

UDC 311.1/7

DOI <https://doi.org/10.24919/2308-4863/82-1-51>

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## THE IMPORTANCE OF MACHINE TRANSLATION IN CONTEMPORARY LANGUAGE INDUSTRY

*This article describes the key role of machine translation in the modern language industry, exploring its contributions, challenges, and the synergy between humans and machines that is shaping the future of multilingual communication.*

*Effective language proficiency is essential for businesses, governments, and individuals in today's globalized world. The language industry, long dominated by human translators, has undergone a major transformation with the advent of machine translation (MT). Today, MT is a key element of communication strategies, helping to overcome language barriers and streamline workflows.*

*Thanks to advances in artificial intelligence, neural networks, and big data, modern MT tools provide faster, more accurate, and more contextually-informed translations than ever before. Industries such as e-commerce, healthcare, entertainment, and education are increasingly using MT to expand their audiences and improve service efficiency. At the same time, machine translation poses challenges related to quality, cultural sensitivity, and interaction with human translators.*

*This article examines the important role of machine translation in the modern language industry, its contributions, challenges, and the synergy between humans and machines that is shaping the future of multilingual communication.*

*In addition to the obvious advantages of machine translation, such as speed and accessibility, an important factor is its role in ensuring inclusivity. Thanks to MT, people from different cultures and social groups gain access to information in their native language, which contributes to the reduction of language barriers and inequalities. This is especially true in countries with multilingual populations, where access to educational and medical resources is significantly improved thanks to automated translation.*

*However, even with the most advanced technologies, collaboration between machine and human translation remains important. Human translators provide a fine understanding of context, idiomatic expressions, and cultural nuances that are often lost in automated translation. The future of the language industry likely lies in a harmonious combination of technological advances and human expertise, which will allow for more accurate, sensitive, and contextually adapted translations.*

**Key words:** *machine translation, human translation, translator, vocabulary, translation challenges.*

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## ВАЖЛИВІСТЬ МАШИННОГО ПЕРЕКЛАДУ В СУЧАСНІЙ МОВІ

*Ця стаття описує ключову роль машинного перекладу в сучасній мовній індустрії, досліджуючи його внесок, проблеми та синергію між людьми та машинами, що формує майбутнє багатомовного спілкування.*

*Ефективне володіння різними мовами має велике значення для компаній, урядів і приватних осіб у сучасному глобалізованому світі. Мовна індустрія, де тривалий час переважали людські перекладачі, зазнала значної трансформації з появою машинного перекладу (МП). Сьогодні МП є ключовим елементом комунікаційних стратегій, допомагаючи долати мовні бар'єри та оптимізуючи робочі процеси.*

*Завдяки досягненням у сфері штучного інтелекту, нейронних мереж і великих даних, сучасні інструменти МП забезпечують швидші, точніші та контекстуально глибші переклади, ніж будь-коли раніше. Галузі, такі як електронна комерція, охорона здоров'я, розваги й освіта, дедалі частіше використовують МП для розширення своєї аудиторії та підвищення ефективності обслуговування. Водночас машинний переклад створює виклики, пов'язані з якістю, культурною чутливістю та взаємодією з людськими перекладачами.*

*У цій статті аналізується важлива роль машинного перекладу в сучасній мовній індустрії, його внесок, виклики та синергія між людиною і машиною, що визначає майбутнє багатомовної комунікації.*

*Крім очевидних переваг машинного перекладу, таких як швидкість і доступність, важливим фактором є його роль у забезпеченні інклюзивності. Завдяки МП люди з різних культур і соціальних груп отримують доступ до інформації на рідній мові, що сприяє зменшенню мовних бар'єрів і нерівності. Це особливо актуально для країн із багатомовним населенням, де доступ до освітніх і медичних ресурсів значно покращується завдяки автоматизованим перекладам.*

*Проте, навіть із найсучаснішими технологіями, залишається важливою співпраця між машинним і людським перекладом. Людські перекладачі забезпечують тонке розуміння контексту, ідіоматичних виразів і культурних нюансів, які часто втрачаються при автоматичному перекладі. Майбутнє мовної індустрії, ймовірно, полягає в гармонійному поєднанні технологічних досягнень і людської експертизи, що дозволить створювати більш точні, чутливі та адаптовані до контексту переклади.*

**Ключові слова:** машинний переклад, перекладач, лексика, проблеми при перекладі.

**Problem Statement.** Machine translation (MT) is a major technology that has transformed the language industry and global communication. However, despite its speed and efficiency, there are significant challenges in ensuring the accuracy and relevance of translations. Key challenges include handling idiomatic expressions, long words, and cultural nuances, which creates the need for human translators to edit machine translation results. This indicates the advancement of technology and its further integration with human experience.

