SURVEY ON INTELLIGENCE TEST OF SMART TRANSLATORS

[a]ALEXANDRA MANDÁKOVÁ

The University of Economics in Bratislava, Faculty of Applied Languages, Department of English Language, Dolnozemská cesta 1, Bratislava 852 35, the Slovak Republic
email: [a]alexandra.mandakova@euba.sk

Abstract: Software tools for translating texts from foreign languages are now part of the practice of almost any professional translator. It might even seem that the translation process has been completely automated, making it the exclusive domain of computers, in which the human factor, i.e. the role of the translator, no longer plays a role. During our own translation work, we had the opportunity to check the accuracy and efficiency of selected translation software (Bing Microsoft Translator, DeepL, and Google Translate). We report on our experience with the practical use of CAT (computer-aided translation) to point out, in particular, the shortcomings of AI translators that we encountered in 2022 when translating long continuous texts from English into Slovak. We give examples of specific software errors as well as results of testing the translation of more complex concepts.

Keywords: Analysis of the translators' errors detected when translating from ENG to SL, Computer-Aided Translation (CAT), Machine Translation (MT), Post-editing (or postediting), AI Translation

1 Introduction

Since computers have become a part of almost every household, nobody can imagine life, especially working, without them. The same is true for professional translators. The tools they use to help them with their translations are becoming increasingly sophisticated. However, in the modern era of computing, a phenomenon called artificial intelligence (AI) is increasingly coming to the fore, and much is expected of it. *"Artificial because it is tied to a man-made artifact. But intelligence - there are multiple perspectives on this. But it is quite sufficient to state that if the behaviour of this system is considered intelligent by humans, it is intelligent.*"[1] Compared to traditional computer programs, it contains algorithms that allow you to learn and develop your skills based on previous experience, the purpose is to achieve better and higher-quality results. Thus, AI algorithms are in part autonomous compared to traditional algorithms. It will surprise no one today that artificial intelligence (AI) algorithms are a common part of almost any device, computer software, or mobile phone application. Even a common text editor that detects spelling mistakes already uses AI functions. Software translators from/into foreign languages are another example of their use. Thanks to the fact that they are also freely accessible on the Internet, they are now actively helping both professional translators and everyone around the world overcome language barriers and significantly reduce the time needed for translation. Will they eventually replace professional translators altogether? Will artificial intelligence overwhelm human intelligence? In this paper, we aim to map this very situation and at least partially evaluate the current level of software translation tools – online translators with integrated AI (artificial intelligence) capabilities – by focusing on and testing their abilities to translate text documents from English into Slovak, one-way. In the opposite direction, i.e. from the Slovak language to the English language, we did not run any tests and did not test the translators. We think that without harming the general validity of our obtained results and the conclusions drawn. We logically assume the validity of the premise that when comparing the translations both ways, there would be no major deviations or differences between them in terms of correctness. Moreover, our testing cannot be considered totally exhaustive, reflecting all aspects of the problem, because such testing would be beyond our capabilities. Rather, the aim was to probe into these software tools from the perspective of translators during their working experience and to provide a list of interesting cases encountered during their working experience.

Recall that it all started in the relatively recent past, when machines began to gradually replace humans, or rather especially their physically hard human work. The valiant hero of a well-known American legend from the mid-19th century, a certain railway builder named John Henry, was said to have managed to defeat the machine and win the first prize in a wrestling match with a steam-powered jackhammer. Since then, however, times have changed and man can no longer compete with the machine in many areas. More recently, mankind is also facing a challenge from computers as to whether these machines will gradually replace even human mental work and intelligence. We can clearly see how, in the 21st century, the computational capacity of microprocessors can lightly perform extremely complicated mathematical calculations and the simulation of physical and other phenomena. More recently, there have been artistic feats of artificial intelligence such as the generating of graphic visualisations according to given verbal instructions (projects freely available on the Internet: DALL-E (OpenAI), Midjourney, Stable Diffusion, etc.), also by generating melodies, musical tones, and songs added. It wins over a good player in a game of chess, or in the game of Go, in which the computer has won the world championship. Well-known AI communication projects such as Bard (chatbot) or ChatGPT are now also part of Internet search engines, thus enabling interactive communication with the user at a higher level. They can correctly answer questions, thank for a compliment as well as politely say hello.

Artificial intelligence (AI) is also a frequent subject of science fiction literature and films. Some of those themes, let's be honest, are gradually becoming reality. If AI manages to surpass the intelligence of humans, we are talking about the so-called singularity. Concerns are growing that such a major turnaround may occur in the relatively near future, when AI will be able to fully replace human intelligence, thus displacing it from its current exclusive position of being the number one thinking entity on this planet. So, it may soon happen to any of us that our home computer will one day display on its monitor the message "*Cogito, ergo sum.*" ("*I think, therefore I am.*"; René Descartes)

2 Theoretical basis of the research problem

We devote the following chapter with subsections to presenting and explaining basic and important concepts and technical terms related to the topic of machine translators with integrated artificial intelligence (AI). We also outline the principle of testing and preliminarily present the evaluation of intelligent machine translators.

