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Machine and AI-driven translation in the medical field

Testing accuracy and acceptability

Abstract

Machine and AI-driven translations have become widespread in the medical field as they help remove language barriers between physicians and patients. However, the literature has warned against the many pitfalls of automated renditions, and has highlighted the need for human intervention to guarantee accuracy. This paper is aimed at exploring the quality of the AI-driven and machine translation (from Italian into English) of an online popularised article addressing Parkinson's disease (PD) in light of comparable corpus analysis. To this end, the AI-driven Notebook LM platform and the DeepL machine translation solution are used. In addition, a corpus of 10,000 articles dealing with PD is composed and consulted. The paper findings report that the automated translations are characterised by issues encompassing word choices, pre- and post-modification, collocational and colligational usages. Therefore, automated target texts can be considered acceptable when applied in a physician-patient context given that essential communicative functions must be prioritised. In more formal settings, conversely, human translation aided by comparable corpora, or automatic translation post-edited by corpus consultation, are more reliable.

1 Introduction

1.1 Medical translation

Fischbach (1988) posits that medical translation is the most ancient form of scientific translation, at least in the West. Rusu and Vîlceanu (2021) argue that medical translation is both technical and scientific, and that translators face numerous challenges, such as different and diverse target readership, specific requirements, lack of targeted language resources, and continuing evolving terminology resulting from the latest scientific discoveries (Gotti 2015: 3). Medical texts also embrace different fields, such as pharmacology, surgery, obstetrics, paediatrics, psychiatry, just to mention a few (Karwacka 2015: 272). Moreover, medical communication takes place in both professional-professional and professional-lay contexts. In the former case, complex terminology can be used, whereas in the latter it should be avoided (Gotti 2015; Karwacka 2015). Also, the healthcare system has gradually become more patient-centred (Gotti 2015: 16), with the result of giving more relevance to the comprehensibility of medical information.

For these reasons, translators must not only be acquainted with source and target languages, but also with technical terminology and discourse competence (Rusu/Vîlceanu 2021). In this respect, O'Neill (1998) claims that the most favourable situation is when medical translators and health professionals cooperate in such a manner that the former edit the translations of the latter, and vice-versa: "the ideal situation would be for the medical professional who translates to be edited by a linguist, and the linguist translating medical work to be edited by a medical professional" (O'Neill 1998: 76).

1.2 Automated translation in the medical field

The use of automated or machine translation is argued to be beneficial in both the second language (L2) learning classroom and in translator training (Lee 2021; Rivera-Trigueros 2021; Almahasees 2022). It is also applied in the patient-physician relationship (Nunes Vieira/O'Hagan/O'Sullivan 2021) and, hence, in the medical field (Zappatore/Ruggieri 2024). As MT improved in quality, the literature has increasingly investigated the effectiveness and reliability of MT output in the healthcare system. To this end, researchers have explored MT platforms such as Google Translate, DeepL, Matecat, Yandex and other software solutions (Cambedda/Di Nunzio/Nosilia 2021; Rivera-Trigueros 2021; Takakusagi et al. 2021; Almahasees 2022; Zappatore/Ruggieri 2024). Randhawa et al. (2013), for example, report that MT allows users to carry out complex translations in the medical field. Thanks to the improved performances of written translation platforms, physicians can better interact with patients (Randhawa et al. 2013: 382). Takakusagi et al. (2021) assess the reliability of the DeepL platform when translating medical texts from Japanese into English. They posit that MT can produce grammatically accurate texts, despite the different syntactic structures of the two languages. Conversely, compound sentences tend to generate some issues. Cambedda, Di Nunzio and Nosilia (2021) analyse errors in the medical machine translation from Russian into Italian of MT software solutions such as DeepL and Yandex. They investigate whether DeepL (a Neural Machine Translation system) produces better translation outputs than Yandex (a Statistical Machine Translation tool). In their findings, they posit that DeepL performs the overall translation better, although Yandex is more reliable with cultural-specific words. Daniele (2019) discusses the increased quality of Google Translate when addressing abstracts of academic articles in the medical field. In particular, the author finds a strict correlation between translation errors and lexical density. Among the most common mistranslations, the following tend to prevail: word order, sub-technical terms (i. e., field-unrelated terminology), neglect of polysemous words with a particular meaning in the specific field (e. g., "leaflets" is rendered as *volantini* by MT, instead of *lembi valvolari*), and wrong calques or false cognates (e. g., "complication" is translated as *complicazione* instead of the field-specific *complicanza*, and "coaptation" is translated literally as *coaptazione* instead of *combaciamento*) (Daniele 2019: 3–4). On the one hand, MT has become increasingly effective and, hence, used in medical settings (Daniele 2019;

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Cambedda/Di Nunzio/Nosilia 2021); on the other hand, scholars remark the importance of human intervention on quality grounds (Chan 2018).

