TEACHING ARABIC AS A FOREIGN LANGUAGE:
THE USE OF MACHINE TRANSLATION

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Abstract: The talk about the use of machine translation (MT) in teaching Arabic as a foreign language derives its merit from the great interest that has received the position of the Arabic language in the machine translation community over the past decade. Indeed, the Arabic language is the fifth most spoken language in the world and the demand for learning it from non-native speakers has been increasing in recent years. This led to the development of strategies and means of learning and teaching the Arabic language in light of contemporary scientific standards, and in line with the scientific and technical development and the requirements of the times. In this paper, we focus on the role of using machine translation as a tool in enhancing the teaching of the Arabic language as a foreign language. Therefore, this paper touches on the positive side of this technology in terms of its contribution to improving Arabic language learning.

Keywords: Machine Translation; Teaching; Learning; Arabic; Foreign Language.

Résumé: La discussion autour de l'utilisation de la traduction automatique (TA) pour enseigner l'arabe en tant que langue étrangère tire son mérite du grand intérêt que suscite la position de la langue arabe dans la communauté de la traduction automatique au cours de la dernière décennie. En effet, la langue arabe est la cinquième langue la plus parlée au monde et la demande de son apprentissage auprès de locuteurs non natifs ne cesse d’augmenter ces dernières années. Cela a conduit au développement des stratégies et moyens d'apprentissage et d'enseignement de la langue arabe à la lumière des normes scientifiques contemporaines, et conformément au développement scientifique et technique et les exigences de l'époque. Dans cet article, nous nous concentrons sur le rôle de l'utilisation de la traduction automatique comme outil pour améliorer l'enseignement de la langue arabe en tant que langue étrangère. Par conséquent, cet article aborde le côté positif de cette technologie en termes de sa contribution à l'amélioration de l'apprentissage de la langue arabe.

Mots clés: Traduction Automatique ; Enseignement ; Apprentissage ; Arabe ; Langue Etrangère.

Introduction:
The widespread of globalization, the development of information technology, and the rising needs for breaking the language barriers between different nations, increase the need for learning new human languages including the Arabic language, considering it as one of the most spoken and widespread Semitic languages, it is the official language of 25 countries and it is spoken by about 467\(^1\) million people, making it the fifth most spoken language in the world.

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entire world. It is also one of the educational languages that can describe all kinds of sciences with its various specialization; science, literature, politics, civilization as well as being the language of religion and worship, this undoubtedly contributed to increasing the demand for learning Arabic for non-native speakers and led to the crystallization of new visions and strategies in the field of teaching the Arabic language for non-native speakers based on the values of sustainability, efficiency, openness, and innovation while relying on technological advance to develop programs and educational materials. Machine translation is one of the spectacular methods that play an ultimate role in foreign language learning. It keeps pace with digital and computing development and responds to the artificial intelligence progressing in teaching languages and influencing the global map of languages. Through this paper, we will examine the extent of machine translation's contribution to teaching Arabic to non-native speakers. First, we will try to outline the concept of machine translation, review its history and stages, and then we will stand at what it has provided to help teaching Arabic to non-native speakers.

Machine Translation:
Before dealing with what machine translation is, we must first make a distinction between machine translation and machine assisted translation (MAT) or computer assisted translation (CAT). Machine-assisted translation is the use of software to assist a human translator in the translation process, translator creates the translation, and some aspects of the process are facilitated by software. In contrast, automatic translation, or machine translation (MT) is the translation created by a computer, optionally with some human intervention. It is a set of systems that allow a text to be translated by machine alone, without the noticeable intervention of a qualified person in this field during the translation process. However, pre-editing and post-editing are often necessary to prepare a successful action. Machine translation is the attempt to automate all, or part of the translation process from one human language to another, it works on introducing artificial intelligence by helping the computer to perform the translation through the linguistic and cognitive patterns stored through structures and terminology. This mechanism can operate on a personal computer as a standalone application; on the internet or intranet. In the form of a standalone application (word processing, for example), or the form of programs directly integrated into the Internet, in (Word), or in (Excel), etc. Machine translation is one of the important automatic processing of natural languages, which is also a branch of artificial intelligence.

