



Previewing the Future of Arabic-English Machine Translation In the Wake of AI Breakthroughs

Authored by:

Ms. Nagla A. Ahmed

Program Unit, Applied College, Jazan University, Jazan , KSA
nelbasheer@jazanu.edu.sa

ABSTRACT

This paper is a timeline mapping study that conducts a systematic literature review on previewing Google Translate machine translation tool's accuracy in Arabic-English Language pair in the recent wake of artificial intelligence (AI) breakthroughs. The paper examines and consults relevant anthologies of systematic literature reviews on both the linguistic and the technological dimensions of the topic. The key literature reviewed include the currently published linguistic challenges identified in Arabic-English languages' translation, the latest MT Accuracy Metrics ratings as well as the current Google Translate tool's AI enhanced capabilities. By tracking the pace of both the linguistic dimension and the technological dimension the study aims at predicting how near-human will AI drive MT Arabic-English translation. The paper has concluded with identifying three areas of relativeness in achieving such quality of translation: 1) the inherent linguistic Ar-En languages' differences; 2) the per-field variance of translatability; 3) and necessity of the human post-editing of the MT translated texts.

Keywords: Machine translation, Google Translate, Artificial Intelligence.

INTRODUCTION

In the near past, before 2005, the process of translating from English to Arabic required laborious efforts and consulting paper dictionaries despite the availability of PCs that time. The difficulty increased by time as knowledge in all fields have been expanding with the pace of globalization. That growing multi-discipline sources of knowledge posed challenges to the English-Arabic translators who had to deal with various fields such as medical, scientific and technology translation (Omar & Salih, 2024). Therefore, as the terminology in these specializations grew, the translator had develop and expand their familiarity and update their information constantly and continuously, not rely on the information he acquired in a previous period. Then, machine translation (MT) was developed as the daughter of IT technologies to play a major role in bringing the Arabic-English gap narrower as a qualitative shift in the translation process. Ever since, the MT tools are helping translators to tackle the meanings of words and terms of different types in the texts, and using these tools has become a requisite of professional translation. Yet, that early breakthrough in the computerized MT translation, is far from sealing that horizon of that service. The English-Arabic language pair translation still requires systematic and organized techniques, along with keeping up with the changing world and

information trends. The translators are still required to deal with journalistic translation which is concerned with the philosophical faculty, scientific translation with the purely terminological dimension, religious one with the spiritual dimension, literary translation, etc., which indeed constituted a challenge.

Problem statement

While the recent breakthroughs in AI technology is raising concerns at several levels including warfare, personal data protection, public misinformation/ disinformation. etc., the field of translation it is rather auspicious. One reason is because the Arabic-English language pair so far seems to be a domain of challenge to machine translation (MT); mainly because of the wide difference between the origin of the two - Arabic the sematic language and English the Germanic-Roman language. However, the AI technology so far has succeeded in narrowing the differences and in enabling MT texts that are just a “post-editing throw” away from producing a semi-human Ar-En translation. So, the question that poses itself is whether the AI advance with yield in a wizard MT that is in dispense with post-editing and completely flawless? It is indeed a question whose answer lies in today’s AI stand as well as in the future’s.

Study questions

- Which specific linguistic areas that pose a challenge to machine translation in general?
- What particular linguistic does Arabic language pose to MT?
- How has the recent advances in AI impacted the efficiency of MT’s Arabic-English produced texts?
- Will AI in the future be able to produce a human-like error free Arabic-English MT translation?

METHOD

A timeline mapping method of research is adopted in this study that is conducted through a systematic literature review. The timeline mapping method of research as an arts-based data collection method is defined by Bagnoli, 2009; as, “a process that involves analyzing and visualizing the scientific literature on a particular topic to identify research gaps, improve collaboration, and inform decision-making”. The method is said to be evolved from the came popular during the post-1960 as a standard method of data collection in several fields through life-course interviews as noted by Adriansen, 2012; Chen, 2014.

The first component of the timeline mapping therefore, is the linguistic domain of Arabic and English whose data is obtained through systematic tracking of the literature findings on this area.

