Journal for Educators, Teachers and Trainers
The PROFESIOLab electronic, peer-reviewed, open-access Magazine

ISSN 1989 – 9572

DOI: 10.47750/jett.2024.15.01.014

The Reality Of Automatic Translation For The Arabic Language From The Perspective Of Artificial Intelligence

Farida Ramdani*

Journal for Educators,Teachers and Trainers, Vol. 15 (1)

https://jett.labosfor.com/

Date of reception: 18 Apr 2023

Date of revision: 03 Dec 2023

Date of acceptance: 29 Dec 2023

Farida Ramdani (2024). The Reality Of Automatic Translation For The Arabic Language From The Perspective Of Artificial Intelligence. *Journal for Educators, Teachers and Trainers*,Vol. 15(1).120-125

University of Blida 2 – Lounici Ali, Algeria

Journal for Educators, Teachers and Trainers
The LabOSfor electronic, peer-reviewed, open-access Magazine

Journal for Educators, Teachers and Trainers, Vol. 15 (1)
ISSN 1989 –9572
https://jett.labosfor.com/

The Reality Of Automatic Translation For The Arabic Language From The Perspective Of Artificial Intelligence

Farida Ramdani*
University of Blida 2 – Lounici Ali, Algeria
Corresponding author*
Email: f.ramdani@univ-blida2.dz

ABSTRACT
Computing has opened up various linguistic and cognitive dimensions, with a significant focus on the Arabic language, which stands out from other languages due to its distinctive phonological, morphological, and syntactic features. It is essential for artificial intelligence applications to pay attention to Arabic, as many countries have succeeded in computing their languages, such as English, which has become a leader in various fields. Despite the richness and diversity of Arabic vocabulary and its various forms, it has not received the attention it deserves.

Keywords: Translation, Arabic Language, Artificial Intelligence, Automatic Translation Applications.

INTRODUCTION
The marginalization of the Arabic language persisted for centuries, but with the advent of artificial intelligence, the landscape of its teaching and learning underwent a radical transformation. Simulation models of the human mind found a warm reception among language specialists, as evidenced by real-world experiences. Over the past few years, applications of artificial intelligence have witnessed an unprecedented surge and rush, aligning with contemporary neural studies that, following the discovery of the effectiveness of neural networks, highlight the evolution of various computer applications from the perspective of biologically-inspired approaches.
The objective of our intervention is to address the following problem: What are the computational procedures for the Arabic language in the context of artificial intelligence applications? Hence, we have chosen to title our research: "The Reality of Automatic Translation for the Arabic Language from the Perspective of Artificial Intelligence." The goal is to explore the advantages of the Arabic language, its computability, and its contribution to the development of automated processing.

1. Computing the Arabic
Language: From Concept to Methodology: At first glance, it appears that computing the Arabic language is an exception in light of the developments that have affected many languages. We can only discuss this topic with the evolution of computational linguistics, known as an interdisciplinary field that combines language and computer science. Invented in the late first half of the past century, specifically in 1948, the field of computational linguistics has witnessed the integration of human knowledge. The utilization of computers in language studies globally is challenging to pinpoint precisely, as it did not occur in a single thrust but rather through mostly individual efforts across different stages and in various countries.
A thorough examination of the computer sciences that emerged in the mid-twentieth century heralds a new concept of language computing, which evolved through automated research. This concept officially took academic form in 1954 at George Town University. In its early stages, the focus was on automatic translation from other languages to English. Subsequently, the foundations of this science solidified through conferences, seminars, and journal publications.
Researchers in linguistics did not confine their studies to the closed structure of language but opened up to new fields like computational linguistics. This field is described as a new branch in both applied and theoretical linguistics, primarily dealing with human languages and their programming through electronic computers. Notably, computational linguistics comprises two intertwined aspects: the linguistic research aspect and the computational aspect. According to contemporary mathematical studies, computational linguistics encompasses various applied areas, with artificial intelligence (AI) at the forefront. AI is a domain where efforts converge towards automating programming through simulating natural human intelligence, representing an innovative approach in several specialized branches of applied linguistics, with computational linguistics being an integral part.
Artificial intelligence stands out as a crucial branch of computational linguistics, seeking to simulate the human mind in understanding linguistic phenomena comprehensively. This interdisciplinary field amalgamates linguistics, artificial intelligence, information science, mathematics, and logic, with the goal of transferring