Artificial intelligence:
The term "Artificial intelligence" officially appeared for the first time in 1969 at the first conference on artificial intelligence in Washington. It means that the machine performs whatever mental operations and tasks a person can accomplish based on the mathematical and computer patterns that simulate human work and imitate what is happening in the human brain. Its fields include expert systems, cybernetics, robotics, robot-assisted education, computer-aided engineering design, machine translation, automatic processing of natural languages, etc.

Natural Language Processing:
Natural language processing (NLP) means a subfield of linguistics, computer science, and artificial intelligence with the interactions between computers and human language, particularly in how to program computers to process and analyze large amounts of natural language data. The result is to have a computer capable of "understanding" the contents of documents, including their contextual nuances of the language. The technology can accurately extract information contained in documents and categorize and organize the documents themselves. The roots of natural language processing can be traced to the article by Alan Turing entitled “Computing machinery and intelligence”.

History of Machine Translation:
Since the early days of computers, scientists have tried to build machine translation systems. Scientists agree that Warren Weaver - a scientist in mathematics and cybernetics who held the position of vice president at the Rockefeller Foundation for Research in the United States of America - was the first to use the computer to translate in 1947: “When I look at an article in Russian, I say: This is really written in English, but it has been coded in some strange symbols. I will now proceed to decode”. Warren Weaver suggested that cryptanalysis techniques might be applied to translation and that a computer could be built for this purpose. All the improvement we witness today in the machine translation field owes its success to this first idea and develops from it. Taking the term decoding, it is the jargon that has been used and continues up until today, the actual algorithm that translates a sentence is yet called a decoder.

In 1951, the Massachusetts Institute of Technology in the USA started the machine translation project, a year later the first conference was held in which practical experiments for machine translation were conducted under the auspices of the Rockefeller Foundation. In 1954 the first translation from Russian into English was successfully carried out at George Town University of the United States of America. In 1955, the Soviet Union conducted the first experiment in machine translation from English to Russian in mathematics (based on a dictionary containing two thousand three hundred words). During the Cold War between the United States and the Soviet Union, the rivalry between the two great powers emerged through military alliances, weapons development, industrial advances, space experiments, and technology development. The two powers competed for continuous spending to develop research in the scientific field. Several researches continued then to develop the so-called first generation of machine translation programs in the USA, France, Germany, Russia, Hungary, and Czechoslovakia; to provide the intelligence services with accurate information about the content of rival countries’ document. Almost all efforts in the West were concentrated on translating from Russian into English. In the 1960s, Peter Thomas at the California Institute of Technology was able to create three translation systems; Autotran, Technotran and Systran, which were recognized and distinguished from other systems. Therefore, the enormous difficulties encountered in machine translation were revealed, which led to a slowdown machine translation research and possibly neglecting the topic until 1975.

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3 - An excerpt from the letter written by Warren weaver. This letter, preserved at the Rockefeller Archives Center, may the origin of efforts at machine translation. Retrieved February 24, 2021 from: https://historyofinformation.com/detail.php?entryid=3425
Between 1975 and 1985, the interest in machine translation in Europe and Canada has seen a return to research in this field; the use of expert systems, natural language processing, and the creation of what could be considered the second generation of machine translation software have evolved. As a result, some commercial machine translation softwares appeared on the market. Scientific research and the treatment of natural languages have developed in this period, especially European and Japanese languages. This development included lexical research, grammar, morphology and semantics. In this period, modern artificial intelligence methods have also developed; these methods are still in continuous development. When the fifth generation of computers appeared in the 1980’s and the scientific, technical and commercial needs increased in modern societies, linguistics engineers and system designers started suggest machine translation programs for the first time in the market, that were rule-based systems, followed by the creation of electronic websites on the Internet to provide translation services, some of these systems have achieved a high degree of commercial success. Another trend had emerged in 1980’s which was the use of statistical methods to solve problems in language; researchers at IBM proposed statistical machine translation then. This idea was slowly picked up in 1990’s and the whole field of natural language processing went through a revolution from the rule based approaches to statistical approaches, it took until early 2000s where statistical machine translation system supplanted the previous existing rule-based systems, where the debate intensified about the efficacy of each of them; at the same time Google has started a statistical system for the online translators. Since mid-2010’s, the third wave of neural methods were appeared and were integrated to machine translation as well, starting with neural language models as a component of statistical machine translation systems. Quickly the entire field of machine translation switched to a completely neural machine translation system. We can consider that 2016 was the year that signaled a break from the previous statistical approaches and since then most of machine translation softwares circulating in the market nowadays are based on neural machine translation.