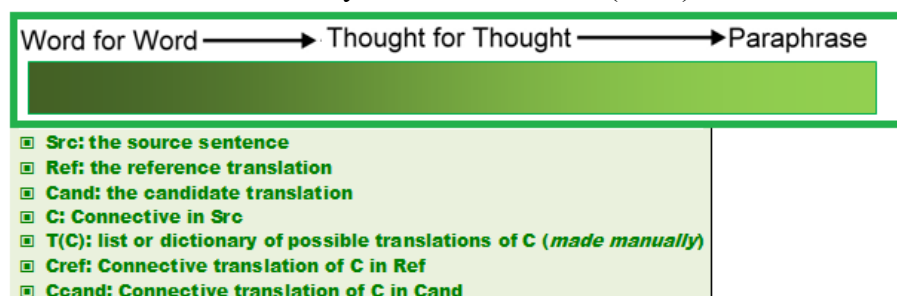
The second component of the timeline mapping process, is the technological domain whose data is obtained through systematic tracking of the AI enhanced MT advances.

Timeline	Literature Topics	
	AI MT Evolution	Ar-En language pair
2005 – 2010	● The introduction of the Artificial Intelligence (AI) in MT	● Early flaws in MT Arabic-English language pair translation
2011 – 2017	● Artificial Intelligence Natural Language Generation (GenAI)	● Current MT Arabic-English language pair translation
2018 – beyond	● AI expansion with aggregate database growth	● Persistent challenges that MT face in Arabic-English language pair translation

LITERATURE REVIEW

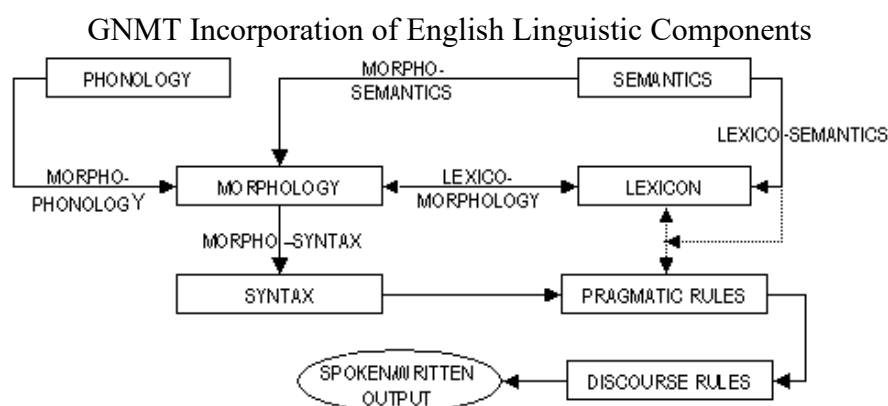
The translation-culture inseparability was long addressed by researchers such as Lambert & Delabastita (2008) who determine 5 aspects: socio-cultural, historical, theoretical, applied and pedagogical context to be the source-target language bridge. Based on this theory the Arab researchers Kocmi & Bawden (2022) applied it on the Arabic-English language pair context referring to English-Arabic linguistic as well as cultural differences to be posing barriers o translators. In connection to that, developing the Accuracy Evaluation Metric (ACT) of Connective Translation as an evaluation metric in mid-2000s, as an evaluation method for machine translation models and it attempts to identify its translation in a human reference translation that is as used by standard and its candidate translation (Popesco & Hajloui, 2015). The ACT metric uses a two-standard procedure that appear in the model of a dictionary of possible translations of each material connective type, collected from test data and validated by humans.

Accuracy Evaluation Metric (ACT)



This has been an investigation by Dwairy, Farah and Achoui (2006) on the variance in translating texts between English and Arabic language pair based on a prior hypothesis that terminology area of translation would pose as an issue more in the case of translating Arabic-to-English than it is vice versa. This variance leads to accuracy challenges. The hypothesis was based on the fact that, correct use of terminology usually requires more familiarity with wide and various fields in both the source and target languages. Early Ar-En language pair translation studies such as that by Hamdalla (1998) like they predicted the MT future challenges as he referred to what is now termed as conceptually-based principle of computer programming which is much about organizing term-into-graphical work.

