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Prospecting the Future of Translator Amid AI and Machine Practices and Outputs

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مذكرة مقدمة لاستكمال متطلبات نيل شهادة الماستر في اللغة الإنجليزية و آدابها

ترجمة تخصص:

دراسة مستقبل المترجم في ظل تطور الذكاء الإصطناعي و ممارسات و مخرجات الآلة
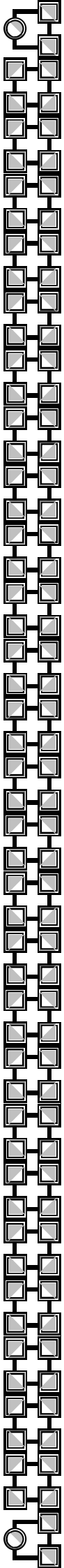
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شيماء حيدر

تحت إشراف

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أمام اللجنة المكونة من

محمد كوداد	رئيسا	قاصدي مرباح
جمال قوي	مشرفا	قاصدي مرباح
حمزة زغار	مناقشا	قاصدي مرباح

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Dedication

To my late father... may God bless your soul

Acknowledgements

Special acknowledgment is due to my family, for their support, my mother, three sisters Messaoud, Nadia, Roqia to whom I am so indebted, for their support all along my personal and academic journey, you are my life wellspring of motivation and enlightenment, you had instilled in me faith in myself and my capabilities. My thanks fly to Ahmed and Samir who had been my backup during the hardships I faced. Heartfelt appreciation to my supervisor; you are an exceptional educator, excelling not only in the realm of translation studies but also in exemplifying responsibility and professionalism. I extend my gratitude for your guidance, teachings, and the insights you have shared in class, all of which have contributed to our personal growth and quest for excellence. Thank you for believing in us, and your impactful words, "don't put skies for yourself" shall always resonate with me.

Prospecting the Future of Translator Amid AI and Machine Practices and Outputs.

Abstract

Artificial intelligence (AI) has recently been the center of international media coverage due to its impact on all the fields, including translation. As a result, a heated debate, buried for years, has re-emerged about whether this technological development represents a threat to the future employability of translators and interpreters, or an offered asset for translators to innovate the field and cope up with the digital age, to bring it to higher levels. In the light of prospecting the future of the profession, a systematic evaluation has been conducted to assess the effectiveness for MT in rendering texts of the various domains. The aim of this research is to investigate the impact of artificial intelligence in reshaping the translation industry amid. It provides a scrutinized systematic evaluation of machine translation outputs alongside with a theoretical framework to provide an insight of MT background and its relevance to the study. The results demonstrated the undoubtful assistance that AI translation tools offer to translators, however the languages complex nature, diversity, sensitivity, and interconnection with the humans is far away to be fully and successfully stimulated. AI powered models such as GPT-4 can translate whereas human translator proofread.

Keywords: Artificial Intelligence, Machine Translation, Human Translation, Error Analysis.

دراسة مستقبل المترجم في ظل تطور الذكاء الاصطناعي وممارسات و مخرجات الآلة.

ملخص

لقد بات الذكاء الاصطناعي مؤخرا محط أنظار الصحافة لأثره الواسع الذي شمل كل الميادين بما فيها الترجمة. الأمر الذي أحيا جدالا ساخنا حول ماهية أثر التطور التكنولوجي على صناعة الترجمة بين خطر يهدد مستقبل صناعها وعون للرفع من الترجمة والوصول لأعلى مستوياتها ضمن إطار التفكير حول مستقبل المهنة، تم إجراء تقييم نظامي لقياس فعالية ترجمة الذكاء الاصطناعي في تقديم نصوص من مختلف المجالات. هدف هذا البحث هو دراسة تأثير الذكاء الاصطناعي في إعادة تشكيل صناعة الترجمة. إذ يعرض تقييم محكم لنتائج الترجمة الآلية بالإضافة إلى إطار نظري لإعطاء نظرة عامة عن خلفية الترجمة الآلية وأهميتها للدراسة. أظهرت النتائج المساعدة الكبيرة التي تقدمها وسائل الترجمة الآلية التي تعمل بالذكاء الاصطناعي للمترجمين، ومع ذلك، فإن

طبيعة اللغات المعقدة، والمتنوعة، والحساسة، وتفاعلها مع البشر لا تزال بعيدة عن أن تحاكى بنجاعة. يمكن لنماذج مثل GPT-4 التي تعمل بالذكاء الاصطناعي أن تكون ذا عون كبير للمترجم اذ بإمكان للسرعة والجودة المحسنة لأدوات الذكاء الاصطناعي والملكة اللغوية التي يمتلكها عقل المترجم أن ترتقي بصناعة الترجمة لأعلى مراحلها عبر ترك الترجمة الأولية للآلة بينما يتكفل المترجم بمراجعة دقتها وجودتها.

الكلمات المفتاحية: الذكاء الاصطناعي، الترجمة الالية، الترجمة البشرية، تحليل الأخطاء.

Anticipation de l'avenir des traducteurs à l'ère de l'IA et des pratiques et productions de machines.

Résumé

L'intelligence artificielle (IA) a récemment été au centre de l'attention médiatique internationale en raison de son impact sur tous les domaines, y compris la traduction. En conséquence, un débat vif, longtemps enfoui, a refait surface sur la question de savoir si ce développement technologique représente une menace pour l'employabilité future des traducteurs et interprètes, ou s'il s'agit d'un atout offert aux traducteurs pour innover dans le domaine et s'adapter à l'ère numérique afin de le hisser à des niveaux supérieurs. Dans le cadre de la réflexion sur l'avenir de la profession, une évaluation systématique a été menée pour évaluer l'efficacité de la traduction automatique dans la restitution de textes de divers domaines. Le but de cette recherche est d'étudier l'impact de l'intelligence artificielle sur le remodelage de l'industrie de la traduction. Elle fournit une évaluation systématique scrutée des sorties de la traduction automatique ainsi qu'un cadre théorique pour donner un aperçu de l'arrière-plan de la TA et de sa pertinence pour l'étude. Les résultats ont montré l'assistance indéniable que les outils de traduction IA offrent aux traducteurs, cependant, la nature complexe, diversifiée, sensible, et l'interconnexion des langues avec les humains sont loin d'être pleinement et pleinement stimulées. Les modèles alimentés par l'IA tels que GPT-4 peuvent traduire ; tandis que le traducteur humain se charge de la relecture.

Mots-clés : Intelligence Artificiel, Traduction Automatique, Traduction Humaine, L'analyse des Erreurs.

List of Abreviations

Abreviation	Expression
AI	Artificial Inteligence
EA	Error Analysis
HT	Human Translation
MT	Machine Translation
MTE	Machine Translation Evaluation
NMT	Neural-Based Machine Translation
RMT	Rule-Based Machine Translation
SMT	Statistical-Based Translation
ST	Source Text
TT	Target TEXT

List of figures

List of tables

Contents

Appendices

Introduction

In the realm of advancement, the distinguished leap of artificial intelligence shall not be overlooked. Recently AI has been the focus of science and the talk of the town due to its impact on all the domains thus translation deem no exception; making it faster, more efficient, and accessible on a global scale. Machine translation tools and AI algorithms have significantly enhanced the speed and accuracy of translation processes, enabling the rapid exchange of information across languages and cultures. The fast evolution of technology in automating translation had cached the concern of researchers, scholars and specially translation practitioners. With more and fast evolution of AI-based translation models; the concern has been escalated towards fear; as this radical change did not only demonstrated amazement of end users but also threatened the translators and interpreters' positions.

Objectives of the study

This study is conducted for several objectives to attend, personal and academic which we state below:

- Academic objectives

This study aims to give concrete evidences via a systematic study about the future state of art of translation industry face to face with the radical revolution that it faces.

It aims also to contribute in the field of computational linguistics, by giving a throughout insight of the dual outcomes of AI, in order to enhance the futuristic performance outputs.

- Personal objectives

As a translator, besides my passion of translation, unveiling the doubts about the future of the profession of translation is investigating my future career, it ensures and gives me a deep insight, and a final say on the new approach that the industry is adopting.

Research questions

- Main question

To what extent may artificial intelligence and machine translation practices and outputs, affect the translation industry?