According to some researchers, MT should be applied as a last resort, in that an indiscriminate use may put some social categories at risk (Nunes Vieira/O'Hagan/O'Sullivan 2021). For example, relying on MT to communicate with a patient can give rise to confidentiality issues when sensitive data are inputted in the MT system (Nunes Vieira/Di Nunzio/Nosilia 2021: 1525). In addition, complex or less common languages may not be supported by MT tools, thus giving rise to forms of discrimination (Nunes Vieira/Di Nunzio/Nosilia 2021: 1528). It is for these reasons that the scientific community has proposed an agenda for exploring the risks of MT in various scenarios, as well as for improving its algorithms and comparing its performances (Khoong/Rodriguez 2022).

In this respect, Zappatore and Ruggieri (2024) carry out an investigation of academic papers focusing on medical MT. They find that the scientific community generally welcomes MT in the healthcare system. MT output is overall satisfactory, especially when addressing biomedical texts, and because it enhances the patient-physician communication flow. Nonetheless, there are still shortcomings in fluency and accuracy, unnatural translations, and confidentiality issues due to sensitive data. Therefore, the authors posit that MT training and human post-editing are essential.

1.3 AI-generated translations

The advent of artificial intelligence (AI) has revolutionised the way laypeople and professionals approach field-related texts. There are several studies carried out by scholars that show the benefits and drawbacks of AI-driven translations. Federici et al. (2023: 151) warn against the allure of MT- and AI-based solutions by stating that "volunteerism and technology lull users into a false security of the translation quality achieved through automated processes". Giampieri (2024) reports that intelligent machines can can produce target texts that are apparently satisfactory because their communicative intent is clear. Nonetheless, they feature a number of translation infelicities, which revolve around lexical and collocational choices. This sentiment is echoed by Al-Jarf (2024), who analyses the English-Arabic language pairs and the translations carried out by the Microsoft Copilot chatbot in the medical field. In particular, the chatbot generates literal translations or false equivalents of technical terms.

On the other hand, there are scholars who advocate AI-driven translations, as they claim that AI tools can outperform standard MT platforms. Keles, Gunay and Caglar (2024), for example, develop a Large-Language-Model (LLM) approach trained with highly field-related data. They focus on the medical field, and find that their model succeeds in developing high-quality translations. Therefore, their study contributes to AI-related global healthcare progress. Grimm et al. (2024) investigate how LLMs, in particular GPT-4, can help make advancements in medical communication and focus on otolaryngology. The authors test the translation performance of GPT-4 systems into English, Spanish and Mandarin. They find that GPT-4 tools can successfully provide accurate medical information in different languages, thereby helping improve access to medical services.

1.4 Corpora

A corpus is a collection of texts characterising a variety of a language (Sinclair 1991: 171). Corpora are generally consulted via an interface, which can be online or offline. They are an important tool that translators, linguists and practitioners can use when tackling sector-based language. As a matter of fact, they are employed in both the second language classroom and in translator training, as they help make informed decisions (Rodríguez-Inés 2008; Vigier Moreno 2019). They are also argued to increase the user's self-confidence (Vigier Moreno 2019).

Scholars have carried out many language investigations unveiling the usefulness and benefits of corpus-aided translations (Frankenberg-Garcia 2015; Vigier Moreno 2019; Bernardini/Ferraresi 2022: 207). Corpora, in fact, are considered helpful as they contain authentic language samples and show patterns of real language in context (O'Keeffe/McCarthy/Carter 2007: 25–26; Bennet 2010; Farr/O'Keeffe 2019). They allow users to notice collocations, which are words frequently associated with other words (Sinclair 1991; O'Keeffe/McCarthy/Carter 2007: 18).

Prieto Velasco (2013) posits that multimodal corpora are insightful to address specialised knowledge and investigate technical language. As a matter of fact, they help users gain insights into sector-based knowledge by relating specialised language with non-language-related content. For example, by analysing image-text interfaces, users can understand how linguistic and visual input merge into field-related content.

Corpus linguistics and corpus-aided translation studies have been largely developed over the years, especially in the medical field (Deleger et al. 2012; Mollá/Santiago Martínez/Sarker 2016; Rodríguez Martínez/Ortega Arjonilla 2018; Butler/Simon-Vandenbergen 2021; Pan 2021; Adolphs et al. 2024). Pan (2021) carries out an analysis of trainee translators' corpus-driven work in the medical field. The researcher argues that corpus analysis helps develop the translators' critical thinking and awareness of medical language. Butler and Simon-Vandenbergen (2021) conduct a corpus-assisted investigation of terms such as "social and physical distance" in view of the consequences of the coronavirus pandemic. They show how corpora help investigate collocational behaviours of word forms and derive semantic implications. Mollá, Santiago Martínez and Sarker (2016) create a corpus to develop and test text processing tools for evidence-based medicine; in particular, for summarisation tasks and for the appraisal of clinical evidence. In the study by Deleger et al. (2012), the authors implement a corpus for medical natural language processing tasks, whereas Nye et al. (2018) design a database with multi-level annotations of patients, interventions and outcomes in support of medical literature.