The researchers Zughoul & Alshaar (2005) of Meta Journal of Translation tracks the timelines from the first 2005's English-Arabic MT tool. Zughoul & Alshaar attributed the birth of English-Arabic MT to the revival of globalization and to the development of IT technology and the rising needs for breaking the language barriers in the world. The case of Arabic MT it was the work of the one Arab company, Sakr of Al-Alamiyya Group was produced in 2008, and that a the major available software applications for Arabic/English Arabic MT as well as MT related software and it was surveyed within a historical framework. The flaws with that early mid-2000s Ar-En MT software were highlighted by studies such as that by Al-Fawareh & Jusoh (2014) whose paper points out errors in translating some proverbs, idioms and adage items since it was fed dictionaries of the synonyms. Meaning the flaw of that early MT version lied in relying on word-for-word translations and often produced inaccurate results for complex sentences. Then by 2016, Google Translate was developed realizing a step forward in Ar-En MT accuracy using statistical machine translation. Unlike the pre-2010, versions, Google Translate introduced its own framework called Google Neural Machine Translation (GNMT). Meaning that GNMT revolutionized the translation process by dint of AI capability of analyzing the meaning of entire sentences rather than individual words. On the other hand, as Al-Sohbani (2013) stresses, even though Google Neural Machine Translation (GNMT) has been escalated so comprehensively on English -the source language, it falls short in the domain of foreign (the target) languages. So far the GNMT smartly accommodates English linguistic domains.



As artificial intelligence (AI) technology curated developments culminated in more tangible applications from 2018 and after, several studies evaluated the accuracy of Google Translate across different language pairs including Arabic. One study conducted by the UCLA Medical Center and cross-referred to by Kocmi & Bawden (2022) found that Google Translate retained the overall meaning of 82.5% of translations in some fields rather than others. According to the rating the accuracy rates varied across languages, ranging from 55% in specialized fields to 94% in humanities. Whereas, the study by Lee (2014) found that Google Translate today –as of 2020, achieves an accuracy rate of only 57.7% for translating English terms compared to about 42.4% classic Arabic terms. The researchers Amerhein, Maghe & Ghuillou (2022) curated a translation accuracy challenge set (ACES) that evaluates a wide range of MT metrics including the submissions to the WMT 2022 metrics. In the Arabic-English context the study highlights the word/character level to be more complex errors based on discourse and real-world knowledge. A key finding of the researchers was the recommendation that developing metrics that give more weight to the source and less to surface-level overlap with the reference. The systematic review of literature by Omar & Salih (2024) on English/Arabic MT post-

editing recommends using the Preferred Reporting Items for Systematic Review and Meta-Analysis concentrating on evaluating and developing MT software. The findings as well emphasize co-engaging the translators' skillsets and competencies along with the AI escalation of the MT system. Without the translator reading and re-reading the given English/ Arabic text the human is likely to fall in the context-bound translation fault and so does the AI enabled MT tool (Omar & Salih, 2024). This is because the AI enabled MT software processes lexical items and sentences using algorithm in order to produce the GenAI MT translation and localization. The same applies to Google Translate tool's translation as it access its in-built database of dictionary, figurative speech content, technical meaning, common expression, etc., to produce the full text.

Terminography as a subdivision of lexicography and deals with the documentation of the terminology of different subject fields, often creates Ar-En mismatch at the level of the technical and scientific terms. Therefore, novice translator can be misled determining items as "term" or a special use synonym (Lambert & Delabastita, 2008). Such mix up in associating for example the term "thermal science" for "radiators science" since programming the MT requires more AI training. This is because all the related professions in the communications field, such as translation and technical writing, are often aware of the word without having a precise knowledge of what it implies. Also terminology is unlimitedly linked to specialist knowledge and therefore with languages for special purposes (LSPs). According to Baki (2001) translating terms properly has a lot to do with structured set of concepts, as the word "structured" bears the explanation that in practice, terminological collections may well contain not only well structured standardized terms and concepts, but innovative as well, vague and unstructured conceptual and linguistic information. On the other hand, to Facta (2012) programming AI and MT depends on how accurate the basic definitions of the terms which includes more post-editing AI training on the work performed. Meaning the task is manual as much as AI laborious job of creating and documenting terminological resources as a whole and not only the text in hand. This is because any activity which evolves translating terms is in fact the broader term which includes not only terminology work but areas like training, tool development, and organizational and administrative measures as well.