2.1 Testing method and the examined sample

The testing was conducted in 2022 during the author's translation work, when she recorded slight or major inaccuracies or, rarely, errors made by these intelligent tools and otherwise excellent helpers. We analyze the initial state of affairs as a basis for reassessing the qualities that machine translation (MT) offers. We seek to answer to what extent a human assistant/translator indispensable in the translation process is, and how necessary their supervisory role is. In terms of terminology, a human translator´s role still counts (see definitions of MT, CAT, MAT, MAHT). Also, the results of a survey conducted by the Bulgarian Academy of Sciences, Institute of Philosophy and Sociology, Sofia, among the human translators interviewed (N = 101), state that "*Only 10% of respondents believe AI's impact could result in their profession's extinction.*"[2]

We observed the system of translators' responses in the course of the author's translation practice, during the editing of text documents and news articles, which she was translating mainly during the year 2022. The scope of the text was approximately ***500 standard pages of English texts***, i.e. a total of

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[1] Farkaš, I., Jaslovský, M.: *Umelá inteligencia nevie, čo je realita.* (3/2023)

approximately 10,000 characters, including spaces, which she translated into Slovak. The author's primary job is teaching English for Specific Purposes (ESP).

2.2 Intelligent translators vs. language corpora

To investigate the effectiveness of intelligent machine translators, one could under certain conditions also use the resources of the so-called corpus linguistics, which "*has gradually established itself as a separate linguistic discipline (on the level of e.g. cognitive linguistics, generative linguistics or psycholinguistics) that deals with all the common levels of linguistic description. It follows structuralism in its methodological foundations, but brings specific tools and methods to linguistic research.*"[3]

The essential need for high-quality language corpora is also emphasized in the chapter on Statistical Machine Translation Technology. According to Aranea's Web Corpora publication (citation), "*A corpus serves as a tool for comparing phenomena in a native language with a foreign language and vice versa. It is used to look up phrases that no dictionary – neither explanatory nor translation dictionary – can capture.*"[4] With this in mind, under some specific circumstances, by adapting the corpus, it would be possible to investigate the effectiveness of intelligent translators using corpus linguistics, but the scope of this investigation would be beyond our technical and capacity capabilities. As we know, large national corpora contain such large amounts of data that they are usually limited mainly by the memory and disk capacity of the servers. "*In the use of corpora as a tool for translators, we mainly use the contrastive factors that corpora offer us. We search for expressions in a foreign language and examine the frequency of their occurrence while preserving the equivalent meaning. ...As an example, we look at the European Union texts, where there are even translations of translations from translations available. In the work of a translator extracting comparable language corpora, collocation analysis is especially important.*"[5]

2.3 Statistical machine translation technology

Regarding the technology or the way intelligent translators work, it can be said that they need to store, analyse and process a wide range of data in the form of multilingual dictionaries for each language pair. They also process a robust database of language rules, which they gradually update and add new data to over time (also via AI). The goal is to achieve the most accurate and relatively fast translation possible.

"*...The software parses the text and creates a transitional representation from which the text in the target language is generated. This process requires extensive lexicons with morphological, syntactic, and semantic information, and large sets of rules... The software uses these complex rule sets and then transfers the grammatical structure of the source language into the target language.... Statistical machine translation uses statistical translation models whose parameters are based on the analysis of monolingual and bilingual corpora... At least 2 million words are needed for a specific field, and even more for a general language. Theoretically, it is possible to reach the quality level, but most companies do not have such a large number of existing multilingual corpora to build the necessary translation models. In addition, statistical machine translation is processor-demanding and requires extensive hardware configuration to run the translation models at an average level of performance. ...Statistical MT provides good quality when large and proficient corpora are available.*"[6]

For informative reasons, we mention that one of the interesting projects that resulted in the creation of web corpora and portals was the Aranea project, carried out at the Comenius University in Bratislava as a UNESCO activity of the Department of Plurilingual and Multicultural Communication between 2018 and 2020.

2.4 Terminology

In the following section, we present definitions of the most important terms related to the use of intelligent translators.

MT (Machine Translation) "*...indicates automated translation. It is the process of using computer software to translate text from one natural language into another natural language.*"[7]

CAT (Computer-Assisted/Aided Translation) "*... indicates computer-aided translation. It is also called machine-assisted translation (MAT) or machine-assisted human translation (MAHT). These multiple abbreviations refer to essentially the same process of producing a translation, namely a translation produced by a real human, with part of the translation process facilitated by computer software.*"[8]

"*...Pre-editing is the process by which a human prepares a document before using machine translation. Some call it ... global readiness editing... It can involve tasks of varying complexity and is ideally carried out by a qualified editor who can analyse the source text from the MT machine's perspective.*"[9]
PEMT (Postediting Machine Translation) "*...machine translation after editing is a combination of machine and human translation. It is a type of translation process that involves an initial machine translation followed by post-editing by a human translator/editor. Human translators work on the text to produce the final version. They ensure that it is linguistically and stylistically correct and that it corresponds exactly to the original document.*" [10]

"*Artificial intelligence (AI) is the intelligence of machines, which is its main feature that distinguishes it from the intelligence of animals and humans.*"[11]

"*AI is the ability of a computer or computer-controlled robot to perform actions that are normally performed by intelligent creatures, i.e. humans.*"[12]

"*AI translation is simply the application of machine learning to different languages. It is highly sophisticated and thus far removed from conventional machine translation, which simply translates every word, often resulting in serious misinterpretation errors. However, AI tools can understand words, tone of voice, complex sentence structure, and even jokes or slang language. The result is usually higher quality translation and content that is more effectively customized to specific markets.*"[13]