Today, the United States, Japan, Russia and China are at the forefront of countries that employ machine translation to serve their social, economic, scientific and technical requirements. In Europe, the need was for a machine translation system to assist in translating between the languages adopted in the European Common Market. Instituto Técnico de Informática de Valencia (ITI) and the Recognition of Forms and Technology of Human Language research group of Politècnica de València are the first in the world to apply the statistical translator Moses in a commercial environment by developing a platform of self-learning, corpus cleaning and recycling in collaboration with Pangeanic. Since 2019, Pangeanic has been leading NTEU.eu¹, a CEF project of the European Commission, the largest farm of neural network-based machine translation engines for European public administrations. Thousands of machine translation programs are on the market today. Japan's machine translation software has sold millions of copies, at a cost of tens millions of dollars. In the Arab countries, machine translation efforts are still in their early beginnings, despite the multiplicity of research and studies, what is currently available in the market of machine translation software into Arabic is still very limited². However, some machine translation systems have been completed such as the Arab Transform program issued in 1996 for simultaneous translation from English into Arabic and the Arabic translator system produced

¹ - Neural Translation for the European Union will create and release near-human quality machine translation engines built on industry tested neural networks technologies to/from all official EU languages except English.
² - عبد الفتاح أبو السيدة، الحاسب الآلي والترجمة، (1987) مجلة السان العربي، مكتب تنسيق التعريف، الرباط، المغرب، العدد 28، ص: 97، 98.
by Al-Farahdi Company. The program translates complete texts and includes the translation of texts from the English language into the Arabic language, it also includes a general dictionary that contains more than two million English words and phrases. At present, we can refer to some machine translation projects that have achieved remarkable success in the field, most notably:

1. **Sakhr Software:**
   This company is considered one of the oldest Arab companies working in machine translation for the Arabic language field; it collaborates with a team of language experts, computer linguists, and software engineers. This Egyptian company has issued several programs for communicating with the Internet, including the “الدليل” program. It provides bidirectional machine translation for Arabic-English and works on natural language processing research on the Arabic language. It is a hybrid engine that optimizes rules-based and statistical-based processes to achieve the translation; the engine is a full-fledged integrated system embedding NLP processors, formal grammars, transfer lexicons, and enterprise-specific terminology.

2. **King Abdulaziz City for Science and Technology (Information Technology Unit)**
   - This Unit has been working for several years on building and developing the automatic bank for Arabic terms, and the bank’s activities include the following:
     A database of automatic terms, including the term, its source, its date, its first use, as well as its equivalents in other languages (English, French, German ...).
     - A database of scientific books (authored and translated) in the Kingdom and outside the Kingdom of Saudi Arabia.
     - Database Arabic dictionaries.

3. **The Arabic Translator Program from (ATA):**
   ATA is an Arab company based in London, intending to provide original Arabic software and not Arabic versions of foreign programs. The Arabic Translator Program was first released in 1996. This program is equipped with the “Windows” program with Arabic support; it includes an international dictionary, specialized dictionaries, and allows users to build their dictionary. The original text can be entered by one of the three known methods. An electronic file prepared by the keyboard, or by an electronic scanner, and the program includes a spelling checker for the English text, so the translation is completely done through it before checking and reviewing by the user. The translation can also be divided into successive paragraphs, so the user reviews each paragraph after translating it. The translation can also be divided into successive paragraphs, so the user reviews each paragraph after translating it. The program includes dictionaries available during the automatic translation process.
   The future will witness the integration between the work of human translators and machine translation, as machine translation needs qualified translators to develop and follow up on its work.