As both automatic translation and corpora are ICT tools at the disposal of linguists and translators, it is interesting and useful to explore to what extent they can be combined with other language resources, such as AI-driven and MT platforms in the translation of medical articles and glossary entries. In addition, it would be beneficial to investigate and show how corpus consultation can be applied in translator training, especially as a post-editing tool.

2 Research questions

In light of the above, this paper is aimed at answering the following research questions:

(1) Can AI-driven and machine translation be relied upon?

(2) To what extent is automated translation qualitatively satisfactory with respect to authentic (or real-life) language and/or corpus evidence?

To this end, an Italian popularised article describing Parkinson's Disease (PD) is translated into (British) English by using the Notebook LM and DeepL.com platforms. At the same time, a corpus of medical articles written in English and dealing with PD is compiled. In this way, AI- and MT-driven outputs can be analysed and compared with corpus evidence. Therefore, it is possible to ascertain whether and to what extent the terms proposed by AI and MT appear in medical PD-related language and settings.

Amongst others, the aim of this paper is to verify whether and how an *ad hoc* corpus can be consulted to assess and post-edit automatically generated output.

It must be noticed that the above-mentioned research questions and the related answers are applicable only in the case analysed in this paper. Therefore, AI-driven and MT terminological and phraseological accuracy and reliability are assessed only in light of and to the extent allowed by the data gathered in this paper.

3 Methodology

An Italian medical article for the general public is sourced from the web and translated via Language Model and MT platforms. The popularised article provides online readers with clear, rigorous and easy-access information about a range of conditions resulting from PD. It is 103 words long and is retrieved and abridged from the *Fondazione Veronesi* (2025) research institute website. or the purpose of this paper, it is translated from Italian into English by using the Notebook LM and DeepL software solutions. Notebook LM is an AI-powered research assistant and note-taking tool developed by Google. It relies on advanced AI models, such as the Gemini 2.0 among others. It allows users to upload documents and generates responses on the basis of the data provided. DeepL is an online translation platform leveraging neural machine translation. For the purpose of this paper, British English is chosen as the target language.

In order to assess the quality and reliability of the automated translations, a corpus of academic articles focusing on PD is composed. As the register level of the article is different from that of academic articles, only the abstracts and the conclusions of each article are included in the corpus, in the hope that these might avoid high-register wording, excessive technical argumentations, and academic conventional language. In retrospect, it may be argued that this proved not to be the case, i. e. that the chosen fragments also display academic rather than patient-oriented usage. Yet, the texts in the corpus nevertheless reflect wording and usage typical of English medical texts.

The corpus is created by using the AntCorGen software solution (Anthony 2024b) and then analysed by using the AntConc offline concordancer (Anthony 2024a). With AntCorGen, users can enter a set of keywords in the system and start a targeted search in the PLOS One academic research database. They may select the field of interest (e. g., medicine, law, computer science, etc.) and decide which sections of the academic article to download (e. g. title, abstract, introduction, etc.). AntCorGen accesses the PLOS One database, downloads the selected sections, and saves each one as a text file in a separate folder.

For the purpose of this analysis, the following keywords are entered in the AntCorGen search field as alternative searches: “Parkinson”, “Parkinson disease”, “Parkinson’s disease”, and “PD”. The “Medicine and health sciences” category is chosen and the following article sections are considered for download: title, abstract, and conclusions. At the end of the process, the corpus is composed of 10,000 medical articles; 60,403 word types and 3,894,936 tokens. The corpus is then uploaded to and saved in the AntConc software tool, which is an offline concordancer generating concordances (i. e., lines of text), and collocations (i. e., words that frequently appear together), thus helping notice word usages in context. Lemmas (or headwords) can be searched for by using the asterisk, which functions as a wildcard character. The asterisk can also be placed between words; in this way, it replaces any alphanumerical and non-alphanumerical character. For example, by querying “the * patient*”, it is possible to retrieve words (probably modifiers) that precede either “patient” or “patients” (e. g., “the elderly patients”, “the studied patients”, etc.).

Finally, 50 medical abstracts[1] addressing Parkinson’s disease are uploaded to Notebook LM. In this way, the system can rely on the language of the documents provided and, hopefully, produce a consistent field-related target text. The prompt inputted in the AI solution is as follows: “On the basis of the language and terminology of the documents uploaded, translate the following text into English: *[text].*”

4 Analysis

This section of the paper discusses the source text and the related automated translations. In order to assess the quality and acceptability of the automatically generated output, target terms are queried in the corpus. The Garzanti bilingual dictionary is consulted to source possible (and alternative) translation options. By doing so, the terms or words proposed by MT and AI can be either corroborated or challenged.