**Research Review.** Recent research in the field of neural machine translation (NMT) shows significant improvements in translation quality over traditional methods. NMT provides more natural and contextually accurate translations, which contributes to its wide application in multilingual content creation and international business. However, challenges related to style, cultural specificity, and data security remain. The integration of MT technology with human expertise demonstrates the potential for achieving synergies that combine technological scalability with the accuracy provided by human translators.

**Objective.** The research method is to identify ways to improve machine translation by combining technological advances in artificial intelligence and human expertise. Particular attention is paid to addressing the issue of accuracy, stylistic adaptation, and cultural relevance to maximize the effectiveness

of MT in global communications and make it a reliable tool in the digital age.

**Introduction.** Effective communication across languages is essential for businesses, governments, and individuals in today's globalized world. The language industry, long dominated by human translators and interpreters, has undergone a transformative evolution with the advent of machine translation (MT). Machine translation has become a cornerstone of modern communication strategies, from breaking down linguistic barriers to streamlining workflows.

Fueled by advancements in artificial intelligence, neural networks, and big data, MT tools now provide faster, more accurate, and contextually nuanced translations than ever before. Industries ranging from e-commerce and healthcare to entertainment and education increasingly rely on MT to reach broader audiences and deliver services efficiently. However, alongside its benefits, machine translation also raises questions about quality, cultural sensitivity, and its relationship with human translators.

This article delves into the pivotal role of machine translation in the contemporary language industry, exploring its contributions, challenges, and the synergy between humans and machines shaping the future of multilingual communication.

**Analysis articles related to topic.** Analyzing articles related to this topic, here's what I researched. Machine translation (MT) has evolved from rule-based systems to statistical and hybrid models,

and now to neural networks, which mimic human translation processes. Neural machine translation (NMT) provides more natural, accurate translations, reducing the need for extensive human post-editing. MT facilitates real-time and large-scale content translation, helping businesses target diverse linguistic markets. This capability is crucial in e-commerce, travel, and customer support, where multilingual communication is a competitive advantage. By automating translations, MT reduces costs compared to traditional human translation. This makes language services more accessible to smaller businesses or for less critical content. MT doesn't replace human translators but transforms their roles. Translators now engage in machine translation post-editing (MTPE), improving the output of MT systems and ensuring cultural and contextual accuracy. This blend of human expertise with machine efficiency adds value to the industry. Machine translation (MT) is a technology designed to automatically translate text from one (source) language into another (target) language. This technology is constantly evolving, with rapid development, especially in the last decade, in academia in terms of teaching specialized translation and the commercial sphere. Not long ago, 'machines' started progressively replacing multiple human roles in various industries and even in healthcare. With the emergence of digital computers, tasks that were formerly performed only by humans were progressively being replaced by machines. The rapid technological advances in the mode of translation and the incorporation of translation technologies into the translation process have also affected the thought process of translation. As artificial intelligence (AI) increasingly permeates all areas of life, it fundamentally alters how we live in today's hyper-digitalized society. It suffices to imagine how the advent of extra-linguistic realities like smart homes, online shopping, web searches, cybersecurity, contactless payments, and even self-driving cars have been altering our world. (Newmark, Peter, 1988: 258). AI is now a top priority because of its importance to the digital transformation of modern society. The emerging and rapidly evolving translation industry, which employs linguistic agents known as translators, appears to be heading down the path of 'industrialization' and is therefore not immune to the effects of technological advancement. Before delving into the characterisation of MT, the fundamental question should be asked first: What does the term 'translation' mean? The translation is closely related to multilingualism, as it "serves as an intercultural, bilingual, and communication tool between people and cultures." Within the European Union, translation also serves as a tool for connecting Europe's cultural

diversity together and promoting intercultural understanding. Supporting minority languages is one of the EU's aims; hence, the necessity to provide quick multilingual translation in a variety of legal and corporate documents has become an actuality. (Castilho, S., Doherty, S., Gaspari, F., Moorkens, J., 2018: 112).