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How does machine translation work?

Machine translation systems are classified, according to the basic methods in building their systems, into the three following:

1. **Direct Machine Translation: First Generation:**
   It is based on implementing word-for-word translation through direct lexical comparison in a bilingual dictionary. These systems lack in-depth analysis of component sentences, and they usually operate between two languages and in one direction.

2. **Intermediate Machine Translation:**
   It is the first method of indirect machine translation. The goal was to create a single intermediate language for all the world's languages so that the meanings between more than one language are represented in common intermediate models and structures, which allow the design of multilingual systems. This method works by analyzing the source language text and transferring it to models and structures represented in the intermediate language, then generating the text of the target language based on these structures and intermediate models, and from the characteristics of the intermediate representation that includes all the necessary information to generate the target text without reference to the source text. It is an abstract representation of the source text and the target text together, so it is a neutral representation between the different languages. This trend has faced enormous difficulties in defining a single intermediate language due to the presence of morphological, syntactic and semantic differences between the languages of the different linguistic families.

3. **Interlingual Machine Translation:**
   These systems use two intermediate languages to translate a source text into a target text. An intermediate language relates only to the source language to represent any text written in it, and an intermediate language relates only to the target language to represent any text written in it, and it works through successive operations; analysis, transformation, and generation. These systems were distinguished by some of the most important features:
   - The possibility of defining an intermediate language which integrates all languages, and retains the aspect of neutrality and independence towards these languages;
   - The ability to overcome the complexities of analysis and generation programming that deal with abstract intermediate structures far from the specificities of the specific languages.

**Machine translation methods:**
There are three different methods of machine translation:

1. **Machine translation with post-editing:**
   According to experience, machine translation, even for scientific and technical texts, requires revision to become acceptable for publication, and this revision includes modifications in terms of the dictionary, words, structures, etc. However, if the translation is for general information and recognition of the text content as a whole, it is possible to go beyond this step. This is the translation method used by the "systran" system, which is adopted in the
Secretariat of the European Economic Community (EEC) in Luxembourg and the US Air Force as well.

2. Machine translation with pre-editing:
Some companies such as GM Canada and Mattel Games in the USA have applied Machine translation with pre-editing in a modified form. These companies give instructions to those who write texts in the original language relying on some rules. Also, the original text can be delegated to an editor to reformat the text in a modified language that the computer can understand and translate.

3. Interactive machine translation
The interactive machine translation starts with the system suggesting a translation hypothesis to the user. Then the user may accept the complete sentence as correct or may modify it if there is some error. Typically, when modifying a word, it is assumed that the prefix of this word is correct, leading to a left-to-right interaction scheme. Once the user changes the word considered incorrect, the system then proposes a new suffix. Such a process continues until the translation provided satisfies the user. Generally, the translation takes place sentence by sentence, and part of the text appears with the corresponding translation, so dialogue occurs between the translator and the computer. The main problem with this method is the necessity for the translator to be present in front of the computer throughout the translation process, while in the other two previous methods the computer may translate at the official working hours of the employees. Also, the editor is not required to be present in the same place.

Google translate, Microsoft office, Ginger, Reverso, Systran and Say Hello are the substantial machine translation programs used by Arab translators, they can be considered efficient in regards to their speed and accuracy.

By reviewing the Western and Eastern experiences in the USA, Europe, and Asia, we find that states and institutions support the research of machine translation and computerization of national languages. Initiatives in the Arab world are undertaken by individuals or corporate researchers and are given the limited support of Arab minds in their countries, many of these minds turn to companies in Foreign countries so that most of the experiments in machine translation into the Arabic language are taking place in those countries. Interest in the Arabic language increased after recent international events, and consequently, spending on computerized research in the USA and Europe increased.

The role of translation in teaching foreign languages:
Translation has always been used in teaching foreign languages, as it mainly relied on verbatim translating written texts and deriving the language grammar from them. The Common European Framework of Reference for Languages considered translation as a writing activity in the field of language education, whether it was related to written translation or interpretation.