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1 Due to the constraints posed by the system, only 50 documents could be uploaded to Notebook LM at the time this analysis was carried out.

4.1 Source text and automated translations

Table 1 below reports the source text (ST) and the related automated target texts. The underlined words or phrases in English are searched for in the corpus.

ST	DeepL	Notebook LM
Parkinson (malattia di Parkinson) *La malattia di Parkinson (o morbo di Parkinson) è un disturbo motorio degenerativo e progressivo classificato come malattia cerebrale, causato dalla morte dei neuroni dopaminergici con conseguente deprivazione della dopamina, il neurotrasmettitore che consente il controllo dei movimenti.* *La progressione della malattia e la possibilità che comprometta anche altre funzioni oltre al movimento, impattano negativamente sulla qualità della vita dei pazienti e dei loro caregiver. L'età media di esordio della patologia è 68 anni per gli uomini e 70 anni per le donne, mentre la malattia di Parkinson a esordio precoce si manifesta già a partire dall'età di vent'anni.*	Parkinson's disease Parkinson's disease (or Parkinson's disease) is a degenerative and progressive motor disorder classified as a brain disease, caused by the death of dopaminergic neurons with consequent deprivation of dopamine, the neurotransmitter that allows the control of movements. The progression of the disease and the possibility that it also compromises other functions in addition to movement, negatively impact the quality of life of patients and their caregivers. The average age of onset of Parkinson's disease is 68 years for men and 70 years for women, while early-onset Parkinson's disease occurs as early as 20 years of age.	Parkinson's Disease (Morbo di Parkinson) Parkinson's disease (PD) is a degenerative and progressive motor disorder, classified as a brain disease. It is caused by the death of dopaminergic neurons, resulting in dopamine deprivation, the neurotransmitter that allows for movement control. The progression of the disease and its potential to impair functions other than movement negatively impact the quality of life of patients and their caregivers. The average age of onset is 68 years for men and 70 for women, while early-onset Parkinson's disease can manifest as early as twenty years of age.

Table 1: ST, MT and AI-generated translation

As can be seen from Table 1 above, the source text is rich in technical (or sector-based) language, such as *disturbo motorio degenerativo e progressivo* (MT and AI: "degenerative and progressive motor disorder"); *morte dei neuroni dopaminergici* (MT and AI: "death of dopaminergic neurons"); *deprivazione della dopamina* (MT: "deprivation of dopamine"; AI: "dopamine deprivation"), and so on. It is evident that machine-driven output is mostly literal, as in the phrases *con conseguente deprivazione* (MT: "with consequent deprivation"), or *impattano negativamente* (MT and AI: "negatively impact"). One might wonder whether and to what extent the automatically translated texts mirror authentic or recurrent medical language. This paper explores such a possibility and highlights how to consult the *ad hoc* corpus for post-editing and translator training purposes.

4.2 Corpus-assisted analysis and post-editing

At first glance, the translated titles are somehow inconsistent. In MT output, for instance, there is no reformulation as in the source text (i. e., *la malattia di Parkinson (o morbo di Parkinson)*), and the mere repetition of "Parkinson's disease" is rather disappointing (MT: "Parkinson's disease (or Parkinson's disease)"). In Notebook LM, conversely, the source phrase *(Morbo di Parkinson)* is retrieved.

By searching for "Parkison* disease or" in the corpus, the following phrases appear: "Parkinson disease or Parkinson's disease" and "Parkinson's disease or PD or parkinsonism". Therefore, there is alternative nomenclature offered by corpus evidence, such as "or PD", and "or parkinsonism".

As regards the phrase *disturbo motorio degenerativo e progressivo* (MT and AI: "degenerative and progressive motor disorder"), if the word "disorder" is searched for in the corpus, the following phrases come to the fore: "movement disorder", "neurodegenerative disorder" and "progressive disorder". For example, there is a concordance with "progressive neurodegenerative disorder". Alternatively, "*degenerat*" can be queried. In this way, words containing "degenerat" are obtained, and the following noun phrases are noticed: "neurodegenerative disorders" and "neurodegenerative disease". It can be argued that the automated solutions do not account for specialised or more recurrent language patterns. In the corpus, in fact, "movement" is preferred over "motor". Indeed, by searching for "motor disorder*" in the corpus, 22 hits are obtained, whereas by looking for "movement disorder*" 233 occurrences are found. Also, as can be observed, the word order is different, as "progressive" precedes "(neuro) degenerative". However, the use of the coordinating conjunction *e* between the two adjectives in the source text should be accounted for. Therefore, the sequence of the adjectives may be written as "progressive and neurodegenerative" in the target text.