human intelligence to computational intelligence. This enables the automated analysis of linguistic systems at multiple levels in the shortest possible time.
The interdisciplinary nature of computational linguistics, influenced by fields like artificial intelligence, prompts us to raise issues related to field research. Computational linguistics is considered one of the applied branches that leverages computer data to study various linguistic issues, such as monitoring linguistic phenomena across levels—phonetic, morphological, syntactic, rhetorical, and stylistic. It involves statistical operations, the creation of dictionaries, automatic translation, and language instruction.
Processing research problems in its applied dimension has become a fundamental requirement in light of the intersections imposed by new sciences through the computational model realized in computational linguistics. Computational linguistics is a new science where linguistics intersects with a visual apparatus generated by logical mathematical sciences. It adheres to constraints imposed by machines designed for information processing, and research in this field leads to the creation of a unique algorithmic model known as "linguistic engineering" or "language technology."
The computational model is based on two aspects: the theoretical aspect, which deals with understanding the deep theoretical framework operating in the human brain and contributes to solving specific problems, such as translation between languages. The applied aspect involves dealing with algorithmic mathematics, a set of rules arranged in a specific way to produce results similar to those found in human processes.
In the computational approach, the focus is on logical and mathematical formulas that consistently form part of this atomic field. The data subjected to computational operations in mathematical computations are quantities of information represented as mathematical entities. This is also true for computational physics, where data is treated as physical entities. The same concept applies to computational linguistics, which takes computational data as its subject.
In conclusion, computational issues involve employing the computer's computational, statistical, and mathematical operations, translating language into mathematical symbols comprehensible to the computer. Through this process, automated processing becomes feasible within the framework of the computational model.

2 The Computational Model and Artificial Intelligence Applications

Since its emergence in the past decade, the computational model has undergone remarkable development, influencing all applications of artificial intelligence. Among these applications, machine translation applications have recently gained momentum for several reasons, including the branching and intersection of sciences and their progress in practical aspects. This has opened the door to other knowledge fields that are worth exploring and extending in the realm of automated processing. Specialists have paid significant attention to these fields from an applied perspective. The goal is to produce programs with knowledge of human language, aiming to enhance interaction between humans and machines.
Existing computational linguistics programs are still far from reaching human capabilities, but they have numerous practical applications. Regardless of the languages understood by computers and the specific domains of their discourse, the use of human language increases the acceptance of programs and the productivity of their users.
It is worth noting that Arab computer scientists aim not only for theorizing but also for analyzing and understanding relationships between phenomena. Their goal is to reach practical results addressing current issues in artificial intelligence applications, language education, and other fields. In this context, analysts start with the simplest speech chains, considered the least that can be uttered in communication, then add all possible sub-chains.

3 Artificial Intelligence and Machine Translation Applications

While exploring the field of Arabic language computing, machine translation applications stand out as a revealing domain, particularly when associated with language and its processing domains. Translation is notably influenced by linguistic phenomena and language sciences and is built upon their foundations. Machine translation applications are considered among the most significant linguistic and computer-related tasks in the era of information and communication technology.
Considering the capabilities of machine translation applications, machines, through the services they offer, represent a form of intellectual luxury. If humans can translate, computers with their specific programs can also do so. This achievement has both drawbacks and merits, impacting the near and distant future.
In the same vein, there is a belief that artificial intelligence applications focused on machine translation have become capable of replacing humans in all aspects of life. This trend has started to emerge frighteningly in advanced countries, where the idea of dispensing with machines has become nearly impossible in some areas. Previously, some people believed that machine translation was impossible, stating, "It is impossible to condense the meaning of a text into a sequence of symbols." However, today, this has become a reality, surpassing our imagination by far.

Machine translation applications, in reality, involve analyzing the original text, transferring its elements from the language it will be translated into, and then generating this text based on the analysis and transfer. Machine translation has become associated with the "human intervention required to tidy up the text before and after translation." In fact, most human interventions in translation today are merely slight adjustments to what machines already accomplish.

The role of humans in translation has been significantly minimized, thanks to studies in neurosciences that followed recent scientific breakthroughs in this field. Consequently, machine translation applications have become an effective means of utilizing scientific and technological knowledge in the Arab society. Since much knowledge is produced, disseminated, and preserved in English, machine translation from other languages to Arabic, or vice versa, becomes a way to bridge the scientific gap resulting from the cultural inflation towards the global cultural sphere compared to its Arab counterpart.

Therefore, computational linguistics, through the field of machine translation, claims leadership in all sciences adjacent to it. Summing up what was mentioned, the field of machine translation bore fruit after the development of applied models. Machine translation enters artificial intelligence by assisting the computer in performing translation through linguistic and cognitive patterns stored by structures and terms it retrieves for the translated language.