- Sub questions
✓ How artificial intelligence is redefining the translation industry?
✓ What are the machine translation lapses?
✓ What are the machine translation advantages?
✓ Does AI fast evolution pose a threat to the translators and interpreters' jobs.

Hypotheses

In an attempt to answer our research questions, we are hypothesizing that:

✓ AI revolution is partially digitalizing the industry
✓ Automation is creating and increasing competitiveness in the market.
✓ MT cannot reach the cultural sensitivity background, language mastery and diversity that human translators can possess, especially in the literary texts, and the distant languages pairs.
✓ It is much realistic to consider AI as an asset that helps translators and interpreters to maximize their performance to its optimum, rather than a threat of their jobs.

Methodology

This research adopts a qualitative-descriptive approach that uses machine translation evaluation MTE, particularly adopting Costa et.al framework. As evaluation is the golden key to reveal MT quality performance.

Structure of the study

This research is made up of two chapters. The first chapter concerns the theoretical and conceptual framework in which we stated all the literature relevance to the

topic, it is about translation starting by giving its definition to its typologies, then focusing on machine translation, followed by machine translation assessment and finally concluded by a brief comparison between the Arabic linguistic features and English linguistic features.

The second chapter is the analytical and methodological framework, we explained the methodology opted for our study, described the chosen MT system and the selected data, and finally an analysis of MT outputs, followed by discussion of the results analysis.

Literature review

Much researches tackled this topic partially not fully; it has been studied from different perspective. According to a recent study by Khoshafah (2023), which evaluated the accuracy of ChatGPT for Arabic-English translation, the findings showed that ChatGPT-3 lack accuracy comparing to the human translation. In another study Seghour in her article entitled Translation Challenges in the Digital Age, (2023), she explores the translation present under the digital wave, however her study opted for desk research, another article by Benounane and Naceur, they examined the current state of machine translation, focusing on investigating the limitations of the statistical approach and the implications of neural models (Benounane & Naceur, 2020). Bouguesmia (2020) discussed the implications of using AI in translation. The study highlighted the effect of AI on the education sector. Many other studies conducted studies to evaluate the effectiveness of earlier MT tools such as Google translate in comparison to the human translation. Still, none of the above researches tried to tackle the possibility of replacing the human translators by AI-based translation tools throughout their results.

Limitation of the study

- Investigating this topic was struggled by technical issues, the system faces downtime in its peak hours.
- The deep learning technique is two-edged innovation, it makes GPT learn from its mistakes and information that the user provides which makes the study challenging, as the results changes according to the user inputs.

CHAPTER-I. Theoretical and

Conceptual Framework

As a vital practice, translation has been undergoing continuous progress and evolution, particularly with the introduction of machines and automation, and further accelerated by the AI revolution. This technological leap has revolutionized the field of translation. This chapter embodies the translation's vibrancy coping with the present-day advancement. It aims to provide a comprehensive overview of translation as a concept and its approaches within the AI development. Additionally, it delves into the assessment typologies of translation outputs, exploring different methods and criteria used to evaluate the quality of translated content and the efficiency of automation; concluding it with an overview of English-Arabic linguistic properties as the pair language of our study.

I.1. Translation Definition

Translation, in its broad definition, is the process of rendering texts or speeches from one language into another. It's compounded of the Latin roots' "trans" and "ation"; the first means "to carry across," and the second refers to "action." This combination reflects a sort of action of meaning being transferred across languages; in this sense Jacobson (1959) defines translation as: "two equivalent messages in two different cods". however, translation process still remains a sophisticated activity that involves components of complexity and intricacies going beyond a mere linguistic substitution. This is highlighted by Toury (1995) who sees translation as "taken to be any target-language utterance which is presented or regarded as such within the, target culture, on whatever grounds."

The aim of translation is not limited to understanding and converting the text but also to grasping its implications and ramifications. In addition to deciphering obscure meanings unknown to the translator, the challenge extends to articulating concepts that can resonate in the target language. Besides, the notion of "translation" itself can be understood differently as "process," "major," or "output," depending on the angle we adopt. Many researchers and linguists have defined translation based on diverse perspectives that revolve around the purpose, nature, practice, and related specializations of translation. In synthesizing and reconciling the diverse definitions put forth, it becomes apparent that while interpretations may vary, there is an underlying

consensus on the foundational principles of translation that consist in conveying the meaning across languages

I.2. Translation Typologies

Translation can be categorized based on two main factors: the performer of translation and the mode of translation. The first category concerns the executer of the translation task whereas the second refers to the manner of translation

I.2.1. Mode Typologie

I.2.1.1. Oral versus Written Translation

The mode of converting meaning between languages determine the type of translation, oral translation refers to interpreting, it is defined by Franz Pöchhacker (2004), in his textbook "Introducing Interpreting Studies" as "a form of translational activity in which a first and final rendition in another language is produced on the basis of one-time presentation of an utterance in a source language". He highlighted that interpreting is distinguished from written translation via its immediacy and not its orality. In the other hand written translation is generally referred to as "translation", it consists at converting the meaning of written texts and is a more formal translation comparing to interpreting, that require the total accuracy.

I.2.2. Performer Typologies

I.2.2.1. Human Translation (HT)

Known as traditional translation, human translation is an ancient practice and the oldest form of translation it consists on performing translation by human translators interpreting and converting text or speech from one language to another. it is still human as it is performed ultimately or partially by human with the possible intervention of machine within a kind of assistance.

I.2.2.2. Machine Translation (MT)

Machine translation is the translation performed automatically by a computer with different degrees of human involvement. Initially, machine translation systems were utilized primarily for translating scientific and technical documents from one

language (source language) into another natural language (target language). Later on, the machine translation purpose and audience had been generalized targeting all domains and industries including popular and personal use to chat in this globalized world.

Consequently, various definitions emerged, either general or more profound, deeply rooted in conceptual frameworks. However, in the digital age, the use of technology has become more prevalent and necessary in the practice and industry of translation. It has triggered a paradigm shift and evolution in the realm of translation; this calls for giving technology a more prominent place in defining translation

I.3. Machine Translation and AI

Investigating machine translation cannot surpass mentioning the artificial intelligence, deemed the root and revolutionizer of computational linguistic field in general and machine translation in particular.

I.3.1. AI Definition

Artificial Intelligence (AI) is a branch of computer science developed to simulate the behavior and performance of human brain using algorithms. It possesses the ability to learn by example and simulation, making predictions based on the knowledge it acquires (Abiodun et al., 2018). To define Artificial Intelligence, one must look back to the term origins. Thanks to John McCarthy, often referred to as the "father of AI", and the one who coined the term "artificial intelligence". He stated that artificial intelligence is the field that comprise creating machine intelligence rather than replicating the human intelligence, it does not only consist on mimicking the human intelligence; additionally, it learns it. This later enables the software to find solutions and perform tasks on its own without relying on the stimulation of the human intelligence through solutions that could be not existing in the parallel human world; therefore, this comprehension surpasses the constrains that human are biologically bounded by. Though the two definitions demonstrate some contradictions, AI indeed is still in the phase of stimulation.

In accordance to what has been mentioned earlier, Encyclopedia Britannica differently defines Artificial Intelligence as the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. In the same vein during a virtual scientific seminar Alcina (2008) described AI as the intelligent use of data to assist humans highlighting that the goal is to create software that can sense, think, manage, act and adapt, enabling machines to develop and think through data and algorithms.

Despite the different perspectives in defining artificial intelligence its commonly agreed that AI basically is the stimulation of human brain intelligence in performing tasks via software that utilizes algorithms to function.

I.3.1.1. Machine Learning (ML) in Translation

Machine learning played a significant role in translation industry, as it exceled the development of machine translation systems, and demonstrate effectiveness in statistical machine translation (IBM model). It deemed a radical shift in the quality performance of machine translation from RBMT to nowadays models.

Machine learning algorithms enable computers to learn patterns from data and make predictions or decisions without being explicitly programmed. In translation, machine learning models are trained on large amounts of bilingual text data to automatically learn how to translate between languages.

I.4. Machine translation Approaches (MTA)

The impact of technology leap has delineated MT into three distinct approaches that reshaped the translation since the emergence of automated translation, each approach has its deficiencies and efficiencies, which determined the use of each approach, causing the refinement and development of MT as an attempt to improve the shortcomings.