As far as *classificato come malattia cerebrale* is concerned (MT and AI: "classified as a brain disease"), by looking for "classified as" in the corpus, the following concordances are found: "classified as mitochondrial disease"; "classified as disease causing mutation", and "classified as Parkinson's disease". In this case, MT and AI are accurate; however, it would be tempting to explore other possible language solutions in the corpus. This can be done by querying "*ed as a * disease". With this phrase, users can list (regular) past participles followed by "as a" and preceding "disease". Sample phrases are, for example, "described as a disease" or "recognized as a systematic disease". Finally, by listing the collocates of "disease*", the word "brain" is retrieved in phrases such as "brain diseases", as suggested by the automated tools.

In light of this analysis, a possible corpus-assisted translation of the phrase *disturbo motorio degenerativo e progressivo classificato come malattia cerebrale* can be "progressive and neurodegenerative movement disorder classified as a brain disease". As already mentioned, in the first part of the phrase, the word order is different from the automatic target texts, and the term “movement” prevails over “motor”, as evidenced by corpus analysis. The second part of the phrase is similar in both the MT/AI outputs and the language of the corpus.

The next phrase to address is *morte dei neuroni dopaminergici con conseguente deprivazione della dopamina* (MT: “death of dopaminergic neurons with consequent deprivation of dopamine”; AI: “death of dopaminergic neurons, resulting in dopamine deprivation”). The Garzanti dictionary suggests “dopaminergic” as a translation of *dopaminergico*. By searching for the collocates of “dopaminergic”, the words “neuron”; “neurons”, and “neuronal” are retrieved in concordances such as “dopaminergic neuron loss”, “dopaminergic neurons loss”, and “dopaminergic neuronal loss”, where the latter is slightly more frequent. It is evident that the term “loss” best collocates with “neuronal” and “neuron(s)”. By listing the collocates of “death”, the word “neuronal” is featured in phrases such as “neuronal cell death”, “neuronal death” and “dopaminergic neuronal death”. However, the related hits are lower than the ones obtained with the word “loss”. For instance, the phrase “dopaminergic neuronal death” shows 22 concordances. The corresponding expression “dopaminergic neuronal loss”, by contrast, generates 33 occurrences. Hence, “loss” seems more frequent than “death” (proposed by MT/AI). However, it can be stated that both “loss” and “death” are equally used in the language of the corpus.

As concerns *deprivazione della dopamina*, by listing the collocates of “dopamine”, the following words come to the fore: “depletion” (in a phrase such as “depletion of dopamine*”,* which generates 7 hits); “deficits” (e. g. “associated with dopamine deficits”, one hit), and “deficiency” (in 11 concordances with “dopamine deficiency”). Therefore, “deficiency” best collocates with “dopamine”, instead of “deprivation” (as proposed by MT/AI), which shows no hits.

As mentioned, the prepositional phrase *con conseguente (deprivazione della dopamina)* is rendered as “with consequent deprivation of dopamine” by MT and as “resulting in dopamine deprivation” by AI. By searching for “consequent”, one hit is found with the word “dopamine”, namely, “the consequent loss of the dopamine innervation”. It would be useful to search for “dopamine de*”, where “de*” allows for the retrieval of any word starting with “de”, such as “deficiency”, “depletion”, or “degeneration”. In this case, the following interesting phrases emerge: “results in dopamine deficiency” (as partly suggested by AI); “correlated with growing dopamine deficiency”, and “associated with dopamine deficits”. Therefore, the post-edited target phrase can be “dopaminergic neuronal loss resulting in dopamine deficiency”. It can be inferred that the MT prepositional phrase “with consequent (deprivation)” is not common, whereas the transitional phrase “resulting in” is accurate, according to corpus evidence. The sentence that follows can then start with “dopamine”, so that there are no cohesion issues.

The next phrase to address is *il neurotrasmettitore che consente il controllo dei movimenti* (MT: “the neurotransmitter that allows the control of movements”; AI: “the neurotransmitter that allows for movement control”). The Garzanti dictionary confirms "neurotransmitter" as a translation of *neurotrasmettitore*. By searching for the collocates of "control*", the words "movement" and "movements" come to the fore in many phrases with "movement control". The related concordances are, for example: "involvement in movement control"; "have a direct influence on movement control"; "which help control voluntary movement" and "able to produce faster voluntary movements". When investigating the expression "voluntary movement*", 36 hits are obtained. Therefore, a possible corpus-assisted post-editing is "the neurotransmitter which helps control voluntary movements". As can be noticed, the machine-translated text mostly relies on post-modification; i. e., "the control of movement", where "control" is post-modified by the prepositional phrase "of movement". This phrase, however, generates only one hit in the corpus, where pre-modification prevails. As a matter of fact, "movement control" (as suggested by AI) produces 24 hits. Therefore, corpus consultation is useful not only to find collocations, as in the examples provided above, but also to verify pre- or post-modifcations and, hence, colligations. Colligations refer to the frequent co-occurrence of syntactical categories.