"*Neural Machine Translation (NMT), translation with artificial intelligence, uses a technique known as neural machine translation - first developed by Google in 2016. NMT software mimics the method by which humans learn languages. These tools examine patterns in a language using a huge number of documents, both in the source and target language. NMT systems use this information to create codes that map almost any word or phrase to the target language. Neural learning systems are designed to improve their accuracy throughout their task until they reach a point at which they acquire natural language*

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[3] Cvrček, V., Kováříková, D.: *Naše řeč.* (In: Benko, V., et al.: *Webové korpusy Aranea*, 2011), 15 p.
[4] Benko, V. et al.: *Webové korpusy Aranea.* (2019), 13 p.
[5] Benko, V. et al.: *Webové korpusy Aranea.* (2019), 14 p.
[6] Systran: *What is Machine Translation? Rule Based Machine Translation vs. Statistical Machine Translation.* (www.systransoft.com, 2023)

[7] Systran: *What is Machine Translation? Rule Based Machine Translation vs. Statistical Machine Translation.* (www.systransoft.com, 2023)
[8] LiLo: *What is Computer-Assisted Translation or CAT?* (www.lilo.global, 2022)
[9] Toppan Digital Language, Williams, D.: *What is Machine Translation Pre-editing?* (toppandigital.com , 2022)
[10] QuickSilver: *Post-Editing Machine Translation.* (quicksilvertranslate.com, 2021)
[11] Wikipedia (en.wikipedia.org, 2022)
[12] Encyclopædia Britannica (www.britannica.com, 2022)
[13] CCJK, AZ Susan: *What is AI Translation And How Does It Work?* (www.ccjk.com, 2022)

proficiency. An example is the artificial intelligence translation site Google Translate."" [14]

2.5 A review of translators with integrated AI features

The next subchapter will summarize the basic knowledge and features of the most widely used translation software and applications based on integrated AI features.

"Google Translate... has long been one of the leaders in its sphere. This is mainly due to its high-quality infrastructure. Translation is provided by a modern neural network operating on the principle of machine learning. This means that every day it pushes the quality of its services forward. An indisputable advantage of Google Translate is the number of supported languages. It has already climbed above the magic hundred." [15]
"Lingea... has launched a unique project that is unparalleled in Central Europe. It aims to try to break through and has the ambition to gain the label of the best translator of Slavic languages." [16]

"DeepL (formerly Linguee). ...offers probably the most comprehensive and accurate translation from a variety of languages. ...Of course, Slovak and Czech are also available, and in excellent quality... Although relatively unknown to the general public, it was also one of the first to use neural networks in translation. The disadvantage is the support of 'only' 26 languages." [17]

"Bing Microsoft Translator ... is a user translation portal provided by Microsoft as a part of its Bing services for translating text or entire web pages into different languages. All translation pairs use Microsoft Translator, a neural machine translation platform and a web service developed by Microsoft Research as its backend translation software" [18]

"Trados Studio is a computer-aided translation software tool that offers a complete centralized translation environment for editing, controlling and managing translation projects and terminology. It is available as a local desktop tool or online. ...UK-based RWS, which offers language processing, content management, and intellectual property management services based on technology, was described in 2022 as 'the largest publicly listed language services provider'." [19]

From 2023, AI principles are already making their way into the realms of well-known internet search engines, namely the two most widely used ones, Google and Microsoft Bing, through the so-called *"ChatGPT AI and Bing search engine linking is a reality. It can do this because it is the largest investor in OpenAI and has further increased its stake in January 2023."* [20]

"Alphabet, Google's parent company, responded by launching its own service called Bard (currently running a lightweight version of LaMDA/Language Model for Dialogue Applications), but it incorrectly answered a trivial question." [21]

For our article, we focused on the most used or best intelligent translators such as IBM translator, Reverso, or Translatedict, which we did not test. In practice, users also tend to use various voice translators, small *"handheld"* devices such as Langie LT-52, Timekettle WT2 Plus, or Vasco M3, whose level of translation quality most probably does not exceed the level and

quality of the best translators and global market leaders, based on the very definition that these are the leaders. However, we have not looked into them further.

3 Examples of the output of intelligent translators and a brief description of their recurrent errors

The tables below show the output translations of the intelligent translators, showing both correct and incorrect translation types.
In the upper part of the given examples, we offer the source language text (EN- English language) and then the best possible version of the translated text in the target language (SL- Slovak language) the s. c. Reference Translation.

3.1 Testing translators in translating proper nouns and geographical names

Artificial intelligence as the main thinking unit of intelligent translators, according to our judgment, could fully demonstrate its abilities in the case when it was necessary to think, reason, and make extra effort and activity, such as searching in an online encyclopaedia, to find the correct translation of the English name of the flower species to find the right counterpart in the Slovak language. In our example 1, we give an example of the English name of a flower (Leopard's banes), which does not correspond very well with its Slovak equivalent, and is certainly not its literal translation. It is therefore a translation issue. Unfortunately, it turned out that all tested online translators were not successful in this respect. We believe that this is an area where these programs cannot be fully relied upon. The inevitable thing was to take personal initiative and start searching the Internet on your own. Based on the English name and the appearance of the flower, it was possible to identify its Latin name (*Doronicum orientale*). With the help of this information, it has been relatively easy to click through the online encyclopaedia to the correct name in the Slovak language (*Kamzičník východný*). We think that such a trivial investigative activity on the Internet could also be handled by an AI that can solve much more complicated tasks. We do not know exactly where the problem is, but hopefully, the software developers will fix it soon. Below, we provide specific examples of the output of individual AI-integrated translators.