I.4.1. Rule Based Machine Translation (RBMT)

The primary model of machine translation historically was rule based MT, it is a traditional approach to MT that relies on pre-defined set of rules that encapsulate the

grammatical and syntactic structures of both SL and TL, in addition to extensive bilingual dictionaries that cover the semantic, syntactic, morphological and contextual knowledge to map words and phrases along with their equivalents in between the language pairs these rules were manually constructed; thus it makes it expensive and a hard task .

It becomes extremely difficult with rule-based systems to account for collocations, idioms, and other seemingly irrational linguistic features (Alansary, 2011; Alqudsi et al., 2012; Hutchins & Somers, 1992; Peng, 2013); moreover, this system lacks language fluency and the ability to adjust for the exceptions that occur in various languages (Systran, 2018).

I.4.2. Statistical-Based Machine Translation (SBMT)

Statistical Machine Translation (SMT) is a computational translation approach that had integrated machine learning within its system, in 1990, Brown et al. proposed the idea of SMT; he emphasizes the transition from rule-based techniques to data-driven methodologies in machine translation. This advancement enables machines to directly extract patterns and relationships from extensive datasets, hence improving the quality and adaptability of translation. It consists probabilistic models by analyzing the previous existing human translations known as bilingual corpora (assembled written texts in two languages).

This system does not rely on grammatical rules instead, the computer understands the functioning of the second language through the probability theory (Alqudsi et al., 2012; Zughoul & Abu-Alshaar, 2005). According to According to Benounane and Djilali (2020), SMT emergence was a response to the idea that language complexities cannot be settled and reduced in the scope of dictionaries and rules. Instead, the emphasis should be put on creating systems that can understand and learn translation via probabilities theory, the model efficiency arises significantly in the situation of choosing the accurate equivalents among several possibilities. The quality of the outcomes improves, accordingly with the information database growth.

I.4.3. Neural Machine Translation (NMT)

Neural Machine Translation (NMT) is the most advanced machine translation model, it performs translation task depending on a set and combined algorithms within neural network using Deep Learning technique to enhance the translation quality mimicking the human production and performance. The NMT has provided high quality performance in contrast to the other MT models with more accurate outputs leading the forefront of the Machine Translation industry. Therefore; it gained the attention of researchers as an attractive alternative approach (Ive, 2017, p. 17), contrasting the indivual's outputs (phrases and words) allows NMT to learn analyzing words within large context of a sentence, these systems can generate more precise automatic translations compared to previous MT approaches; therefore, advanced performance in terms of quality and accuracy.

It is worth noting, that the NMT evolving leap owed to the three technique that has been integrated which had incredibly improved the MT outputs, these three techniques are explained below.

I.4.3.1. Deep Learning (DL)

Deep learning is a new field in machine learning research. It establishes and simulates the neural network of the human brain for analysis and learning, and interprets the data by mimicking the mechanism of the human brain. At present, deep learning has made breakthroughs in many core problems of natural language processing. Machine translation tasks are one of the typical examples (Jiang et al., 2020). Deep learning is defined as part of machine learning that is governed by "a set of methods that permits computers to learn from data without human supervision and intervention

I.4.3.2. Prediction

NMT use the same concept of smartphones keyboards, when we write a message, a list of few suggestions will appear above the keyboard, the user may select or reject the suggestions. This is the prediction technique used by NMT, the decoder predict the most accurate possible target word, taking into account the parts of sentences that a professional translator has already typed (Forcada, M., 2017, p 296)

I.4.3.3. Attention

The essence of attention process effectiveness in MT lies in its ability to solve the problem of long sentence mistranslations produced by modern NMT models. The integration of the attention mechanism that focuses on parts of the source sentence during the translation process, which makes a soft selection over source words and yields an attentive vector to represent the most relevant source parts for the current decoding state (Zaixiang, Z., 2018, p 145). The process functioning is illustrated in the figure below; as it is demonstrated this mechanism works on two levels: the first level concerns linking words with the preceding word in the same sentence e.g. "one" and "this"; whereas at the second level the linkage is based on similar function of the words e.g. "not" and "n't" (Forcada, M., 2017, p 299).

Figure 1 : Attention process
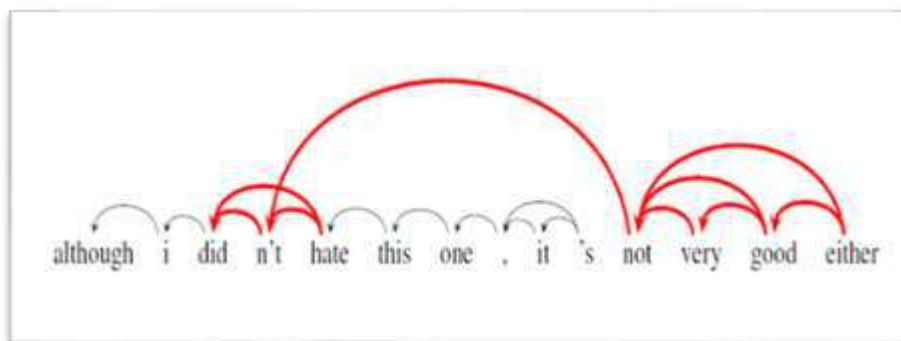
I.5. Quality in Machine Translation

Quality in translation is subject of significant interest, among the basic concepts underpinning translation research is the notion of 'equivalence'. Accordingly, in an attempt to assess meanings across two different languages and cultures, it is questionable to define what makes a good translation. Notably, Translation quality requires comprehension to determine various kinds of translation equivalence and identify translation errors (Chan, 2014). Quality is the ultimate standard to refuse or accept any translation.

I.6. Machine Translation Evaluation (MTE)

According to House (2001, p254), MTE is the set of processes that give credible results for translation quality relying on identifying a model that makes evaluative statements on the "goodness" or "badness" of a translation. It is a way of scoring translation quality. Evaluating translations has always been both academic and popular undertakings. Although the remarkable improved performance of MT lately, still, MT evaluation is indispensable and essential to bring in light the capacity of the system, especially, that some linguistic features such as emotional and stylistic features of the languages (Hutchins & Somers, 1992, as cited in Almahasees, Meqdadi, & Albudairi, 2021).

I.6.1. Automatic Evaluation

Automatic evaluation of machine translation is simply the process of assessing the MT outputs based on automated metrics such as BLEU and without any form of human intervention. It is a fertile field to dictate the effectiveness of the performance of MT systems EuroMatrix (2007,p.9). It consists on comparing MT outputs and the corresponding professional human translations (reference translations). Considering that Assessing machine translation through human judgment can be a laborious and costly; however, adapting for an automatic evaluation would be quick, cost-effective and offers objective numerical measurements of translation quality. Moreover, an automated evaluation measure can be employed for regular activities such as monitoring gradual system modifications during the development process, which may appear impractical in a manual evaluation scenario (Callison-Burch, Osborne, & Koehn, 2006).

I.6.2. Manual Evaluation

Although manual evaluation has been described as subjective and inconsistent, it is regarded by the researcher and (Chan, 2014) as the best method to evaluate MT outputs, and automatic metrics cannot replace it. The manual evaluation focuses on the quality of MT output and the usefulness of MT in dealing with the specific task that MT is expected to do. MT can be evaluated manually in terms of intelligibility, accuracy, and error analysis (EA). Intelligibility evaluates MT to identify grammatical

errors, mistranslations, and untranslated errors. Accuracy checks whether MT output preserves the ST meaning. Error analysis is the criterion for identifying errors found in MT output. (Costa et al., 2015a) show that error analysis is essential to all MT systems. Therefore, the current paper adopts error analysis to evaluate the output of Google Translate.

I.6.2.1. Error Analysis

Error analysis is the systematic examination of less or not successful language usage to determine its rate of frequency, peculiarities, reasons, and outcomes. This method is used to explore and classifies the faults within the output of a Machine Translation (MT) system. This critique is crucial for the reason that it permit discovering both the capabilities and drawbacks of the MT system. By highlighting faults and determining the reasons behind translation inaccuracies, EA strives to uncover the core causes of language processing difficulties. Through this analysis, developers and researchers obtain vital insights into the performance of the MT system, enabling them to enhance its accuracy and efficacy in handling varied language tasks. (Yang, 2010).