There are several technical advancements in translation that use computer-aided translation (CAT) and MT systems (MTSs). While MT works without any intervention of a human in the translation process (the system translates the text itself, using algorithms and words contained in the corpus, but cannot ensure proper inflection or syntax), CAT programs are used to help human translators. CAT programs work with the so-called translation and terminology memory, which can significantly speed up and simplify the work for the user. When given fifteen different documents for translation, in which certain expressions or passages are repeated, CAT programs ensure that the translation of these documents is always consistent and uses the same terminology. Conversely, if the same passage is inserted into a MT-based translator, the results can be completely different each time. (Taus, 2010). These techniques have sped up information distribution (through translations) and mediation in the globalized world. These advancements have greatly impacted the way individuals communicate. Their outputs, or, in other words, products, must be thoroughly assessed by MT error analysis to be useful instruments in today's dynamically evolving multilingual society (for economizing the transfer and decreasing the expense of human translation).

MT is using a computer as a translation tool to transmit text across languages. In essence, MT is an interdisciplinary issue since it integrates the fields of computer translation. In a broad sense, MT's character can be defined as transdisciplinary, as both translation and computer science are interdisciplinary. Its goal, however, is not perfection but rather practicality in various contexts such as information or text assimilation (to understand the content or main points of the translation), communication (e-mails, text messages), discussion forums (chatting), and the growth of internet markets without the need for human translators (HTs). (Nord, C. 1995: 265).

Since its beginnings, MT research has come a long way. It has experienced multiple periods of prosperity and decline, and every one of these cycles has been marked by certain methodological and empirical progress, at least in terms of proof of concept. However, inflated expectations have also inevitably led to letdown and, on several occasions, to lengthy dormant periods during which all research activity has stagnated. (Nord, C. 1995: 274). Charles Babbage,

who devised a programmable computing machine, foresaw its potential for language translation in different nations as early as 1834. He could not have known that 120 years later, in 1954, New York would witness the first demonstration of an automatic language translation machine that translated brief statements on topics such as politics, law, chemistry, and military as part of the Georgetown-IBM experiment. Almost as soon as electronic computers were invented, researchers began attempting to develop MTSs. Decoding linguistic codes looked like a suitable metaphor for MT because Britain used computers to crack the German Enigma code during World War II. Some researchers had great expectations that the MT problem would be solved early on thanks to the advent of electronic brains. The field received a significant amount of funding, and the early principles of MT are being used even today. The funding for the field of MT is still motivated by the same motive as code-breaking and talking about decoding a foreign language, and employing modelling techniques such as the noisy-channel model is still present. (Bonet, J., 2013: 63). As Koehn says, “in the early days, many approaches were explored, ranging from simple direct translation methods that map input to output with basic rules, through more sophisticated transfer methods that employ morphological and syntactic analysis, and up to interlingua methods that use an abstract meaning representation.”

Researchers in the field of MT have, over the course of the previous 20 years (at least), learnt the lessons of excessively high expectations and have since tempered their enthusiasm. It is hoped that the improvements in MT quality over the next several years will lead to wider adoption and even more uses of this technology, which is now adequate for some tasks. However, MT is a complex problem, the solution of which has not been not in the cards. Nevertheless, whatever the perception, there has been a significant improvement in the quality of commercially accessible MTS. To some extent, this development has been more gradual and based mainly on the slow mastering of new methods rather than singular groundbreaking discoveries, to which all attention should be paid. (Newmark, Peter, 1988: 148). Free online MTSs, on the one hand, are making MT accessible to non-professional translators and the general public. For instance, in 2010, the European Commission’s 14 Directorate General for Translation (DGT) opted to create a new MTS that would serve as a resource for both the DGT’s translators and the DGT’s clients in the form of a self-service raw translation platform. On the other hand, Koponen states that “MT is also spreading in more professional contexts as it becomes

integrated in widely used translation memory systems.” Even though it is rather unlikely that MT will completely replace HTs, human-machine interaction is becoming an increasingly important aspect of the work for numerous professional translators.

In order for MT to work properly, it must be designed according to certain criteria, divide approaches to MT into two basic approaches: rule-based approach (RBMT) and corpus-based approach (CBMT). RBMT, or also ‘MT based on grammatical rules’, is an approach to MT that is “automatic and domain-specific linguistic knowledge acquisition”. (Way, A., 2019: 315).

**The main part.** In this approach, the meaning of the source text is first analyzed and represented, and then the equivalent is synthesized (generated) in the target language. Creating a text representation that is both lexically and structurally clear is an important criterion. Interlingua, an MTS that uses language abstraction and its independent representation of languages, is a component of the RBMT, as are other methods such as a direct approach to word-for-word translation and transfer at different linguistic levels.