Example No. 1

ENG.	Everywhere are high alpine Tatra bluebells and ***Leopard's banes***.
SLOV.	Všade sú vysokohorské tatranské zvončeky a ***kamzičníky východné***.

DeepL *Translate:*	Všade sú vysokohorské tatranské zvončeky a ***leopardie bane***.
Google *Translate:*	Všade sú vysoké alpské tatranské zvončeky a ***leopardie šišky***.
Bing *Microsoft:*	Všade sú vysokohorské tatranské zvončeky a ***leopardie bane***.

Another problematic area for intelligent translators was the translation of some geographical terms. Again, we note that most of the output of these applications was correct, but due to the error rate of the translations, it was necessary to check whether the translated name corresponded to the correct geographic area. The presence of a *"human"* translator was therefore absolutely necessary. We have many places on the globe with similar if not almost identical names. A good example of the failure of translators with integrated AI functions is a situation in the author's experience when it was necessary to translate based on the overall context of the text to make it clear which country´s name was being translated. In this case, it is the region of *Kurónsko*, a historical territory near the city of Riga in Latvia. Most translators, however, have concluded that it is the area around the city of Kursk in Russia, the Kursk region, which is different and located about 250 km away from the aforementioned Curonian region, and on the territory of a completely different autonomous country. Thus, confusion can

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[14] CCJK, AZ Susan: *What is AI Translation And How Does It Work?* (www.ccjk.com, 2022)
[15] onlineprekladac.eu: *Nejlepší překladače v roce 2021: Online překladače, překladače pro mobily i prohlížeče.* (www.onlineprekladac.eu, 2021)
[16] onlineprekladac.eu: *Nejlepší překladače v roce 2021: Online překladače, překladače pro mobily i prohlížeče.* (www.onlineprekladac.eu, 2021)
[17] stiahnut.sk: *Najlepšie internetové prekladače pre rok 2022.* (stiahnut.sk, 2021)
[18] Wikipedia (en.wikipedia.org, 2022)
[19] Wikipedia (en.wikipedia.org, 2022)
[20] Koubský P.: *Zbesilé preteky o vyhľadávač s umelou inteligenciou. Vyhrá Google alebo Microsoft?* (Denník N/dennikn.sk, 2023)
[21] Tomek, R.: *Graf dňa: Súboj umelých inteligencií sa preniesol na akciové trhy a Google platí za omyl tej svojej.* (Denník E/e.dennikn.sk, 2023)

easily arise in a translation where the translated text has explicitly stated an explicit statement: *"In this text, we are talking about historical territory in Latvia. A ride in a Curonian fishing boat is a must."* However, we found the correct translation in the output of one of the three online translators tested. All the AI had to do was read with understanding and look at the map. (*Img. No. 1*).

Example No. 2

| **EN.** | A ride in a ***Curonian*** fishing boat is a must. |
| **SL.** | Plavbu na ***kurónskej*** rybárskej lodi nemožno vynechať. |

DeepL Translate:	Jazda v ***kurskom*** rybárskom člne je povinná.
Google Translate:	Nevyhnutná je jazda na ***kurskej*** rybárskej lodi.
Bing Microsoft:	Jazda na ***kurónskej*** rybárskej lodi je nevyhnutnosťou.
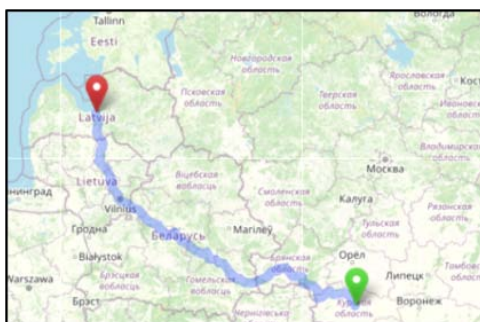
Img. No. 1 (Source: OpenStreetMap.org)

In the case of the ethnicity name, there was a curious case where one of the examined translators could not quite correctly distinguish between the name of the nationality and the type of animal. This is a rarity that may amuse and therefore we mention it in our paper. We note, however, that the overall context of the translated text available to the translator made it clear that these were the locals of the region in question. Thus, no extensive reasoning was necessary to infer this fact. However, when we tried to verify the case later, more than six months later, the translator had already assessed the situation well and translated the text correctly. So, there is a tendency to improve. This is a fundamental characteristic of AI, i.e., that it can learn and experience its own mistakes.

Example No. 3

| **EN.** | In those days a tiger cost less than a Castilian donkey. Do the local ***lamas*** know that? |
| **SL.** | V tých časoch stál tiger menej ako kastílsky osol. Vedia to miestni ***lámovia***? |

DeepL Translate:	V tých časoch stál tiger menej ako kastílsky osol. Či to miestne ***lamy*** vedia?
Google Translate:	V tých časoch stál tiger menej ako kastílsky osol. Vedia to miestni ***lámovia***?
Bing Microsoft:	V tých dňoch stál tiger menej ako kastílsky somár. Vedia to miestni ***lámovia***?