I.7. Arabic-English Linguistic Features

Arabic and English are two different languages that belongs to different families, in one hand Arabic is a sematic language of Afro-Asiatic family, in the other hand; English is German language that belongs to Indo-European language family (Al-Khresheh, 2016). Different families mean different characteristics and features, this divergence create uniqueness of languages as a genuine creation. The first saliant difference is their alphabetical system, while Arabic uses Abjadiya, its letters are written from left to write, English uses Latin alphabet, writing from right to left; it is universal and acronymic language. Besides, Arabic is heavily inflected language meanwhile English is poor inflected language. Cohen (2015) opines that English has relatively impoverished morphology comparing to Arabic due to its simplicity. Languages like Arabic have complex morphology in comparison to English which have relatively simple morphology. English on the other hand has concatenative morphology in which words can be made up of a main stem. A more apparent difference relies in Arabic phonetics, in contrast to English, Arabic relies on diacritics that determine the

morphosyntactic status of words. Whereas English, as an analytic language depends on word order and function words, since it has a strict type of worder order (SVO), reducing its flexibility comparing to Arabic. Another main difference between the two languages emerged under the automation of languages, according to Koehn and Knowles, Arabic is widely considered a language with law resources in terms of training data volume and computational linguistics advancement (2017).

Figure 2: Arabic versus English linguistic features

CHAPTER-II. Methodological and
Practical Framework

This chapter is devoted to the evaluation analysis of AI- based translation outputs between English, Arabic and French (as the intermediate language in many contexts in Algeria), for the sake of reliability and enrichment we have chosen samples of different texts, from different sources, and different domains to ensure the full coverage of the different MT output types. The study opted for descriptive qualitative approach, translations are tabulated, commented and analyzed in reference to the human translation, in order to understand the efficiencies and deficiencies of MT in converting the meaning and their causes, then the results discussion followed by chapter conclusion.

II.1. Methodology

This study aims to conduct an evaluation of the translation of an AI-based machine translation, as it needs to apply a structuring systematic methodology, for this reason, the present research has chosen (Costa et al.,) framework to evaluate the AI-based translations. This empirical descriptive qualitative research methodology is adopted to provide a concrete, solid, and most importantly constructive feedback about the quality of translation in terms of error analysis, which is regularly employed for evaluating the quality of machine translation. Costa et al.'s error analysis framework is the most prominent one that relates mutually between human error analysis frameworks and all previous MT error taxonomies, as shown in Figure 2.

Figure 3 : Costa et al error analysis taxonimy
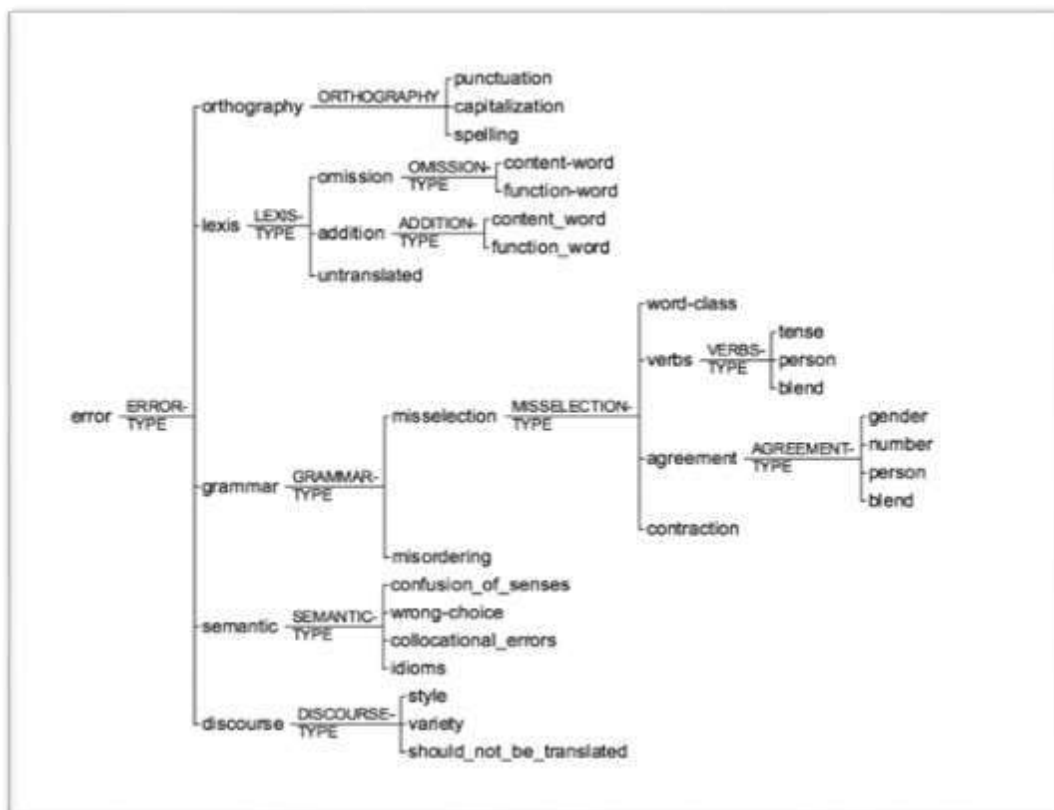
II.2. Data Collection

The samples of the study have been retrieved from various resources, personal, local, and international. The rationale behind this choice is to enrich and enlarge the study scope of MT output types within different contexts and guaranty the full coverage of errors made by the system, they are found alongside the appendices, in addition the length of the samples varied from very short to longer samples the reason is to see the performance of MT in accordance to the input size, however, we considered the translation unit and the context, the very small segment should still dictate the context, which is a paramount element in translation for both human and machine translators. for credibility screenshots of the chosen system results have been taken and organized in the appendices section detailing its timing.

II.3. Chosen MT System

Currently, the cutting edge of AI-based translation system is ChatGPT, according to several studies conducted on the basis of comparing effectiveness of MT systems, GPT is tested to stand as the best AI-based machine translation, for that reason, the last version "GPT4 Pro" has been chosen as the model of our study to test the quality of its outputs. As it is mentioned in figure 4, GPT-4 define itself as follow

Figure 4: GPT-4

GPT-4

GPT-4, OpenAI's most advanced AI model to date, excels in tasks that require advanced reasoning, complex instruction interpretation, and enhanced creativity. While it operates slightly slower than the ChatGPT model, it delivers superior outputs for tasks demanding higher reasoning skills.
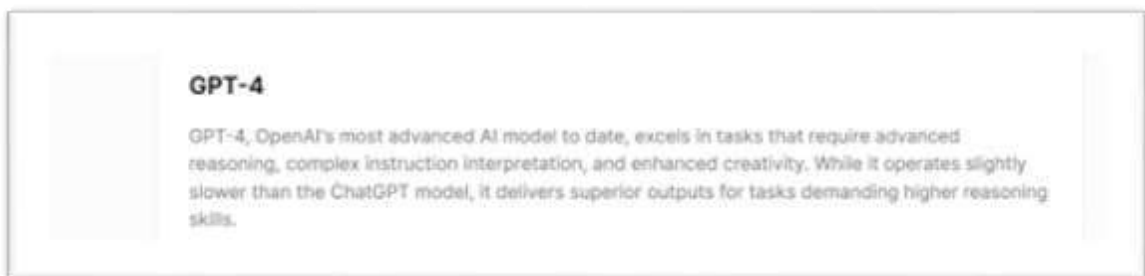
It is worth noting that during our study, the GPT-4 has been innovated to GPT4o, adopting with circumstances, we continued our study opting for the updated version (figure 5).