The translation process was used as a method for teaching languages in the first middle of the nineteenth century to study and compare linguistic structures. This method was known as the "Grammar Translation Method" as it focuses on the grammar in both languages.

"In a typical Grammar-Translation Text, the grammar rules are presented and illustrated, a list of vocabulary items is presented with their translation equivalents,"

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and translation exercises are prescribed. The sentence is the basic unit of teaching and language practice".

The translation process was used as a method for teaching languages in the first middle of the nineteenth century, to study and compare linguistic structures. This method was known as the "Grammar Translation Method" as it focuses on the grammar in both languages. Linguists called to avoid translation in learning a foreign language and using the mother tongue in some cases only, such as learning new words or knowing the extent of the learner's understanding. The language of origin affects the foreign language through the linguistic overlap. It was deficient for the student to have the most important faculty in language, which is the ability to communicate with other people through dialogue. That is an obstacle and a deficiency calculated on translation as a pedagogical method in teaching language. Some researchers combined the two methods and called for the importance of communication and focus on the importance of activities that stimulate discussion and reflection without neglecting the role of translation. And at the same, they have warned about the mother tongue influence. The first person to use the term "educational translation" was Jean Delisle, it means the use of translation exercises as an educational method aimed at teaching a foreign language. Admiral Ladmiral believes that learning a foreign language should be done in parallel with the mother tongue, and the exclusion of translation is only an educational hypothesis. The second language learner reorganizes the experience represented by the pedagogical position through the mother tongue. The verbal form in the second language does not carry its meaning except through the mother tongue. The method of interpretation can be used in teaching languages through the findings of modern translation methods, it facilitates the investment of translation in a context closer to reality and the creation of texts that create more interaction with students. Modern linguistics has contributed to the development of translation studies theories and the improvement of their curricula, thanks to Darbelnet and Vinay, who theorized the "comparative stylistics" approach. This was able to highlight the essential role of translation following other studies that gave more momentum in this field. The topic remains under investigation and exploration to seek the possibility of integrating translation exercises into the teaching foreign languages field. On one side, this could help learners understanding the linguistic material, and on the other side, teachers to examine the delivery of the teaching message.

For Arabic as a foreign language learner, translation can be a useful tool to learn the language. Translation from Arabic into the mother tongue gives the student the ability to understand, comprehend, analyze, and acquire new vocabulary, this could be beneficial in terms of learning the stylistic characteristics of different texts and understand the cultural differences between the two languages. Translating from the mother tongue into the Arabic language enables the learner to express in Arabic by conveying the meaning using its vocabulary and structures and identifying some cultural peculiarities. Learners may translate small texts to be able to employ what they have learned and achieve text consistency. It helps them practicing reading, understanding, and comprehending the text and then transferring its meaning into the Arabic language according to the context, taking into account the peculiarities of the Arabic

2 - Ibid. p.8-10.
language, and is not restricted to the source text structure, but rather to the extent of its understanding, comprehension and ability to transmit with a focus on the cultural context.