CONCLUSION

In conclusion, how far will AI advance MT in the context of Ar-En language pair translation in the future and enable it to make up for the so far imperfect translated texts, is a complex matter that is limitedly predictable. However, assuming AI and MT will keep proportionally advancing, yet there are several instances of relativeness that make the prediction vague. The first area of relativeness, is the inherent linguistic Ar-En languages' differences besides other Arabic-Arabic variables such as Arabic culture, the dialects vs. classic Arabic variance in addition to the natural change Arabic language is undergoing. The second area of relativeness, is the per-field variance of translatability especially in the context of the Ar-to-En texts rather than that in the En-to-Ar texts. This is because some Arabic disciplines are a mix of religion and culture whose texts cannot be taken in the abstract. The third area of relativeness, is the fact that human role of post-editing of the MT translated text is indispensable and should not be viewed as an MT flaw. Meanwhile though, the timeline tracking by the dedicated Ar-En languages' translation conventions such as the 7th Conference on Machine Translation (WMT22) may in the future rate higher in the MT Accuracy Metrics.

REFERENCES

- Abdellah, AS., (2003). The problem of translating English Linguistic into Arabic language. U.S. Department of Education (.gov). www.svu.edu.eg/translation
- Abreu, G. (2023). Literature Mapping in Scientific Research: A Comprehensive Review. Mind the Graph Platform. <https://mindthegraph.com/blog/literature-mapping/>
- Amerhein, C., Maghe, N., & Ghuillou, L. (2022). ACES: Translation Accuracy Challenge Sets for Evaluating Machine Translation Metrics. Indian Institute of Technology Madras. DOI: [10.48550/arXiv.2210.15615](https://doi.org/10.48550/arXiv.2210.15615)
- Al-Fawareh, H., and Jusoh, S., (2014). Smart phones usage among university students: najran university case. International Journal of Academic Research Vol. 6. No. 2. March, 2014. file:///C:/Users/dell/Downloads/Smartphone-usage-university-Students.pdf
- Al-Sohbani, Y., (2013). Challenges of arabic-english translation. SAVAP International Journal, Pakistan. Vol.4 (4)/ 2013(4.4-47). www.savap.org.pk/journals/ARInt.pdf
- Baki, KH., (2001) Stylistic Problems Confronting Arab Students in Arabic ... www.faculty.ksu.edu.sa/scc/Pages/artic1.aspx
- Dwairy, M., Farah, A., and Achoui, M., (2006). Parenting Styles in Arab Societies. Journal of Cross-Cultural Psychology 2006; 37; 230. Sage Publications <http://www.sagepub.com/counselingstudy/Journal%20Articles/Dwairy2.pdf>
- Hajlaoui, N., (2006) Assessing the Accuracy of Discourse Connective Translations www.publications.idiap.ch/downloads/Hajlaoui_CICLING-2013_2013.pdf
- Author to whom correspondence should be addressed.
Informatics 2024, 11(2), 23; <https://doi.org/10.3390/informatics11020023>
Submission received: 23 February 2024 / Revised: 14 April 2024 / Accepted: 19 April 2024 / Published: 22 April 2024
- Kocmi, T., & Bawden, R. (2022). Findings of the 2022 Conference on Machine Translation (WMT22). Anthology ID: 2022.wmt-1.1. Abu Dhabi, United Arab Emirates (Hybrid). <https://aclanthology.org/2022.wmt-1.1.pdf>
- Lambert, J., & Delabastita, D. (2008). Functional Approaches to Culture and Translation. Language Studies. Benjamins Translation library. <https://www.academia.edu/1095263>
- Lee, SY., (2014). Examining the factors that influence early adopters' smart-phone adoption: The case of college students. Telemat. Inf., 31(2), 307-318. www.sciencedirect.com/science/article/
- Omar, L., & Salih, A. (2024). Systematic Review of English/Arabic Machine Translation Postediting: Implications for AI Application in Translation Research and Pedagogy. College of Arts and Applied Sciences, Dhofar University, Salalah 211, Dhofar, Oman [https://google books.com.sa/books?isbn=9027216770](https://googlebooks.com.sa/books?isbn=9027216770)
- Zughoul, R., & Abu-Alshaar, A. (2005). Meta Journal des traducteurs Translators' Journal English/Arabic/English Machine Translation: A Historical Perspective. Meta Journal of Translation. Volume 50, Number 3, August 2005. DOI: <https://doi.org/10.7202/011612ar>