With regard to the expression *la progressione della malattia* (MT and AI: "the progression of the disease"), by searching for "disease progression*" in the corpus, 515 hits are obtained, where "disease progression" is not preceded by a definite article. By contrast, by writing "progression of the disease", 37 occurrences are found. This is another example where pre-modification prevails over post-modification.

As regards *la possibilità che comprometta anche altre funzioni oltre al movimento* (MT: "the possibility that it also compromises other functions in addition to movement"; AI: "its potential to impair functions other than movement"), by querying "the possibility that", 116 hits are retrieved, whereas by searching for "the possibility of", 131 are found. By searching for "its potential to", only 9 hits are obtained. Hence, it can be inferred that the target phrase suggested by MT is more frequent. In addition, the Garzanti dictionary proposes "likelihood" as a translation of *possibilità*. By querying it in the corpus, several hits are retrieved with phrases such as "the likelihood of tripping", "the likelihood of developing symptoms", etc.

Another way to explore noun phrases containing gerunds (as in the last examples above) is by applying asterisks as in the following example: "the * of *ing". In such manner, any word between "the" and "of" is queried together with a gerund form. Interesting results are the following ones: "the risk of developing PD"; "the risk of developing Parkinson's disease"; "the incidence of freezing", and "the probability of developing severe disorders". In the same way, the syntax "the * of *ed" may help find noun phrases collocating with past participles. For example, the phrase "the possibility of shared pathophysiology" comes to the fore. Therefore, the phrase *la possibilità che* can be rendered as "the probability / risk / possibility / likelihood of".

As concerns *comprometta anche altre funzioni* (MT: "it also compromises other functions"; AI: "to impair other functions"), the Garzanti dictionary suggests "compromise" and "jeopardize" as translation candidates of *compromettere*. By searching for "jeopardi*", a few concordances are obtained (namely 4), such as "jeopardized cell survival" and "which may retard and jeopardize the advance of cell therapy". By looking for "compromise*", more hits are retrieved (i. e., 185), such as "compromised between several functional outcomes: motor, fluency and neuropsychological outcomes"; "compromised respiratory function"; "compromised performance", and "a compromised motor system". By querying "impair" and "impaired", many more results are obtained (that is, 1,218). Sample phrases are "impair the modular control of gait", "impaired motor function", and "impaired brain function". Therefore, AI proposed a more frequent target word in this case as well.

The next phrase to address is *oltre al movimento* (MT: "in addition to movement"; AI: "other than movement"). From the list of the collocations of "compromis*" and "impaired", the word "motor" is featured in phrases such as "a compromised motor system", and "compromising/impaired motor function". Therefore, if "in addition to mo*" is searched for, the following phrases are retrieved: "in addition to motor discomfort"; "in addition to motor dysfunction", and "in addition to motor difficulties". The word "movement" collocating with the lemma "compromise" does not appear in the corpus. Conversely, it is used with "impairment(s)" in phrases such as "movement and sensory impairments", "impairment in repetitive finger movement", or "impaired movement".

According to corpus analysis, the source phrase *la progressione della malattia, la possibilità che comprometta anche altre funzioni oltre al movimento* can be post-edited as "disease progression**,** the risk/probability/risk/likelihood of impairing/compromising functions other than the motor system", and "disease progression, the possibility of impaired/compromised functions in addition to motor difficulties". It is noticeable that corpus consultation helps find several ways to post-edit the automated target texts.

The phrase *impattano negativamente sulla qualità della vita dei pazienti* is rendered as "negatively impact the quality of life of patients" by both MT and AI. By querying "negative impact*" in the corpus, many hits with "have/had a negative impact on" are obtained. Therefore, MT and AI seem accurate. However, the corpus does not generate any instances of "negatively impact", as nominalisation (i. e., "have/had a negative impact on") prevails. As regards *qualità della vita*, the MT/AI post-modification (i. e., "quality of life") produces more occurrences than pre-modification (i. e., "life quality") in the corpus. For example, the phrase "have a dramatic impact on patients' quality of life" appears in a concordance. There are also several hits with "quality of life of (PD) patients", such as "have profound negative impacts on the quality of life of PD patients"; "has a negative impact on the quality of life of patients"; "limits the quality of life of PD patients", and "impact the quality of life of PD patients". In light of these results, the source phrase can be rendered as "have a negative impact on patients' quality of life", or "limit the quality of life of PD patients".