In this context, it is essential to mention that machine translation applications have become a tangible reality, with an increasing number of continuously available software learning foreign languages. These applications allow users to explore the secrets of their language by comparing cultural and linguistic actions from one language to another. The resulting cultural workers are obtained through the bridge between two cultures, often established by translation, which is an act and cultural dialogue between two languages and cultures.

4 Applications of Machine Translation in the Context of Arabic Language Computing

Who among us has not wondered about the utility and importance of machine translation applications in the field of Arabic language computing? Noam Chomsky, the founder of the transformational-generative school, emphasizes, "Language, in essence, seems to be a rich computational system with a fully precise structure, strict in its basic operations." This is another affirmation that studying language, apart from mathematical and computational frameworks, is an unavoidable shortcoming.

The visual properties of languages have made their computability a latent reality in the minds of researchers seeking to describe their specifications. Some insist on "the differentiation between three models of natural language: an inductive model describing the language's pattern, a combinatorial model considering the language's structural, phonetic, or morphological complexity, and a cloze model steeped in abstraction." The choice among these models goes back to the epistemology of symbolic language, which formulates strict constraints and hypotheses about the structure of natural languages and adopts them.

The visual properties in languages have enabled computer scientists to transition from human translation to machine translation applications. "What settles in the subconscious becomes part of consciousness—the consciousness of language—and this is clearly the main condition for transferring this awareness to the computer according to computational linguists." In fact, the Arabic language, like others, can bear the torch and flag of scientific progress in all its branches, especially in the field of machine translation, due to its features at all language levels.

Looking at the prospects of working on machine translation in the Arabic language, one might lament the significant delay in its computability, despite its inherent qualities and methods. However, the undeniable truth is the obstacles standing in the way of research projects reaching their conclusions. What is hoped for is to open the field for young researchers who have taken the lead on the global stage in computational research, aiming to produce programs with knowledge of human language. These programs are increasingly needed to enhance interaction between humans and machines because the fundamental obstacle to this interaction is communication. Computers these days do not understand our language, and the languages of computers are difficult to learn, not to mention that they do not match the structure of human thinking.

If we observe natural languages like Arabic, we find their ability to be mathematically encoded, which is the key to computation. They are originally composed of mathematical symbols, and our aspiration is "for the computer to compose and analyze language, reading what is written and writing what is read, detecting spelling errors, recognizing morphological forms in context, constructing correct sentences, and parsing as a human does." The specialists emphasize through the computer model that "the sought-after goal that linguists collaborating with computer scientists in natural language processing should achieve is to depart from a coherent theory characterized by conceptual clarity, independence, and comprehensiveness." Such a theory for Arabic can be found among the early grammarians who excelled in all the concepts and original Arabic analytical methods belonging to the school of Al-Khalil ibn Ahmad Al-Farahidi and his student Sibawayh, and those who followed them before the end of the fourth century of the Hijra.

The computational translation model seeks to achieve "significant results for the Arabic language in the fields of Arabic localization, linguistic statistics, natural language processing, language learning, and machine translation, as well as in the field of education." The goal of Arabic language computing lies in providing a comprehensive and accurate description of the linguistic system, enabling it to match human competence and linguistic performance, allowing it to compose and analyze language, reveal spelling errors in written text, construct grammatical forms appropriate to the context of speech, generate correct sentences, parse like a human, and correct pronunciation when encountered.

The spelling correction, morphology analysis, and syntactic analysis tools are nothing but models simulating what humans store in terms of linguistic competence evidence, and models and applications representing language in computers.

Applications of machine translation for the Arabic language in the context of artificial intelligence are considered in the light of procedural aspects. Before delving into the procedural aspects of studying machine translation applications in Arabic, it is essential to emphasize the computability of this language. Scientific studies in computational linguistics have flourished in the Arab world recently, where researchers in this field, which merges computer science and linguistics, have multiplied. It is a vast scientific and applied field, encompassing various applications such as automatic translation, automatic error correction, and computer-assisted language learning.

The Arabic language, with its engineering aspects, has provided a broad field for examining its intricate internal details. Therefore, translating language into mathematical symbols understood by computers or adapting natural language to be a language that communicates and interacts with computers can lead to computers performing many linguistic activities that humans do, with differences in time and cost. When language becomes digital, it becomes a language based on mathematical thinking, equal to both human languages and the language of computers. Human languages contain mathematical phenomena to a significant extent, and mathematics is known for its abstract symbolic mental nature. Language is built on symbols, and there is a clear abstraction for every researcher in it, as stated by Al-Haj Saleh: "The biggest mistake a researcher in this field can make is to think that linguistic analysis, no matter how important it may be, is secondary to mathematical formulation. He may not confess to it verbally, but his work and actions may often indicate otherwise."

