bilingual or monolingual texts. Statistical MT faces many obstacles such as the highly inflected languages limit the effectiveness of statistical MT.(vanlalmuansang, 2018:144).

3-4-Hybrid machine translation: hybrid approaches are a combination of rule-based approach and statistical approach. (vanlalmuansang, 2018:144)

3-5-Neural machine translation: it is becoming the technology of the future, it comes as a successor of statistical MT. It is a deep learning-based approach to MT that uses a large neural network. The power of neural MT is more promising than that of statistical MT as the former shares statistical evidence between similar words.

4-Types of Machine Translation according to the user:

4-1- Machine Translation for Watcher (MT-W)

It is intended for readers who are interested in some information written in foreign languages and who are prepared to accept possible bad translations. It is a dictionary-based translation.

4-2- Machine Translation for Revisers (MT-R)

This type aims to produce a raw translation automatically which is of the quality comparable to that of the first draft produced by human.

4-3- Machine translation for Translators (MT-T)

It helps human translators do their jobs by providing on-line dictionaries, thesaurus and translation memory.

4-4- Machine Translation for Authors (MT-T)

This type concerns authors wanting to translate their texts into one or more languages and who accept to write under control of the system or help the system disambiguate the utterances so that a good translation can be obtained without any more revision.

5- Stages of machine translation: MT goes through different stages as it starts by analyzing the source language words at the grammatical, syntactical and semantic levels, then this source language message is transferred to the target language, and the last stage is the generation of the meaning in the target language. This process can be summarized as follows:

a- Consultation and evaluation: it is to assess whether machine translation is right for the source document.

b- Content and data mining: it includes collections, preparation, cleaning and normalizing of terminology using language assets.

c- Processing and integration: content is translated by the software and then post-edited by a human linguist. Linguistic assets can be managed with tools (translation memory) in order to lower costs over time.

d-Quality evaluation: this stage is about measuring the quality of the translated content.

e-Maintenance: the engine must be continually updated with the latest customer data

(glossaries) to guarantee an accurate translation.

6-Benefits of using machine translation:

MT provides a good starting point for professional human translators because of its:

6-1- Improved productivity: machine translation improves the translation capacity as it allows more content to be translated in a shorter period of time and at reduced costs.

6-2-Lower translation costs: applying technology in translation speeds up the process and reduces translation costs up to 30%.

6-3-Reduced time to market: the automatic part of the translation process helps to the human involvement and saves time.

6-4- Secure environment: to translate files using online translation tools is a huge risk to one's intellectual property as the minute the content is uploaded to the internet, the information becomes public property. Using professional software engines ensures that client information is stored within a secured data center.

7-The importance of machine translation:

The evolution of communication technologies and the rise of cultural interaction, coupled with the spread of globalization and the scientific and knowledge explosion, has led to a scientific, economic, and cultural communication among nations. This resulted in an increasing demand for translation, as major companies and international organizations have encountered difficulties in finding a sufficient number of qualified and competent translators. Consequently, there has arisen an urgent need to provide supportive tools for translation, leading to the emergence of machine translation due to its speed and cost-effectiveness. Machine translation has been adopted in numerous projects worldwide thanks to its advantages, including:

-The machine can perform translations more quickly and at lower costs compared to human translation.

-It saves time and efforts, as the duration required for machine translation is less than that for human translation.

-Machine translation assists human translators.

-It seeks to achieve grammatical, syntactical, and stylistic consistency in vocabulary and its translation. (كبير، 2018: 139)

8-Definition of context:

Context has become a key notion in language studies. It is related to the field of discourse and shared by both the speaker and hearer and tells facts about the topic of the conversation in which the utterances occur and affects their interpretation. Context is defined differently by linguists according to their interests and points of view, this resulted in many definitions to the same concept.

The English Oxford Wordpower Dictionary defines context: 'the situation in which sth happens or that caused sth to happen (...). The words that come before or after a word, phrase or sentence that help you to understand its meaning' (2006:160). We notice that this definition in its first part is general, whereas the second part pertains to the linguistic context of the sentence.