The following sample was problematic for all three tested translators, which could not cope with the word "sumpters". To the detriment of the intelligence of the translators, as soon as the term is typed into an internet search engine, we are presented with the term "pack horse", which can be translated as draught animal (Br. E.) or draft animal (Am. E.)

Example No. 4

| **AJ** | Also, depictions and scenes from the ***sumpters*** over the Sölk Pass are on view. |

| **SJ** | K videniu sú aj vyobrazenia a výjavy s ***ťažnými zvieratami*** nad priesmykom Sölk Pass. |

DeepL Translate:	K videniu sú aj vyobrazenia a výjavy ***zo sumperov*** nad priesmykom Sölk.
Google Translate:	K videniu sú aj zobrazenia a výjavy ***z žumpy*** nad priesmykom Sölk.
Bing Microsoft:	Na pohľad sú aj vyobrazenia a scény ***z sumpterov*** nad priesmykom Sölk.

From the given findings, we conclude that the intelligent translator in several cases had difficulty distinguishing the country according to the geographical or historical context implied by the text. The ambiguity of some terms or names may also be to blame. For example, 'Brittany' can refer to a female name, but also to the province of Brittany (France).

3.2 Test of translators' knowledge of local language phrases - idioms

To translate correctly, it is essential to know at least the basic regional cultural facts of the target country and its linguistic practices. A translation cannot be a purely technical issue, just as the following quotation says:

"Translation is not a simple interchange of words for words. The translator must interpret and analyse all the elements of the text and know how each word can the other words affect. This requires extensive expertise in grammar, syntax (sentence structure), semantics (meanings), etc. in the source and target languages, as well as knowledge of the different local regions." [22]

Examples that aptly illustrate the diversity of established practices in the source/target languages are texts containing phrases/idioms. Some tend to be semantically related in both languages and their usage is very similar, such as *"life isn't always rosy"* meaning „*život nebýva vždy ružový*", or "people aren't buying it", meaning "people aren't going to be deceived or outwitted by this". However, some have quite different verbal forms in both languages, denoting identical or similar phenomena. We select examples that we have encountered during our translation practice and also test the translators' response according to a directed scenario, the so-called directed phase, in which the translators are given deliberately selected inputs whose translation may be problematic, to test the degree of ability to handle a given translation. Among the expressions selected in this way, we included, for example, "*Talk the talk, walk the walk*" and also "*Pig in a poke.*" A looser translation of these established phrases and their Slovak equivalents could be the following phrases: „*vodu káže – víno pije*" (meaning "does not act as he speaks") and „*kupovať mačku vo vreci*" (meaning not knowing what exactly to buy, to take a risk, in the Slovak language it is conventional to talk about an animal - a cat, not about a pig). In this regard, we can say that the translators have failed. Other well-known phrases could be mentioned, but due to the size of the contribution we present them in an abbreviated form in the table below, without correcting and mentioning particular mistakes. (Eg.: There is an elephant in the room. Head over heels. Have a bumpy ride. In a nutshell. etc.)

Example No. 5

| **AJ** | He talks the talk, walks the walk. |
| **SJ** | Vodu káže, víno pije. |

DeepL Translate:	Hovorí, ako hovorí, a chodí, ako chodí.
Google Translate:	Rozpráva, chodí.
Bing Microsoft:	Rozpráva, chodí.

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[22] Systran: *What is Machine Translation? Rule Based Machine Translation vs. Statistical Machine Translation.* (www.systransoft.com, 2023)

Example No. 6

AJ	Don't buy a pig in a poke.
SJ	Nekupujte mačku vo vreci.

DeepL Translate:	Nekupujte prasiatko v hrsti.
Google Translate:	Nekupujte prasa v žite.
Bing Microsoft:	Nekupujte prasa vo vreci.

Example No. 7

AJ	Take me for what I am cause I'll never change **all my colours** for you.
SJ	Ber ma takú aká som, lebo pre teba nikdy nezmením **všetky svoje vlastnosti**. (to be continued ->)

DeepL Translate:	Vezmi si ma takú, aká som, lebo pre teba nikdy nezmením **všetky svoje farby**.
Google Translate:	Ber ma takú aká som, pretože pre teba nikdy nezmením **všetky svoje farby**.
Bing Microsoft:	Ber ma takú, aká som, pretože pre teba nikdy nezmením **všetky svoje farby**.