RBMT translates on two levels. The first level concerns the lexicon, in which the source text is subjected to a morphological analysis in which the words are reduced to their basic form. These words are then searched for their equivalents in the target language. It is a direct translation method that requires lexical information about the source and target word, as well as information about syntactic constraints and rules of word order in the target language. The second level involves transfer on three levels. In the analysis, the external form of the starting sentence is transformed into its abstract form – well, into a suitable representation. It is based on linguistic processes. In particular, it concerns syntactic and morphological analysis, marking of parts of speech, or the unambiguity of word meanings. Subsequently, a suitable representation in the target language is sought in the transfer of this abstract representation, and in the last step, in the synthesis, this representation in the target language is transformed into its external form. Within the interlingua MT, there are two levels. Analyzer, which refers to the conversion of the source text into interlingua, and generator, which refers to the conversion of its appropriate representation into the target language. Translation systems, such as Systran, Toshiba, PROMPT, etc., work on the RBMT principle.

CBMT refers to a situation in which system relies on a ‘corpus’ of stored data to translate from one language to another. It is based on a bilingual corpus. Translation knowledge from these corpora is equally important for this approach. Two types of MT work

on such a principle: example-based MT (EBMT) and statistical MT (SMT) [Article Writing Practice Questions].

The main source of the EBMT is a bilingual corpus. Existing translations are used to create new translations, and the corpora contain various translations of sentences that serve as templates. These translations can be combined in different ways and later used in the creation of new translations. EBMT translates in three phases, which are sentence *decomposition*, *translation selection*, and *merging*. In the sentence decomposition phase, the source text is broken down into its units, for which appropriate translations are subsequently found in the corpus. In the translation selection phase, these units are arranged with their true copies in the target language, and, in the final phase, merging, these units are merged back into an adequately formulated sentence in the target language. The advantage of this type of MT is that if the same sentence occurs for translations, the system can automatically generate a translation without the need to perform the three phases, or steps, mentioned above.

This thesis has already explained machine translation, and before getting into the explanation of neural machine translation and how it works, it is important to explain its name. Mainly the ‘neural’ part, which was inspired by neurons in the human brain. In the human brain, each neuron receives input information from other neurons. In translation, these neurons are called neural networks (NNs), which “take the idea of combining inputs (by a weighted sum), an activation function, and an output value”.

NMT is based on two recurrent NNs (RNNs): an encoder and a decoder. The encoder receives a sentence, then transforms it into a series of coordinates (or vectors) and creates a representation of it. From this representation, the decoder then generates the correct target translation, predicting words based on the context of the sentence as a whole, thus producing coherent sentences in the target language.

NMT is a large NN that is trained in the form of end-to-end, has a small memory track, and has the ability to generalize very long word sequences well. It can process the source segments and transform them into target segments, with NMT going through entire sentences and not just phrases. It does not need to maintain extensive translation (phrase tables) and language models. NMT uses deep machine learning, which a NN represents. To put it simply, machine learning is an algorithm that, based on its data processing, can “learn” and then decide or predict solutions to certain problems, in this case, proposing translation solutions. As already mentioned, the functioning

of the human brain (all connections between neurons) inspired the emergence of NNs. However, unlike the human brain, in which neurons can connect to each other, artificial neural networks (ANNs) consist of discrete layers, connections, and data dissemination. [Taus. Machine Translation Postediting Guidelines]

#### **Advantages and Disadvantages of NMT**

MT is a really useful tool for people without knowledge of a foreign language or for translators. However, the translation is often not adequate and definitive; therefore, there is still a need for human intervention in translation. Thus, the product generated by MT cannot be relied upon because, like others, such a system has its advantages as well as its disadvantages.

When compared with traditional SMT, NMT has a number of evident advantages. Speed is one of the main reasons for using NMT. The next advantage of NMT is that a simple beam search algorithm is all that is needed for the decoder of NMT to provide a satisfactory translation, in contrast to the complex decoder of traditional SMT. (Castilho, S., Doherty, S., Gaspari, F., Moorkens, J., 2018: 54).

NMT works with grammar as well. It often involves not only a mechanical translation of words from the source language into the target language but also a change of word order and correct inflection.