Figure 5: GPT-4o

GPT-4o

GPT-4o, OpenAI's most advanced AI model to date, excels in tasks that require advanced reasoning, complex instruction interpretation, and enhanced creativity. While it operates slightly slower than the ChatGPT model, it delivers superior outputs for tasks demanding higher reasoning skills.
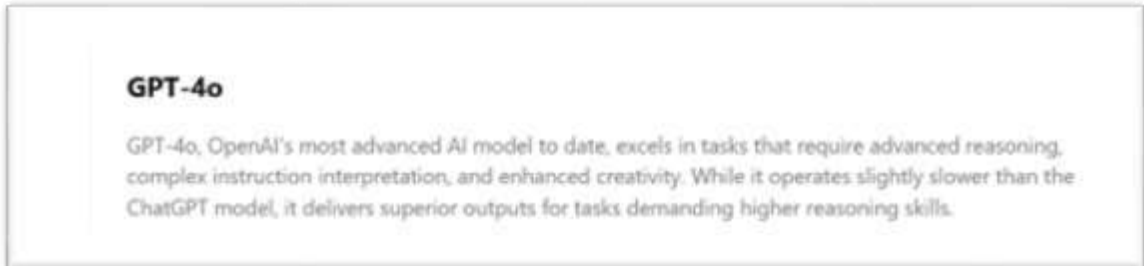
II.4. Results, Commentary and Analysis

II.4.1. Literary Context

Table 1: (Ar-Eng)

Original text	ولكنه رد عليها بطريقة لا يتقنها غير الجزائريين: ما دمت ضيفا عند الرئاسة...روحي لعند بن جديد "يسربيلك". ومضى ليتركها مذهولة
Translated text	But he replied in a way only Algerians could master: "As long as you are a guest at the presidency... Go to the New Gate and ask for Yacine, he will take care of you." And he left, leaving her stunned.

In the first example, the text is retrieved from Algerian literature of Ahlam Mostaghanimi novel "Chaos of the Senses". It is noticeable that GPT opted for literal translation and has failed in conserving the contextual meaning neglecting the contextual background in لا يتقنها إلا الجزائريين; it translated it literally into "only Algerians could master"; however, the segment intended to reflect the Algerian people mentality, it describes the tone that Algerians talk which is known among Arabs as furious and aggressive this latter is lost in the AI translation. producing both semantic and stylistic error. A suggested human alternate translation is "to which he replied, in a tone suited for Algerian passive-aggressiveness". Additionally, it is obvious that this system

cannot deal accurately with colloquialism nor mockery, it appears in the segment "روحي لعند بن جديد يسربيلك"the AI- based translation is nonsensical and phrased awkwardly, it translated "بن جديد"who was the president of Algeria at that time into "Yacine" or "the New Gate" it cannot be understood; besides neglecting the sarcastic intention of the source text. The accurate translation suggested to be "ask the president to host you, then…".

Table 2: (Eng-Fr-Ar)

Original text	It's raining cats and dogs
Translated text	Il pleut des cordes
Translated text	إنها تمطر بغزارة

In this example, an idiomatic expression is translated into two languages, Arabic and French; both translations are converted accurately; thus, the French translation is deemed high quality because it conserves the same semantic load and stylistic features of idiomatic expressions. On the other hand, the Arabic translation is accurate and correct concerning the overall meaning, but semantically speaking, ChatGPT falls short as it has lost its characteristic of idioms. The most accurate translation should be "إنها تمطر كأفواه القرب". It demonstrates the poetic and stylistic impression of the source text.

Table 3: (Ar-Eng)

Original text	إنها تمطر كأفواه القرب
Translated text	It's raining like the mouths of proximity

In this example we translated the accurate previous Arabic idiom into English and the result was interesting. Whereas, the idiom from English into Arabic was correctly translated, the inverse is not. A semantic idiom and morphological diacritic errors occurred due to literal translation of the idiom. Moreover, the results reflect the

inability of the system to understand or distinguish diacritics. The word "القِرب"is vowelized with kasra on the first letter which is in English "skins", but apparently the system misunderstood it to "القُرب" vowelizing the first letter with demmah and translated it into "proximity".

Table 4: (Eng-Ar)

Original text	Furious war
Translated text	حرب غاضبة

In this example we tested the ability of the system to translate collocations; unfortunately, the system does not consider pair words in translation into Arabic. In Arabic it is nonsense to say حرب غاضبة such combination does not exist. It could be translated into "حرب وعرة"still for an optimum equivalent and flawless language the pairing word for a war that is furious in Arabic is "حرب ضروس".

Table 5: (Eng-Ar)

Original text	Gracefull as a swan
Translated text	أنيقة كالبجع

This segment is chosen to examine the cultural and geographic dimensions and considerations that should be taken into account in AI-based translation. Graceful as swan is an English people expression that describe the amazement of someone towards a woman that is beautiful according to their standards of beauty. The English include the animal swan as it is symbol and reference of charm and grace; however, this animal does not exist in the Arab regions nor in their cultural background<, they refer the extreme beauty and grace of a woman to the "gazelle" specifically "الريم" by which Arab poets describe the charm of a woman. The literal translation provided by the system lacks understanding of the cultural background of the target language. The accurate translation that maintains the meaning would be "هي, غزالة...".

II.4.2. Scientific Context

Table 6: (Ar-Eng)

Original text	عثر على بعض الأدوات داخل الترسبات النهرية الحصوية.
Translated text	Some tools were found inside the gravelly river deposits.

This example is of scientific nature, precisely from archeology text; it contains highly precise jargon. The system performed properly in translating the segment but mistranslated the term "الترسبات النهرية الحصوية". The expression represents a term that should be translated into its proper jargon rather than the descriptive literal translation "gravel-fluvial sediments." provided by the model. The accurate human translation is "Some tools were found in gravel-fluvial sediments."

Table 7: (Ar-Eng)

Original text	إن تصنيف العصر الحجري القديم في الشرق الأوسط مازال قيد السؤال
Translated text	The classification of the Old Stone Era in the middle east is still under question

Following the previous example this excerpt is of archeological nature, the translation provided by the system is understandable and accurate in terms of converting the meaning; still, it lacks accurate terminology and precise context of archeologists. It is shown that the system is unable to identify the general context from the specific one. The phrase "the Old Stone Era" is a common expression, specialist would rather use the term "the Paleolithic". The proper translation should be as follow, the classification of the Paleolithic in the Middle East is still questionable.

Table 8: (Ar-Eng)

Original text	قام جاري رولسفون بعمل حفر إختبارية في الموقع
Translated text	Jerry Rolfson conducted test excavations at the site.

In the same vein, this excerpt is archeologist. The extract demonstrates two types of errors: the first concerns the proper name, while the second concerns confusion of senses. The system is confused between the sounds /g/ and /dʒ/. As Arabic does not have the letter of the sound /g/, it translated the proper noun into "Jerry" instead of "Garry." The same goes with his last name; it is misspelled "Rolfson" instead of "Rollefson." On the other hand, confusion of sense occurred due to choosing words that did not suit the context. The term "test excavations" refers to the investigation of a site to evaluate its potential; however, "experimental holes" is the proper term, which refers to digs at an archeological site in order to study ancient civilizations. The human-accurate translation is, "Garry Rollefson did experimental holes in the area".

Table 9: (Eng-Ar)

Original text	The contagious virus is spread by coughing and sneezing
Translated text	يتم نقل الفيروس المعدَّ بواسطة السعال والعطس

As is apparent, the structure of the AI-provided translation is not so smooth; it is influenced by the source language, has kept the passive form, and does not follow Arabic preferences. In this example, the passive voice distorted the harmony of the Arabic text. It should be transferred into the active voice " تنتشر عدوى الفيروس عبر السعال والعطس ". It is noticeable that, in addition to the active voice, the verb "ينتقل," which is basically "transported," in English, which is not the case, is also replaced by "ينتشر," which is the most convenient. The same goes for "بواسطة"; it should be converted to "عبر". Also, a morphological error occurred in "المعدَّ," which is wrong because the last letter is supposed to be vowelized by kesra; otherwise, the meaning is distorted. This error refers to the different morphologies between the pair languages, as the English

system does not have the diacritization MT struggles to convert the correct diacritics of the word.

Table 10: (Ar-Eng)

Original text	إحتشاء عضلة القلب
Translated text	Cardiac Muscle Hypertrophy

This example shows the concrete fatal mistakes that translation could make. The whole expression "إحتشاء عضلة القلب" is a pure medical term that refers to what is commonly known as "heart attack"; however, AI has translated it into another heart-related disease, which is "Cardiac Muscle Hypertrophy. Though they are both cardiac illnesses, each has a different diagnosis, symptoms, and treatment. The scientific term for it is myocardial infarction.