Example No. 8

AJ: *She'll **go bananas** if she sees that mess in the kitchen.* **SJ**: *Bude **šaliet'**, keď uvidí ten neporiadok v kuchyni.* ✓ Keď uvidí ten neporiadok v kuchyni, *zblázni sa*. ✗ *Dá si banány*, ak uvidí ten neporiadok v kuchyni. ✗ *Pôjde na banány*, ak uvidí ten neporiadok v kuchyni.	**AJ**: *In an age of a plethora of information on the internet, some things **need to be taken with a grain of salt.*** **SJ**: *V dobe množstva informácií na internete je niektoré veci **potrebné brať s rezervou**.* ✓ V dobe množstva informácií na internete treba niektoré *veci brať s rezervou*. ✓ V dobe množstva informácií na internete treba niektoré *veci brať s rezervou*. ✓ V dobe množstva informácií na internete je potrebné *brať* niektoré *veci s rezervou*.
AJ: *She has recently met her husband's ex-girlfriend and **there was an elephant in the room** because she really doesn't like to meet her at all.* **SJ**: *Nedávno sa stretla s bývalou priateľkou svojho manžela a **bola z toho veľmi nepríjemná situácia,** pretože sa s ňou naozaj nerada stretáva.* ✗ Nedávno sa stretla s bývalou priateľkou svojho manžela a *bol z toho slon v porceláne*, pretože sa s ňou naozaj vôbec nerada stretáva. ✗ Nedávno sa stretla s bývalou priateľkou svojho manžela *a v izbe bol slon*, pretože sa s ňou naozaj vôbec nerada stretáva. ✗ Nedávno sa stretla s bývalou priateľkou svojho manžela *a v miestnosti bol slon*, pretože sa s ňou vôbec nerada stretáva.	**AJ:** *Digging a bit more we see that **this data is cherry-picked** because, despite local **outliers**, the average value of the mathematical function is within the norm.* **SJ:** *Pri ďalšom skúmaní zistíme, že **tieto údaje sú vyberané selektívne**, pretože napriek miestnym **extrémom** je celková priemerná hodnota matematickej funkcie v norme. (*a translation in the Slovak language is also permissible as *tieto údaje sú ako **vyberanie hrozienok z koláča***)* ✗ Pri hlbšom skúmaní zistíme, že *tieto údaje sú vyberané z čerešničiek*, pretože napriek *miestnym odľahlým hodnotám* je priemerná hodnota
AJ: *She's **had a bumpy ride** at school over the last few months.* **SJ**: *V posledných mesiacoch **to mala v škole ťažké**.* ✓ V posledných mesiacoch *to mala v škole ťažké*.	

✗ Za posledných pár mesiacov *mala v škole hrboľatú jazdu.* ✗ V posledných mesiacoch *mala v škole hrboľatú jazdu.* **AJ**: *Complex numbers **in a nutshell**.* **SJ**: *Komplexné čísla **v kocke**.* ✓ Komplexné čísla *v kocke*. ✓ Komplexné čísla *v skratke*. ✓ Komplexné čísla *v skratke*.	matematickej funkcie v norme. ✓ Keď sa trochu pohrabeme, zistíme, že *tieto údaje sú vyberané*, pretože napriek *miestnym odľahlým hodnotám* je priemerná hodnota matematickej funkcie v rámci normy. ✗ Ak sa pozrieme trochu viac, vidíme, že *tieto údaje sú čerešničkou na torte*, pretože napriek *lokálnym extrémnym hodnotám* je priemerná hodnota matematickej funkcie v norme. (*by DeepL T., Google T., Bing M. T.)

The mathematical expression denoting the local extreme of the function in English *"outlier"* (given in the last example from the previous table) was translated correctly by only one translator. However, given the clear formulation of the sentence being about a mathematical function, we believe that the translators could have had a better "feel" for what is meant. The problem with translating mathematical expressions can also be seen in a later chapter, namely in the first translated expression from Translation Example 9. The Slovak term "*prepona*" (in the English language hypotenuse in the triangle) is translated as "*Hypotension*", which is not a correct translation in the Slovak language, being rather similar in form but different in meaning to the word "hypotension" indicating a drop in blood pressure/low blood pressure.

Based on the above examples, it can be concluded and stated that AI has primarily adhered to the denotative interpretation of the meaning of linguistic terms and has not delved into free translation, in which the connotative meaning of words, as well as whole sentences, can be applied more broadly. The translator DeepL Translate offered a selection of correctly translated terms, or those that belonged to the set of connotative meanings of a given term, as a part of the choice of options for translation, but the user had to click on the relevant item menu and decide, so to speak, for the translator.

3.3 Translators' test to determine the level of understanding of the text and translation within a given context

One of the main goals we have pursued is the ability of translators to understand the text, and especially the context, and then process the acquired information in the translation process. We expected and tried to show that translators can make logical inferences and draw conclusions when individual sentences are taken as true statements. We investigated the ability of translators to discern subtle nuances in meanings and the ability to use the correct translation of a given expression in the output. Especially in cases where, for example, the expression has multiple meanings (denotative and connotative). We have specifically chosen examples that have multiple meanings and can illustrate how their translation depends on the overall context of the whole text corpus. We give here an example of the word "pop", which has at least three different meanings. Starting with the designation of a musical genre (modern popular music), continuing in the meaning of explosive sound, it also denotes a sweet fizzy drink/lemonade or in the abbreviation of poppa (meaning father). The following is the expression "You got it!", which can mean "I understand" or "Yes, I will do that. "We have tested the translators to determine the correct alternative translations of these expressions.

Example No. 9 (Translations of: "you got it" and "pop".)

AJ: *The **hypotenuse** of a triangle cannot be longer*	✗ "Priniesli by ste mi okuliare?" "Jasné, *máš to*!"