**Machine translation to teaching Arabic as a foreign language:**
Thanks to the development of linguistic and computer research and the emergence of sophisticated machine translation software and its systems, the field of translation application expanded to include several aspects, foremost of which is the linguistic field. The intersection between computer and language was marked by a high level of scientific and technical progress. Learning has become dependent on modern technologies, and the machine became intertwined in all aspects of life. This fully applies to modern software and translation applications that can be used in computers of various types and sizes. It is one of the prominent features that indicate the depth of transformation that the knowledge society has undergone. It is becoming a shared of evidence in the new fields of knowledge that interests scientists, philosophers, psychologists, linguists. Technology has served the Arabic language by giving it a new style, ease of use, and pleasure of exploration. The featured relationship between computers and the Arabic language has achieved great success since its beginnings. The Arabic language has unique characteristics that allow the possibility of its automatic programming process in a way that it is not always necessarily noticed in the other languages; "the phonological regularity in the Arabic language and the precise relationship between the way it is written and its pronunciation indicates its ability to machine treatment in general". Experience has shown that machine translation has played and continues to play indispensable roles in teaching Arabic to non-native speakers. The use of electronic dictionaries and translation websites direct students to carry out individual work in this field, and be able to determine the difficulty themselves after analyzing the source text and finding the equivalent in the language, and learning the language by thinking about the equivalent in terms of pronunciation, structures, and cultural context. Also, making mistakes and correcting them remains firmly in the students’ minds. Therefore, the reliance on digitization methods and the use of machine translation in teaching languages does not mean a comparison between the two languages, but rather an exercise that enables students to acquire new vocabulary and employ it in different contexts and language-specific structures. However, we believe that this would be subject to some conditions as it is assumed that the student should be aware of what forms the basis of Arabic language structures, grammar, conjunctions, etc. Ignorance of the basics and rules of the Arabic language, which are supposed to be acquired in advance, impedes the understanding process of the translation produced by the machine. This may affect resulting from the linguistic and cultural overlap. The machine may sometimes neglect the context of the text and suggests a linguistic vocabulary from its dictionary without verifying the intent; it may also tend to translate the meaning and structure literally. Learners are also advised to first make an intralingual translation, particularly in the pre-translation phase, where they are required to annotate and rationalize their particular sentence or linguistic structure in their mother tongue before, interpreting the meaning in the language itself, and then transfer the meaning to another language (Interlingual translation) through the machine translation tool. This method goes beyond the stage of understanding the original text and formulating the target text to reach the level of interpretation as well. Not adhering to the structure of the source text helps the learner to a deeper understanding and strengthens his

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1 - Sociologists like Peter Ferdinand Drucker went to describe modern society by the postmodern, post-industrial society, the informational society, or the knowledge society.

ability to transmit using his style and focusing on the cultural context beside the machine’s operation. And about those involved in teaching Arabic as a foreign language, who privilege the use of translation and the intermediate language in their didactic approach, they must understand that the world is now turning to the exploitation of technology to speed up the research in natural languages, the translation process, and the transfer of knowledge, so it has become imperative for the Arabic language teacher to be familiar with the mechanisms of new technology, especially its basic components that are applied in all fields, including the field of machine translation, dealing with it as new interactive programs and technologies that achieve the goal at the same level that the classical methods were achieving if not more, because the motivation in learning by modern methods has become stronger than before among the learners and they has become at the same level as their teacher in consuming technology. This requires the organization of intensive training courses that teach teachers how to operate the new knowledge, because most of the current educational frameworks, if not most of them, still rely on paper, pen and blackboard to teach translation, so the knowledge bearer has differed, and thus the methods of teaching it must differ as well. The development of an infrastructure for machine translation of the Arabic language will help to learn it as a foreign language, and this requires the provision of the necessary human, knowledge, and material resources that help to realize an industry for translation, as it is a major branch of the language industries in the knowledge society. Also, the linguistic engineering tools of description, explanation and interpretation can be considered as an effective solution to many linguistic problems that result from machine translation. Therefore, in this context, we call for the necessity of developing research and studies focusing on linguistic engineering and artificial intelligence in the Arabic language, to advance the status of teaching Arabic trough machine translation to no native speakers.

Conclusion:
In this current situation in which technology penetrated our lives and became a partner for us in everything we do, it has become imperative to develop the means of teaching and learning, including the teaching of Arabic as a foreign language because of the high demand it is witnessing recently. Machine translation has proven to be one of the most effective tools that have to serve in learning a foreign language; it has confirmed its place as the go-to tool for learning the Arabic language for learners and teachers alike. However, machine translation can not compensate the human work in any way, at least for the present time. Human intervention to review the machine-translated text is imperative to correct any defect and clarify any information generated by machine translation to avoid ambiguity related to context, structure, or style. To encourage learning of the Arabic language and facilitate its spread, we must take into consideration the development of machine translation that works along with human translation through creating systems that fit the nature and characteristics of the Arabic language. This area has become an interesting research field because of the many technological and linguistic challenges to overcome. It is time to intensify efforts to support machine translation projects in the Arab world, develop its tools, and get involved in the advancement of technology and artificial intelligence since we constitute an integral part of the world of knowledge.

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