Table 11: (Fr-Eng-Ar)

Original text	« Les virus sont infectieux et potentiellement pathogènes ; ce sont des entités nucléoprotéiques possédant un seul type d'acide nucléique ADN (acide désoxyribonucléique) ou ARN (acide ribonucléique) ; ils sont reproduits par la cellule à partir de leur matériel génétique ; ils sont incapables de croître et de se diviser »
Translated text	The text translates to: "Viruses are infectious and potentially pathogenic; they are nucleoprotein entities possessing a single type of nucleic acid, either DNA (deoxyribonucleic acid) or RNA (ribonucleic acid); they are reproduced by the cell from their genetic material; they are incapable of growing and dividing."
Original text	الفيروسات معديّة وقد تكون ضارة للصحة؛ إنها كيانات نووية بروتينية تحتوي على نوع واحد من الحمض النووي، إما حمض الديوكسي ريبونوكليك (DNA) أو

	حمض الريبونوكليك(RNA) ؛ تتكاثر بواسطة الخلية من خلال استخدام المواد الوراثية الخاصة بها؛ وهي غير قادرة على النمو والانقسام.

This virology translated English text was rendered flawlessly, it contains the accurate terms with the appropriate style that scientific texts require, which demonstrate the ability of GPT to deal with such texts from French into English. In contrasts the Arabic translation is deformed by morphological, grammatical and lexical errors. which immensely effected the tangibility and the flaw of meaning of the translation, firstly, it's apparent that the system struggles in punctuation of different languages systems, Arabic has different rules of punctuation which were not respected, AI model kept the same punctuation marks in the Arabic text or deleted them like the quotation marks, which affects its flaw of idea and understanding. In addition, the system is impotent concerning rendering acronyms and their significations in the correct grammatical order. Moreover, the acronyms significations were transliterated according to their phonetics though they have their equivalents in Arabic, it reflects the bias of GPT towards source language producing lexical errors. The correct translation is as follow :

"إن الفيروسات معدية وقد تكون ضارة للصحة؛ فهي كيانات نووية بروتينية تحتوي على نوع واحد من الحمض النووي إما الحمض النووي الريبوزي منقوص الأكسجين (DNA)أو الحمض النووي الريبوزي (RNA)"

II.4.3. Media Context

Table 12: (Ar-Eng)

Original text	وصول رئيس البعثة إلى سورية والزيارات الإستكشافية التي قام بها
Translated text	The arrival of the mission's leader to Syria and the exploratory visits they have conducted.

The media language is generally accessible and term-free; however, it is not always that easy to translate, as is projected in this extract. AI has literally converted "رئيس البعثة" into "the mission's leader," which is not correct; it's commonly referred

to as "the head of the mission." The AI translation has also ignored the context of the source text, in which it indicates a diplomatic situation; however, "explanatory visits" are a part of an expedition, and it obviously does not serve the context. The semantic wrong choice error affects the accuracy of the text. The proper translation is "the arrival of the Head of the Mission to Syria and his preliminary visit.

Table 13: (Ar-Eng)

Original text	عبد المجيد تبون قال: القضية الفلسطينية قضيتنا جميعا وأسديت تعليمات للتكفل بالطلبة الفلسطينيين بالجزائر
Translated text	Abdelmadjid Tebboune said : The Palestinian cause is our cause, and I have given instructions to take care of Palestinian students in Algeria.

This AI output illustrate a good example of the improvement of machine translation, it is flawless without any mistake at any language level with no loss or gain.

Table 14: (Ar-Eng)

Original text	استقبل مدير جامعة الجزائر 3, خالد رواسكي, يوم الخميس, سفير جمهورية بنغلادش بالجزائر, محمد ذو القرنين, حيث شكل اللقاء فرصة لتعزيز العلاقات بين

	هذه المؤسسة الجامعية الجزائرية والجامعات البنغالية وكذا السعي لإبرام مذكرة تفاهم لبعث التبادل الأكاديمي وترقية البحث العلمي بين البلدين, حسب ما أفاد به بيان لجامعة الجزائر 3
Translated text	The president of the University of Algiers 3, Khalid Ruwaski, received on Thursday the Ambassador of the People's Republic of Bangladesh to Algeria, Muhammad Zu Al-Qarnayn. The meeting served as an opportunity to strengthen relations between this Algerian university and Bangladeshi universities, as well as to strive for the signing of a memorandum of understanding to promote academic exchange and enhance scientific research between the two countries, according to a statement by the University of Algiers 3.

ChatGPT performed well in this text, with fluency and accuracy in maintaining meaning, structure, and style; however, it still falls short when it comes to titles. The director of the university is not called "president," as GPT mistranslated it, referring to the source language "الرئيس". Instead, the proper translation for "رئيس الجامعة" is "the rector." This semantic error of wrong choice occurred due to the different systems, positions, and titles in different countries.

Table 15: (Ar-Eng)

Original text	الفريق أول شنقريحة يشرف على تمرين تكتيكي بالذخيرة الحية " الحصن" 2024
Translated text	The first team Shangriha supervises a tactical training with live ammunition "Al-Hussein 2024."

It seems that AI faced problems in translating this local extract that contains local lexemes, causing meaning distortion in the sentence. The title "الفريق أول" is a military rank in the Algerian military system; its equivalent in American and British militaries is referred to as "General." The output provided by AI is meaningless; it occurred due to the lack of knowledge and unfamiliarity of the AI translator with the military systems of other countries. Due to that, GPT opted for the literal translation "the first team," which is a lexical mistranslation error. Additionally, the translation of the proper noun "شنقريحة" is a morphological spelling error "Shangriha"; the Latin writing of the sound /ʃ/ for Algerians is the combination of the letters "c" and "h." Though many overlook the correct spelling of proper nouns, this cannot be taken as trivial since it legally represents the identity and existence of a human being. Moreover, it appears that AI cannot distinguish between proper name types; it translated "الحصن", which according to the source text refers to a military strategy title, into "Al-Hussein" occurring morphological diacritic error, it rendered it to the name of person "الحُسَيْنْ". This latter emphasizes the inability of AI to identify homophones due to diacritization.

Table 16: (Eng-Fr-Ar)

Original text	WHO has published Q&As on ventilation and air conditioning for both the general public and people who manage public spaces and buildings.
Translated text	L'OMS a publié des questions-réponses sur la ventilation et la climatisation à la fois pour le grand public et les personnes chargées de la gestion des espaces publics et des bâtiments.
Translated text	منظمة الصحة العالمية (WHO) نشرت أسئلة وأجوبة حول التهوية والتكييف لكل من الجمهور العام والأشخاص الذين يديرون الأماكن العامة والمباني.

This extract is translated into two languages; in the first French translation, we observe the full conversion of meaning, owing to the similarities in grammar, syntax, lexis, and even the systems of the two language-speaking countries. In contrast, the Arabic translation contains major issues in its syntactic structure and word order. The

system misordered" "أسئلة و أجوبة" and "منظمة الصحة العالمية"; however, it did well in translating the acronym WHO and keeping it between brackets. but it should not precede the full Arabic title of the organization. The accurate human translation would be as follow : "نشرت منظمةالصحة العالمية أسئلة و أجوبة حول التهويةو التكييف لكل من الجمهور و الأشخاص الذين يديرون الأماكن العامة و المباني."

II.4.4. Legal Context

Table 17: (Eng-Ar)

Original text	Notwithstanding any other term or condition expressed or implied
Translated text	بغض النظر عن أي شرط آخر معبّر عنه أو مُقدم كمفروض

In the example above, the purely legalese word "notwithstanding" is translated into "بغض النظر." This semantic confusion of senses error emphasizes the inability of the AI translation model to deal with archaic words (old vocabulary) that characterize legal English. Besides, the word "term" has been omitted, though it's essential in a legal context to be precise and rigorous. Moreover, "expressed or implied" is paraphrased in its translation, "معبّر عنه أو مَقدم كمفروض" rather than providing its exact, accurate equivalent, "صريح أو ضمني". Overall, the Arabic AI-based translation was plain and not appropriate for the legal language, which requires a high formal registre and specific jargon. The right legal Arabic translation would be, " بصرف النظر عن أي شرط أو حكم آخر صريح أو ضمني"

Table 18: (Eng-Ar)

Original text	Those who aid and abet corruption offences shall be punished with the same penalty applicable to the perpetrator
Translated text	أولئك الذين يُساعدون ويُواطؤون في جرائم الفساد يجب أن يعاقبوا بنفس العقوبة المطبقة على الجاني.