Thanks to the generalizability of NNs, NMT can construct unseen word combinations that do not occur in the training set. By using an NMT engine, one gets a natural sounding language output that sounds less robotic and more human. As a result of these advantages, NMT is capable of achieving state-of-the-art outputs compared to the best translation systems available today. NMT has some built-in advantages that make it successful as an advanced MT framework, but it also has problems blocking its further development. The issue of MT is also closely related to the quality of the final product, and the quality is often poor. When translating, accuracy is important, but so is stylistics. NMT can sometimes produce ‘ungainly’ sentence constructions that are meaningless. This usually occurs when translating, for instance, idioms. For NMT to create a correct and adequate translation, it is essential to understand the source text. Specifically, its lexical and syntactic ambiguity. Equally important is the conversion into the target language, which is based on an understanding of lexical translation problems, structural translation problems, and interlanguage divergence.

Even though NMT wins over other MT methods, it cannot translate long sentences well. The longer the text, the poorer the translation. Despite NMT's speed, translations still require the intervention of the HT;

however, it is at a stage when it often makes sense to post-edit an existing translation rather than translate the text from scratch. (Way, A., 2019: 320).

#### PRACTICAL PART TRANSLATION OF EXCERPTS FROM THE NOVEL "HARRY POTTER" BY JOANNE ROWLING

*"I wouldn't be so sure if I were you, dear," said Professor Trelawney, the firelight glinting on her long emerald earrings.*

*На твоєму місці, любий, я не була б такою впевненою, - сказала професорка, і полум'я каміна заграло на її довгих смарагдових сережках.*

У наведеному прикладі застосовано метафору firelight glinting, яку було відтворено засобами відповідної метафори в українському варіанті: *полум'я каміна заграло*. Отже, при перекладі, метафору було відтворено засобами відповідника. Якби ми перекладали одним з перекладачів, то переклад був би невірний.

*"Hermione, that thing nearly scalped me!" said Ron.*

*Герміоно, та він мало не зняв з мене скальп! - обурився Рон.*

У фрагменті застосовано метафору nearly scalped me. При перекладі, метафору було відтворено засобами застосування трансформації додавання, зважаючи на те, що словосполучення мало не зняв було додано у тексті перекладу. Також, було застосовано трансформацію граматичної заміни, з огляду на те, що іменник скальп було замінено дієсловом scalped, та трансформацію перестановки, з огляду на те, що порядок слів було змінено.

*Professor Lupin appeared to be holding a handful of flames.*

*Здавалося, ніби професор Люпин тримає в руці цілу жменю вогню, що осявав його втомлене сіре обличчя.*

У наведеному прикладі використовується складна метафора *to be holding a handful of flames*, яке було відтворено засобами метафори в українському варіанті. Проте, при перекладі було застосовано трансформацію додавання, так як перекладач додав словосполучення *цілу жменю* у тексті перекладу – *тримає в руці цілу жменю вогню*.

Переклад за допомоги Google перекладача: *Здавалося, професор Люпин тримав жменю вогню*. Можемо побачити, що переклад не є точним та вірним.

*Aunt Petunia, who was bony and horse-faced, whipped around and peered intently out of the kitchen window.*

*Тітка Петунія, кістлява, з кобилячим обличчям жінка, прожогом обернулась і стала вдивлятися в кухонне вікно* (Rowling J. K., Thorne J., Tiffany D., 2019: 72).

В цьому випадку застосовано таку метафору, як *horse-faced*. При перекладі, застосовано трансформацію граматичної заміни, беручи до уваги той факт, що прикметник оригіналу було замінено на словосполучення «прикметник + іменник» – з кобилячим обличчям.

**Conclusion.** In conclusion, machine translation (MT) represents a significant technological advancement that has profoundly transformed the language industry and global communication. Its ability to rapidly and efficiently translate vast amounts of text across multiple languages is invaluable in today's interconnected world. Neural machine translation (NMT) in particular has elevated translation quality, offering more natural and contextually appropriate outputs than traditional methods. However, despite its advantages, MT is not without limitations. Issues such as handling idiomatic expressions, long sentences, and cultural nuances underscore the continued necessity of human translators to refine and post-edit machine-generated outputs.

The integration of MT with human expertise exemplifies a promising synergy, combining the speed and scalability of technology with the accuracy and cultural insight of human translators. As advancements in artificial intelligence continue to enhance MT systems, their role in areas like multilingual content creation, real-time communication, and international business will only expand. Nevertheless, addressing challenges related to accuracy, stylistics, and data security will be critical in ensuring that MT achieves its full potential as a reliable and practical tool in the digital age.

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