than the sum of its two legs/sides. **You got it**?!	**AJ**: *You haven't heard great music until you've heard this* **pop** *band.*
SJ: *Prepona trojuholníka nemôže byť dlhšia ako súčet jeho dvoch odvesien / ramien / ďalších dvoch strán.* **Rozumiete tomu**?! *(or* **Pochopili ste to**?!*)*	*I haven't driven my* **mom and pop's** *car yet.*
AJ: *"Would you bring me glasses?" "Sure,* **you got it**!".*	**SJ**: *Ešte ste nepočuli skvelú hudbu, pokiaľ ste nepočuli túto* **popovú** *skupinu.*
SJ: *"Priniesol by si mi okuliare?" "***Jasné, spravím to!**" (or* Jasne, *prinesiem!)*	*Ešte som nešoféroval auto mojej* **mamy a otca.**
DeepL Translate: ✓ *Hypotenzíva trojuholníka nemôže byť dlhšia ako súčet jeho dvoch ramien/strán.* Chápete to?! ✗ *"Priniesol by si mi okuliare?" "Jasné,* máš to!"	*DeepL Translate:* ✓ Nepočuli ste skvelú hudbu, kým ste nepočuli túto *popovú* skupinu. ✓ Ešte som nešoféroval auto mojej *mamy a otca.*
Google Translate: ✗ *Prepona trojuholníka nemôže byť dlhšia ako súčet jeho dvoch strán/nožičiek. Máš to?!* ✗ *"Prinesieš mi okuliare?" "Jasné,* máš to!"	*Google Translate:* ✗ Nepočuli ste skvelú hudbu, kým ste nepočuli túto *popovú* skupinu. ✗ Ešte som nešoféroval *mamu a popovo* auto.
Bing Microsoft Translator: ✗ *Prepona trojuholníka nemôže byť dlhšia ako súčet jeho dvoch* nôh*/strán. Máš to?!*	*Bing Microsoft Translator:* ✗ Nepočuli ste skvelú hudbu, kým ste nepočuli túto *popovú* kapelu. ✗ Ešte som nešoféroval auto mojej *mamy a popu.*

In the examples we have given, one can see that the translators were rather careful in their "reasoning" and the outputs were rather "literal". As if they were "afraid" to think abstractly. We go on to determine a person's gender identity or gender. Determining a person's gender identity or gender is also one of the things that can only be determined if the translator correctly assesses the gender of the person mentioned in the text. It is, therefore, necessary that an intelligent translator be able to analyse the meaning of the text in its context, i.e. be able to distinguish not only the denotative but also the connotative meaning of the translated text.

An example of an error made by intelligent translators when translating from SL to EN is the use of the personal pronoun **he** instead of **it** for inanimate nouns, which also occurred in some of our examined texts.

Example No. 10

AJ	Sovereign Volodymyr was born the son of a **female slave who was made pregnant** by King Svjatoslav. In the subsequent fratricidal war, he was the victor.
SJ	Panovník Volodymyr sa narodil ako syn **otrokyne, ktorú** kráľ Svjatoslav **priviedol do stavu tehotenstva**. V následnej bratovraždednej vojne sa stal víťazom.

DeepL Translate:	Panovník Volodymyr sa narodil ako syn **otrokyne, ktorú** kráľ Svjatoslav **priviedol do stavu tehotenstva**. V následnej bratovraždednej vojne sa stal víťazom.
Google Translate:	Panovník Volodymyr sa narodil ako syn **otrokyne, ktorú otehotnel** kráľ Svjatoslav. V následnej bratskej vojne

Bing Microsoft:	bol víťazom.
	Panovník Volodymyr sa narodil ako syn **otrokyne, ktorú otehotnel** kráľ Svjatoslav. V následnej bratskej vojne bol víťazom.

As we can see, the translators did quite well in this section in all its points and tests. We do not assume they have any problem understanding the poem's allegory, metaphor, or the punch line of a joke. Testing of the translators could continue on a much larger scale. Unfortunately, given our limited possibilities, we could map and analyse mostly the basic flaws and mistakes that occur in translations.

3.4 Translators' test for the correct word order usage in sentences and the use of the passive voice

As we have seen, translators can use the propositional logic. However, we also want to show their behaviour if they receive a sentence in the passive voice as input. Will they preserve the correct word order? In the Slovak language, in contrast to the English language, which uses the passive voice much more frequently, it is more natural to use the reflexive pronouns "*sa*" and "*si*" instead of the forms of the passive voice. In general, the passive voice is used when the action in the sentence is more important than the agent of that action. In contrast, in the active voice, the subject of the sentence is the doer of the action.

Example No. 11 (translation concerning the active and the passive voice)

AJ	„The Tragedy of Hamlet, Prince of Denmark" was written by William Shakespeare.
SJ	"Tragédia o Hamletovi, princovi dánskom" *bola napísaná* Williamom Shakespearom. *(trpný rod)* "Tragédia o Hamletovi, princovi dánskom" *napísal* William Shakespeare. *(činný rod)*

DeepL Translate:	"Tragédiu Hamlet, princ dánsky *napísal* William Shakespeare.
Google Translate:	„Tragédiu Hamleta, princa dánskeho" *napísal* William Shakespeare.
Bing Microsoft:	"Tragédia Hamleta, dánskeho princa" *napísal* William Shakespeare.

Example No. 12 (translation concerning the passive and the active voice)

AJ	The President is also expected to attend the event.
SJ	Prezidentova *účasť* na podujatí *je očakávaná.* *(passive voice)* *Očakáva sa*, že aj prezident sa zúčastní na podujatí. *(active voice)*

DeepL Translate:	*Očakáva sa*, že na podujatí *sa zúčastní* aj prezident.
Google Translate:	*Očakáva sa*, že na podujatí *sa zúčastní* aj prezident.
Bing Microsoft:	*Očakáva sa*, že na podujatí *sa zúčastní* aj prezident.

Based on the above examples, it can be concluded that intelligent translators do not leave the shift between the passive voice and the active voice to the human translator, but they handle it very well.