The expression *l'età media di esordio della patologia è* is translated as "the average age of onset of Parkinson's disease is" by both MT and AI. By searching for "average" in the corpus, the phrases "the average age" and "the average age at onset was 65.7" come to the fore. As can be understood, the automated target texts propose the prepositional phrase "of onset", whereas corpus evidence shows "at onset". If "age at onset" is queried, 80 hits are obtained, whereas if "age of onset" is searched for, 68 occurrences are found. Hence, according to corpus results, the former is more frequent and the source text can be rendered as "the average age at onset is".

The last phrase is *la malattia di Parkinson a esordio precoce si manifesta (…) all'età* (MT: "early-onset Parkinson's disease occurs… of age"; AI: "early-onset Parkinson's disease can manifest… of age"). As regards *a esordio precoce*, by querying "onset", the phrases "of early onset" and "with early-onset PD" are retrieved. As far as *si manifesta* is concerned, by listing the collocates of "early onset", the word "age" forms concordances such as "early onset age" and "early age of onset <40 years". There are no collocates showing the verbs "occur" or "manifest". The post-edited text can be the following: "an early onset age is" or "an early age at onset is" (see Table 2 for further details).

5 Findings

On the basis of the analysis carried out, Table 2 below reports the source text (first column) and the corpus-assisted post-edited target text (second column). The source

Source Text	**Corpus-aided post-editing**
Parkinson (malattia di Parkinson)	**Parkinson's disease (PD)**
La *malattia di Parkinson* (o *morbo di Parkinson*) è un disturbo motorio degenerativo e progressivo classificato come malattia cerebrale, causato dalla morte dei neuroni dopaminergici con conseguente deprivazione della *dopamina*, il neurotrasmettitore che consente il controllo dei movimenti.	Parkinson's disease (PD or parkinsonism) is a progressive and neurodegenerative movement disorder classified [recognized / described] as a brain disease. It is caused by dopaminergic neuronal loss resulting in dopamine depletion [deficiency]. Dopamine is the neurotransmitter which helps control voluntary movements.
La progressione della malattia e la possibilità che comprometta anche altre funzioni oltre al movimento, impattano negativamente sulla qualità della vita dei pazienti e dei loro caregiver.	Disease progression and the probability [risk / likelihood] of impairing / compromising functions other than the motor system [the possibility of impaired / compromised functions in addition to motor difficulties], have a negative impact on patients' quality of life, and on their caregivers' [limit the quality of life of PD patients and of their caregivers].
L'età media di esordio della patologia è 68 anni per gli uomini e 70 anni per le donne, mentre la *malattia di Parkinson* a esordio precoce si manifesta già a partire dall'età di vent'anni.	The average age at onset is 68 for men and 70 for women; whereas an early onset age [an early age at onset] is only 20.

Table 2: Source text and corpus-aided post-edited target text

text and the related corpus-driven translation are divided into paragraphs to allow for a clearer comprehension of the translated options. Alternative corpus-aided post-editing is written in squared brackets.

Table 2 above clearly shows that corpus consultation allows satisfactory (albeit time-consuming) post-editing and the retrieval of a wide variety of translation options.

The various corpus consultation strategies described in this section can be replicated in translator training. In such a manner, students in Translation Studies may familiarise themselves with corpus analysis techniques for technical translation purposes.

6 Discussion

Despite appearing smooth, accurate and reliable at first glance, the automated translations of the source text feature some shortcomings. These involve word order, collocational and colligational issues.

The first striking example concerns the absence of a reformulation (as concerns MT) and the presence of a source phrase (with regard to AI) in the article title. As discussed, the first line of the Italian text mentions *La malattia di Parkinson (o morbo di Parkinson)*. MT proposes “Parkinson’s disease (or Parkinson’s disease)”, which is unsatisfactory, whereas AI produces “Parkinson’s Disease (*Morbo di Parkinson*)”. Other translation infelicities concern collocational issues, i. e., word pairs in context. For example, corpus evidence shows the preponderance of “movement” (instead of the MT/AI-proposed “motor”) collocating with “neurodegenerative” and “disorder”.

The word order of the corpus language is sometimes different from the one of the machine-generated target texts. The AI expression “movement control”, for instance, is more recurrent in the corpus than the MT-generated “the controls of movement”.

Another example is the corpus-sourced term “loss” pre-modified by the adjectival phrase “dopaminergic neuronal”. In this regard, MT and AI propose “the death of dopaminergic neurons”. The term “death” appears in the corpus, but it is used less frequently than “loss”. Also, “deprivation of dopamine”, as mentioned in the machine-translated text, produces no hits in the corpus. The corpus-sourced equivalent “dopamine deficiency” (not “dopamine deprivation”, as suggested by AI) is fairly frequent.

As indicated, colligations are strictly related to pre- and post-modifications. For example, in the expression *l’età media di esordio*, the preposition *di* is translated literally by the MT and AI tools (i. e., “of”), whereas corpus evidence shows the preposition “at” in phrases such as “the average age at onset”.