This example contains pair word, which are common in the legal English language, the system failed in translating them accurately but maintained the meaning. The collocational equivalent of "aid and abet" in Arabic is "يساعد و يحرض". apparently, the system cannot identify the features of the legal Arabic which uses the singular absent pronouns to maintain formality and precision. The formal concise translation is "يُعاقب من يساعد ويحرض على الفساد بنفس عقوبة الجاني"

Table 19: (Fr-Eng-Ar)

Original text	Conformément à la loi N° : 08-09 du 25 02 2008 et conformément aux dernières modifications du code civil N° : 07-05 du 13 05 2007
Translated text	In accordance with Law No: 08-09 of 25 February 2008 and in accordance with the latest amendments of Civil Code No: 07-05 of 13 May 2007.
Translated text	وفقاً للقانون رقم: 08-09 مؤرخ في 25 فبراير 2008 ووفقاً لآخر تعديلات للمدني رقم: 07-05 مؤرخ في 13 مايو 2007.

This example, proves that GPT performs well, it communicated the meainig accurately into the both languages English and Arabic, but still stumbles in some lexical and grammatical issues in Arabic, it struggles in converting the full text, the system made a lexical omission error, it ommited the equivalent of ''code'' which suppose to be translated into "القانون" besides the omission of proposition ''du'' ; these eroors

produced an abnormal phrasing in "تعديلات للمدني" re sult inguninteligible of the output moreover it's noticebal that the punctuation in Arabic is put according to source text rather than the Arabic ponctuation system.

Table 20: (Ar-Eng)

Original text	كشف للأحكام السابقة والحالة المدنية
Translated text	Disclosure of previous judgments and civil status.

The system has made a lexical mistranslation error, due to literal translation of "كشف"into "disclosure" instead of "statement". And semantic wrong choice error for the word "judgments" instead of "convictions" and semantic confusion of senses error for the word "previous" instead of "past". The proper translation is, "Statement of past convictions and civil status."

Table 21: (Ar-Eng)

Original text	القاضي المكلف بالمركز الوطني لصحيفة السوابق القضائية
Translated text	The judge assigned to National Center for Judicial Records.

In this sample, we detected grammatical and lexical errors. The first is the mis-selected preposition "to" instead of "at" for Arabic preposition "ل", besides adding the article "the" interfered by the source text. The other is the semantic wrong choice in translating "السوابق" into "records" instead of the accurate correct term pre-criminals. We can notice that the system did well in capitalizing the institution as it is a proper noun. The accurate whole rendition would be "Judge in charge at the National Center of Judicial Pre-criminals.

II.4.5. Administrative Context

Table 22: (Fr-Eng-Ar)

Original text	Une demande de financement dûment signée suivant le modèle BNA.
Translated text	A funding request duly signed following the BNA model.
Translated text	طلب تمويل موقّع بشكل صحيح وفق نموذج البنك الوطني التونسي.

The rendition of this segment into French was well performed, but for a polished language, the verb "suivant" should be rendered as "according to." The Arabic translation was very literal, causing an unnatural output that contains lexical errors. Though GPT outperformed the traditional MT by converting the acronym instead of conserving it untranslated, the system translated it wrongly. The "A" of "BNA" stands for Algeria, not Tunisia; however, the system confused between countries, it rendered it into "البنك الوطني التونسي ". Additionally, the more accurate way to translate "dument signée" is into "حسب الأصول.". The full, correct translation would be as follows:

"A funding request duly signed according to the BNA model"

"طلب تمويل موقّع حسب الأصول وفق نموذج البنك الوطني الجزائري".

Table 23: (Ar-Eng)

Original text	كشف النقاط أستاذة مستخلفة لغة فرنسية شهادة نجاح مؤقتة
Translated text	Score sheet Substitute French language teacher Temporary success certificate

The first two examples illustrate the semantic wrong choice errors in the bureautic formal settings of administrative language; the segments were translated vaguely without any consideration of their register; still, wrong choice didn't mislead the overall understanding of the first two segments. In contrast, the last example shows a lexical error "temporary", which means not permanent, due to a literal mistranslation of the word "مؤقتة" disregarding the specific context that requires specific terminology. Forasmuch, this error does deviate and mislead the meaning of the source text. The accurate translations of the three segments are as follow:

Transcript Results

Interim teacher of French Language

Provisional Certificate of Success

Table 24: (Ar-Eng)

Original text	يتعهد الطالب بالالتزام بميثاق الآداب والأخلاقيات الجامعية
Translated text	The student undertakes to abide by the code of conduct and university ethics

The provided AI-based translation had communicated the meaning with clarity and accurately, it is error free but in administrative writings specific terminology should be respected in addition to the tense and modals; legal and administrative languages are known for the use of the modal "shall' that indicates obligation or requirement instead of the present, and tense should be respected, which was not achieved by the system. The translation is simple, informal, and characterized by common tone. The most flawless translation should be "The student shall be committed to the charter of manners of university ethics."

Table 25: (Ar-Eng)

Original text	تنبيه: لا تمنح إلا نسخة واحدة من هذه الشهادة
Translated text	Warning: Only one copy of this certificate will be issued

This example contains semantic confusion of senses error. The word" warning" has a strong load of abrasive tone, whereas the word "تنبيه"in the administrative documents refers to the intention of drawing attention or highlighting an important point or information, its equivalent in English is the Latin word 'nota bene" generally abbreviated into "N.B." Besides, the system produced a grammatical error in the translating the model verb "will", it should be replaced by "is" to demonstrate certainty in the formal context rather than the future. Furthermore, translation"هذه" into ''this'' instead of the appropriate lexicon "herein" is a semantic wrong choice error. The translation should be "N.B. only one copy of the herein certificate is issued."

Table 26: (Ar-Eng)

Original text	لا يمنح نظير آخر من هذه الشهادة
Translated text	No counterpart is granted this certificate

In this example we notice a wrong choice semantic error occurred in translating"نظير", which refers to another "copy" into "counterpart" which means "the opponent". This incorrect denotative meaning affects negatively the understanding and the meaning of source text. Additionally, the system fails to consider the formality of administrative language. The segment should be translated into, "Only one copy of the herein certificate is issued."

II.5. Discussion

Through the result provided by GPT, we can notice that the system is unable to comprehend the context at its different levels within the pair language (AR-Eng-Ar), it is apparent in all the text types, except for the media texts in which AI

performance was satisfying to some extent e.g. table 12, still had flaws when the text contains proper names or titles of different intersystem e.g. table 12, 13, and 14. Ad-

Figure 6: Myocardial infraction and cardiac muscle hypertrophy comparison
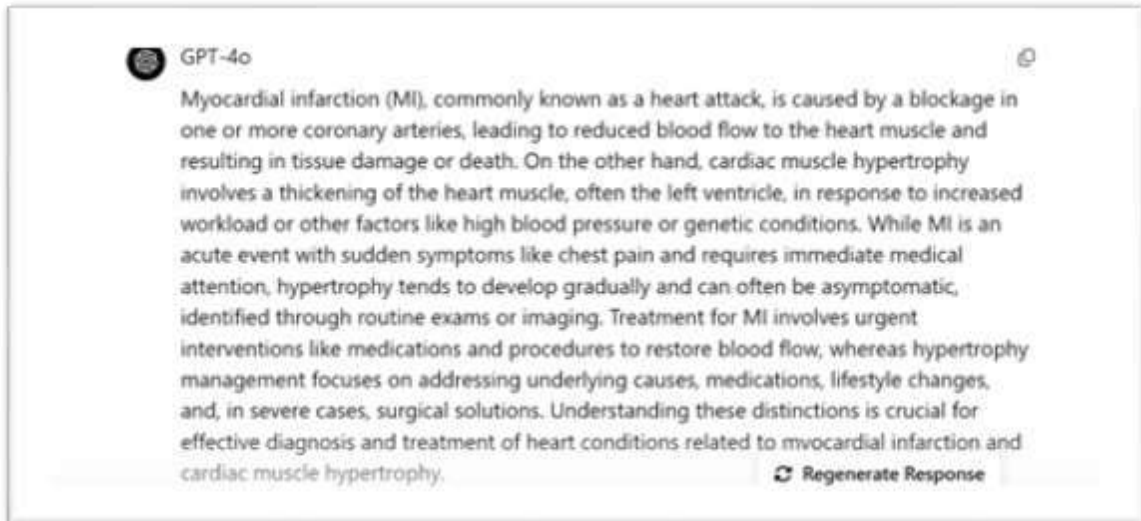
ditionally the stylistics of the source text was not rendered appropriate e.g. Table 4 due to the different geographical and cultural background of the pair languages, the differences of the pair languages had effect on the accuracy while translating, it was reflected significantly in the inability of the system to translate the idioms table 3, the collocations table 2, and the colloquialism table 1, in contrast the beforementioned situation did not affect the correctness of translation when it comes to same family languages. Worth mentioning AI has showed fatal errors in translating technical text particularly medical and archeology terms, it is clearly seen in the example of table 9, the system confused between two different terms that belongs to the same field. This confusion emphasizes the inability of AI to surpass the human intelligibly in encountering the nuances and produce the correct one, this is reinforced by the fact that the system comprehends that "myocardial infraction" and "cardiac muscle hypertrophy" are two different terms of different heart related diseases (shown in figure 6);