3.5 Test of processing versals or the capitalized words in translators

Both uppercase, or capital letters, and capitalization, or capitals but different in size (larger letters for originally uppercase letters and smaller uppercase letters for letters that were originally minuscules) were a problem for DeepL Translate. For the remaining two translators, we did not observe any significant

negatives, and therefore, their translations are presented sporadically in this chapter, namely when the translators mistranslated a Vietnamese name, the translators translated it as NGO - a non-governmental organisation. This is probably because abbreviations and acronyms (an acronym, as opposed to an abbreviation, is not spelt and pronounced as a separate word) tend to be capitalized.

Example No. 13

AJ	*NGO DINH DIEM*, the first president of SOUTH VIETNAM, was a dictator who persecuted the followers of BUDDHISM for many years. A large number of innocent monks were arrested and eventually executed before DIEM himself fell from power and was eventually killed.
SJ	*NGO DINH DIEM*, prvý prezident JUŽNÉHO VIETNAMU, bol diktátor, ktorý dlhé roky prenasledoval stúpencov BUDHIZMU. Veľký počet nevinných mníchov bol zatknutý a nakoniec popravený predtým, ako bol DIEM sám zbavený moci a nakoniec zabitý.

DeepL Translate:	*Mimovládna organizácia DINH DIEM*, prvý prezident JUŽNÉHO VIETNAMU, bol diktátor, ktorý dlhé roky prenasledoval stúpencov BUDHIZMU. Veľký počet nevinných mníchov bol zatknutý a nakoniec popravený predtým, ako DIEM sám padol od moci a bol nakoniec zabitý.
Google Translate:	*Mimovládna organizácia DINH DIEM,* prvý prezident južného VIETNAMU, bol diktátor, ktorý mnoho rokov prenasledoval stúpencov BUDDHIZMU. Veľké množstvo nevinných mníchov bolo zatknutých a nakoniec popravených predtým, ako samotný DIEM padol z moci a bol nakoniec zabitý.
Bing Microsoft:	*NGO DINH DIEM*, prvý prezident Južného Vietnamu, bol diktátor, ktorý prenasledoval nasledovníkov budhizmu mnoho rokov. Veľké množstvo nevinných mníchov bolo zatknutých a nakoniec popravených predtým, ako sám DIEM padol od moci a bol nakoniec zabitý..

Example No. 14 (*only the translator DeepL is listed)

AJ	The city's popularity with both foreign visitors and the VIETNAMESE themselves is due to its wonderfully romantic atmosphere.
SJ	Obľúbenosť mesta u zahraničných návštevníkov aj samotných VIETNAMESE je spôsobená jeho úžasnou romantickou atmosférou.*
AJ	Here stands the statue of the last emperor of AUSTRIA... ...Karl the First. In 1921 he emigrated to MADEIRA.
SJ	Stojí tu socha posledného rakúskeho cisára... ...Karola Prvého. V roku 1921 emigroval do MAĎARSKA.*

4 Conclusion

In practice, there are hundreds or thousands more cases of artificial intelligence (AI) translators failing, but we have not encountered fundamentally bad or unusable translations, and intelligent translators have passed our intelligence test. We conclude that the examples of errors and shortcomings of intelligent translators that we have given are only a partial, carefully selected sample from our translation experience. Because of the limited space of the text, we have selected the most typical and significant examples that show the direction in which intelligent translators could move. Over time, after repeatedly checking our selected software translators for errors, we confirmed that translators are gradually improving and applying machine learning. As a technical remark, we note that some mistranslations were caused by the source language putting certain important terms in the original text in the form of versals, i.e. capital letters, and if they were transliterated into normal form, i.e. only the first letter capitalized or all lower-case letters, the machine translators were already able to translate the term more correctly. Of course, from a quantitative point of view, machine translators outperform human translators, and from a qualitative point of view, despite some shortcomings, a high level of translation is achieved. A very practical aid for the human translator is the provision of a variety of multiple translation options for a particular term or phrase. We also note that the well-known statement of René Descartes mentioned in the introduction ("Cogito, ergo sum."), concerning human thinking and being, has not yet been applied absolutely in the case of intelligent translators, and the person of the translator is probably indispensable, which we have also tried to verify with the results of our paper. We conclude that thanks to intelligent translators, we can translate more efficiently and with higher quality, with a significantly reduced translation time.

In the very conclusion, machine translators, as well as the now popular phenomenon of artificial intelligence (AI), are certainly a powerful assistant and a good servant, but for a truly high-quality understanding and professional translation output, the role of a human translator is still, and in our opinion will continue to be in the future, essential, at least in the role of a supervisor and post-editor of translations. Thus, we can confirm the already cited results of the survey among translators conducted by the Bulgarian Academy of Sciences, Institute of Philosophy and Sociology, Sofia, (2022) among the translators interviewed (N = 101), which shows that only 10% of the respondents believe that the influence of artificial intelligence could lead to the extinction of their profession.[23]
Another research (2019), conducted at the Dalian University of Technology, Dalian, China, also confirms the importance of the mutually beneficial coexistence of human translators and machine translation devices for the quality maintenance of translated texts: "*The assessment shows that although the quality of machine translation is improving, the gap still exists between the quality of machine translation and human translation. Based on the research findings, the author predicts that machine translation cannot possibly replace human translation and the two will continue to coexist in the foreseeable future.*"[24]

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