However, we choose one simple definition: 'The concept of context includes, minimally, language users' beliefs, and assumptions about temporal, social settings; future actions (verbal, nonverbal), and the state of knowledge and attentiveness of those participating in the social interaction at hand' (Oehs, 1979:5 cited in: A survey of Context in Language jul 2022).

9-Types of context: Miller and Leacock have classified context into two types:

-Local context: refers to one or two words immediately before and after the keyword under investigation.

-Topical context : refers to the topic of the text where the keyword has been used. (A survey of Context in Language jul 2022 :3), however these two mentioned above are not enough for understanding the intended meaning of a word and do not provide the necessary information, therefore, context is can be classified into four broad types:

9-1-Local context: it refers to the immediate environment of a keyword in a sentence, including the words that come right before and after it.

2-2-Sentential context: refers to the sentence in which a keyword appears. It provides syntactic information to determine whether the

keyword has explicit or implicit syntactic relationships with other words in the sentence.
9-3-**Topical context**: refers to the subject of discussion and emphasizes the content of a text.

9-4-**Global context**: words do not exist as isolated entities, they are connected to other words and to the broader context of reality. (Duaa Hamid, 2022: 1334).

10-The importance of context in translation:
The context plays a significant role in understanding the meaning of the sentence and its translation as any phrase within a context differs from the isolated one since the latter is characterized by ambiguity and confusion. Given the crucial role of context, Arabs have long stated: لكل مقام مقال ('for every special occasion/situation, there is a suitable expression'). This is a clear indication of the importance of context in determining the intended meaning of a word based on its position within a sentence. Every situation requires a specific and appropriate expression, meaning that context distinguishes the various connotations a word may acquire, thereby excluding alternative meanings and clarifying the word's value in different contexts.

11-Some examples about MT accuracy:

It is important to take into account the context of a sentence when translating because it determines the meaning which can be different depending on the context. It is clear that the context of a sentence is not always taken into account in case of a machine translation.

Here are some examples using 'Google Translate' and 'Reverso context' and their translation

(1) تعدّ المكسرات المشكلة من أفضل الأطعمة الغنية بالفيتامين "ب".

Google translate

Mixed nuts are among the best foods rich in vitamin B.

Reverso context

Problem nuts are one of the best food rich in vitamin B.

In this example, we can clearly understand that the meaning is about the different nuts mixed together making a cocktail such as: hazelnut,

walnut, peanut, almond...According to the meaning of the sentence, we can say that Google translator is clever enough to understand the meaning from the context, whereas Reverso finds it ambiguous and unable to understand what is clearly the meaning of the sentence.

(2) لا تيأسوا من روح الله (يوسف 87)

Google translate

Do not despair of the **Spirit** of God.

Reverso Context

Do not despair with God's **soul**

This Qur'anic verse tries to transmit a message to people, especially believers, which is 'do not despair of Allah's mercy' because He is the most Merciful and Compassionate. We can say that both Google Translate and Reverso context are far from rendering the meaning of this verse as the words 'spirit' and 'soul' have different meanings, not that meant in this verse.

(3) يعتبر شروق الشمس وغروبها آية من آيات الله.

Google translate

Sunrise and sunset are a **sign** of God

Reverso Context

Sunrise and sunset is a **verse** of God's verses. Once again, we can see in this example that Google translate is clever because the meaning is exactly the same as rendered by Google translate, but Reverso seems to translate words literally without taking into consideration the context of words.

12- Conclusion:

To conclude, context plays a crucial role in machine translation, significantly influencing the accuracy and quality of a translated text. Understanding both local and global context allows machine translation systems to capture the nuances of meaning that can be lost when translating isolated words. Local context helps determine the specific relationships between words within a sentence, while global context encompasses broader themes and cultural references that inform the message. By incorporating contextual awareness, machine translation can better handle ambiguities and variations in language use, leading to translations which are not only grammatically

correct but also culturally relevant and semantically precise.

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