Despite the translation infelicities reported in this analysis, in some instances MT and AI are terminologically accurate, as in the expression “the possibility that” rendering *la possibilità che*. The phrase “the possibility that”, in fact, generates several results in the corpus. Nonetheless, corpus evidence also shows a number of alternatives, such as “the likelihood of”; “the probability of”; “the risk of”, and so on. The same can be said of the phrase *classificato come malattia cerebrale*, whose automatic translation “classified as a brain disease" is correct. Also in this case, corpus analysis reveals other possible verb phrases, such as "recognized as" and "described as". It should be noticed that alternative options can also be provided by DeepL. By clicking on individual terms in the target text, the platform shows a pop-up list of alternative translations and reformulations. These, however, are not always relevant. In other instances, Notebook LM generates more adequate renderings, as in the case of the lemma "impair" (far more frequent than the MT-suggested "compromise") and of the connector "resulting in" translating *con conseguente* (rendered as "with consequent" by MT).

In addition to the above successes and shortcomings, it is the opinion of the author that the communicative intent of the source text should also be taken into consideration before deciding whether an automated translation is either "good" or "bad", "reliable" or "unreliable", or "accurate" or "inaccurate". If the purpose of the translated text is to remove the language barriers between a physician and a patient, it might be claimed that, on the basis of the data analysed in this paper, MT and AI have effectively served such a purpose. The automated target texts, in fact, are intelligible and contain no grammatical or syntactical errors that would hinder comprehension. On the other hand, if the automatically generated target texts were to be used in an academic or medical setting with experts of the field, it is evident that they would need improvements, especially from a terminological, phraseological and collocational perspective.

As a whole, this paper showed that corpora can be used to successfully check and post-edit automatically generated output. In addition, the numerous examples of corpus-driven word and phrase retrievals have provided insights into how corpus analysis can be implemented in translator training.

7 Conclusions

This paper was aimed at exploring if and how the AI- and machine-driven translation of an Italian medical article addressing Parkinson's disease could be considered as accurate and reliable. In order to do so, a corpus of academic articles dealing with PD was composed by using the AntCorGen tool, which sources documents from the PLOS One medical database. The corpus was consulted via the AntConc freeware software and the AI- and machine-translated texts were assessed in light of corpus evidence.

Corpus analysis revealed some collocational and word-order issues. Corpus consultation, in fact, brought to the fore different word usages and/or other recurrent terms in the given contexts. Also, MT/AI pre- or post-modifications were often not in line with corpus language patterns. Corpus analysis showed naturally occurring terms and various terminological alternatives. At times, AI-driven translations tended to use pre-modifying constructions favoured in the corpus, whereas MT did not. Furthermore, there were cases where nominalisation was featured in the language of the corpus. Conversely, MT and AI only generated straightforward verbs, thereby giving rise to more informal or less conventional language.

As a whole, however, it is the opinion of the author that the automated target texts were readable and generally comprehensible. For this reason, if the target texts were to be used in a physician-patient context, they could be considered as acceptable. This would not be the case if the automated outputs were to be consulted in an academic setting.

In addition, corpus-assisted translation or post-editing requires time and effort, which translators and managers of translation agencies cannot always spare. Therefore, future advancements in MT and AI solutions are called for to create new algorithms and/or improve the existing ones. In this way, the issues brought to the fore in this paper could be tackled.

The limits of this paper lie in the different typology of the source text and of the parallel texts composing the corpus. The source text, as mentioned, is an article for the general public, which explains the characteristics of PD. The texts composing the corpus, conversely, have an academic register, and contain formal, expert-expert language. However, it could be argued that the source text was not particularly reader-friendly. It is often difficult to avoid a formal and academic register in medical texts, given the large number of technical words that they contain. For these reasons, to some extent, the register of the source text and of the texts composing the corpus was very similar.

In addition, using Notebook LM as a translation tool may have counterbalanced this initial shortcoming. The AI solution, in fact, performed the translation on the basis of the (language of the) articles provided.

Another limit is the fact that a wider variety of articles, perhaps addressing different diseases, languages and/or physical/mental issues could have yielded more varied results. For example, as far as the legal field is concerned, Quinci and Pontrandolfo (2023: 197) found that MT accuracy and reliability depend heavily on the genre and on the languages focused on. Therefore, future research could explore other medical topics and/or address the automated translation of a larger number of texts. Also, other MT/AI tools, such as Google Translate, ChatGPT-5 or the Reverso platform could be taken into account.

Online resources

DeepL: http://www.DeepL.com
Garzanti dictionary: http://www.garzantilinguistica.it
Google Translate: https://translate.google.com/
Matecat: https://www.matecat.com/
Microsoft Copilot: https://copilot.microsoft.com/
Notebook LM: https://notebooklm.google/
PLOS One: https://journals.plos.org/plosone/
Yandex: https://translate.yandex.com/

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