We cannot overlook the value of computing. After the computer was a powerful machine capable of handling the most complex and lengthy computational operations at incredible speed, it has evolved into an intelligent machine in advanced information technology applications, capable of processing, analyzing, and exchanging various types of information.

In contrast to what has been mentioned, we can only say that the Arabic language has reached a commendable level of progress, but the road ahead is still long and challenging for its involvement in machine translation within the field of computational linguistics. Research in artificial intelligence has concluded that the primary function of the human mind, distinguishing it from animal cognition, lies in its ability to produce symbolic systems and utilize them. Chief among these symbolic systems is the linguistic system used for communication, information representation, knowledge storage, and transfer, all of which computer programs are built upon.

CONCLUSION

In conclusion, this research has led us to the understanding that the paradigms of computational translation are linked to various research fields, with a primary focus on neuroscience, artificial intelligence, and other areas that paved the way for machine translation in all languages, especially Arabic. Despite the difficulties and obstacles faced in the realm of Arabic language computing, it has gained a special place in the hearts of Arab researchers. The encoding process was initially deemed impossible, particularly given the specificity of Arabic writing and its form. However, hope persists, and continuous efforts are essential for the success of noble and virtuous endeavors.

REFERENCES

1. Abdelrahman Ben Hassan Al-Aarif, "The Utilization of Computational Linguistics in the Service of Arabic Linguistic Studies - Efforts and Results," Umm Al-Qura University, Journal of the Jordanian Language Academy, Jordan, 2007, Issue 73, p. 48.
2. Saeed Al-Fahim, "Applied Linguistic Studies," Dar Tlas, Damascus, 1982, p. 325.
3. Mazen Al-Waer, "Applied Linguistic Studies," Dar Tlas for Studies, Translation, and Enlightenment, Damascus, 1st ed., 1979, p. 315.
4. Khalifa Al-Mousawi, "Linguistic Terminology and Conceptual Foundation," Dar Al-Aman, Rabat, 1st ed., 2013, pp. 30-31.
5. Abdulqader Abduljaleel, "Modern Linguistics," Dar Al-Safa, Jordan, 1st ed., 2002, p. 181.
6. Leon Jacqueline, "From Automatic Translation to Computational Linguistics: Contribution to a Chronology of the Years 1959-1965," Traitement Automatique des Langues, Special Issue: Thirtieth Anniversary, 1992, Vol. 33, No. 1-2, pp. 25-44.

7. Ghazi Azzeddin, "Computational Linguistics and the Arabic Language," Al-Hewar Al-Mutamaddin, Issue 1639, 2006, Electronic Journal: www.alhewar.org.
8. Abdelrahman Ben Hassan Al-Aarif, "The Utilization of Computational Linguistics in the Service of Arabic Linguistic Studies - Efforts and Results," Umm Al-Qura University, Journal of the Jordanian Language Academy, Jordan, 2007, Issue 73, p. 53.
9. Reda Bab Ahmed, "Computational Linguistics: Terminology and Translation Issues," University of Mascara, p. 17.
10. The same reference, the same page.
11. Nahed Al-Mousa, "Towards a New Description in Light of Computational Linguistics," Beirut, Arab Institution for Studies and Publications, p. 54.
12. Abdelrahman Al-Haj Saleh, "Research and Studies in Arabic Linguistics," Mofem for Publishing, Vol. 1, p. 270.
13. Hossam Eldin Mustafa, "Principles and Rules of Translation Craft," Cairo, 2011, p. 13.
14. Salwa El-Sayed Hamada, "Machine Translation as a Fundamental Pillar in the Arabization Field," Arab Journal of Computer Science and Engineering, Vol. 1, No. 1, p. 25.
15. Abdelnabi Thakir, "Machine Translation and Human Revision," Al-Mutarjam Journal, No. 7, June 2003, p. 15.
16. Marie-Claude, "Introduction to Computational Linguistics," 2nd ed., Quebec, 2008, p. 14.
17. El-Youbi Belkacem, "Computational Linguistics: Its Concept, Evolution, and Application Areas," Maknassa Journal, Issue 12, 1999, p. 52.
18. Ali Nabil, "The Arabs and the Information Age," World of Knowledge Series, Kuwait, Issue 184, April 1994, p. 359.
19. Mahdioui Omar, "Generation of Nouns from Trilateral Roots in Arabic: A Computational Linguistic Approach," p. 36.