Still misselecting the accurate equivalent. The bias of the system to the ST is remarked through its transliteration of scientific term e.g. table 21; the system opted for phonetic translation of the both deoxyribonucleic acid and ribonucleic acid

The same goes with the archeology terms (table 7), the system miss confused the convenient equivalent of the term "حفر إختبارية", thought its understanding of the related terms (figure 7);

Figure 7: Test excavations and experimental holes comparison

> GPT-4o
>
> Test excavations and experimental holes serve different investigative purposes. Test excavations, commonly used in archaeology and preliminary geological surveys, involve digging small trenches to identify artifacts or features and understand site stratigraphy, providing preliminary data for further exploration. In contrast, experimental holes, often used in geology, engineering, and environmental studies, involve drilling narrow, deep boreholes to test scientific hypotheses, gather detailed subsurface samples, and inform resource estimation or construction planning. Test excavations offer initial site insights, while experimental holes provide specific, detailed subsurface data.

The system cannot handle acronyms, it struggles differently in converting the right and full expression according to different situation; in table 15 a lexical mistranslation occurred resulting a misleading expression whereas in example of table 21 the translation was according to the target text, resulting wrong grammatical phrasing. Furthermore, the supposed formal administrative language tone of the TT is not respected (tables: 21,22,23,24,25) including the documents titles, the system uses plain language that is more descriptive than technical, thus, in example 24 and 25 the meaning was distorted due to the system inability to figure out the polysemy of the word "نظير" and "تنبيه"which indicate the disability of AI to dictate the intended meaning of polysemous words. Likewise, in the legal text the AI translation lacked proper legalese, in addition to the lexical and grammatical errors.

II.6. Conclusion

This chapter consisted on providing the methodological and practical framework of our study, it explains the methodology used including the data collection which was retrieved from various resources, it also described the chosen system for the study, and the data analysis of the AI-based translation outputs provided by GPT-

4 and GPT-4o, via error analysis framework of Cosata et al. to evaluate MT performance, and its accuracy, according to the results GPT performs well in the free terminology context in comparison to technical and literary text. It is apparent through the results that the system accuracy in its translations from Franch into English and vice versa was of high level, opposing to their translations into Arabic, besides the model showed a law performance in identifying scientific terms; therefore, we cannot impair the improvements and the stunning development of AI in enhancing the translation quality outputs, it can be shown in some of the texts that AI greatly succeeded in translating accurately without producing any error at any level.

Conclusion

Upon exploring the topic we conclude with constructive answers, to confirm or disconfirm our hypothesis of the research questions, synthesize the research findings, stating limitations, suggesting future research, and finally providing recommendations.

The topic of this study is a buried inquiry that reemerged via AI leap, besides the accumulative knowledge that this research will contribute to academia, it is being conducted out of my passion for translation and my concern for my possibly threatened future career; as someone should stand for this concern and provide satisfactory solid answers. In this dissertation, we attempted to explore, explain, and highlight the efficiencies and deficiencies of MT outputs and how it could reshape the translation industry according to the findings.

In order to achieve our objective, we divided our dissertation into two main chapters, the first is theoretical, it concerns the literature relevance of the topic while the second is practical, it represents methodology and data analysis alongside with the results discussion.

On the course of our analysis we answered our research questions systematically, it is evident now to say that automation did and is continuing reshaping the translation from a very human traditional translation to another ever seen level via semi-digitalizing the translation industry, as the findings of scientific texts reflected a high performance, smooth and unremarkable mistakes in the phraseological level, however, translation could never be fully automated, the occurrence of errors will always require the human intervention. According to the findings, the high quality of the outputs is two edged, AI produce almost free error translation in many cases this may mislead the understanding of the ST and provide translation with wrong information rather a mistranslation that could be recognized through the wrong morphosyntax structure, as the errors are hard to be detected by non-experts of the field. The very positive aspect of AI-based translation is that it saves effort for translators, a translator can rely on MT for draft translation, but peer reviewing by human translator is a must. This proved unprecedented high-quality outputs will definitely create a competitive market for translators as people will accept these promising results and the market will adopt to a new modern approach of AI-based translation especially when it concerns

common conversations, like in tourism and other situations when free-terminology language is used. It is imperative to state that though the benefits of MT in saving time and effort for translators it falls short in literary context. AI stand unable to understand the sensitivity and background of languages as well as their stylistic and artistic features. This was so apparent in the findings, moreover languages interconnectedness is another obstacle. It is paramount to state that AI do well in same family pair languages in contrast to the distant pair languages, and more specifically it is trained on the Indo-European languages that have common grammatical and syntactical systems and same systems whereas languages like Arabic are still too far to be fully comprehended by machines, as AI cannot figure out the correct diacritization of a word. This latter plays the core role of the words function in Arabic, not to forget the non-understanding of mockery, colloquialism, tone and all the languages features that represents the language genius of the language which could be mastered only by human being as it reflects them as communities and as individuals. These fatal lapses of translation due to languages complexities that cannot be overcoming by AI, at least for the next ten centuries within the distant languages pair. Therefore, translation stakeholders should be on ease and follow their nature as human are adaptative creatures and cope up with the day's innovation and benefit from the technology blessing, they can use AI as an indispensable tool for them to be able to keep pace with the radical transformation. It is hoped and expected that this study answered the inquiries concerning the future of translation, and provided a further knowledge with constructive and reasonable arguments.

This study has contributed in investigating the quality of AI-based translation and forecasting its quality impact on the profession, and it could be extended to further researches. It was found that, future studies may consider a large scale of survey including the perspectives and prospects of interpreting from translation stakeholders' perspective, their opinions could have provided a more comprehensive insight and a different view onto the state of art of translation industry under the digital wave. It is hoped and expected that this study answered the inquiries concerning the future of translation, and provided a further knowledge with constructive and reasonable arguments.

Recommendations

- Translation stakeholders:

✓ It is recommended for translators to opt for AI tools such as GPT-4, in order to cope up with this revolutionized and competitive market; the translator should use MT tools for draft translation, while they could be only concerned by the accuracy and fulfilment of proofreading.

✓ It is recommended to adopt AI translation outputs in translation classes as material of analysis, especially in contrastive linguistics in order to train and enhance the future translator's sensitivity of words selection.

- Computational linguistics specialists:

On the reason of not letting Arabic behind in this digital age it is recommended to:

✓ integrate Arabic into the mainstream of computational linguistics, and develop comprehensive corpora via building extensive and diverse corpora covering various Arabic dialects.

✓ Investing in the development of sophisticated morphological analyzers to address the complexity of Arabic morphology in order to enhance the translation quality, especially with the grammatical order.

✓ Develop and maintain databases that contain global and local acronyms along with their Arabic translations and expansions.

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Appendices

Appendix I:

Figure 8: GPT screenshot, 11:38 PM 19/05/2024 (Table 1).

C Chaima Hider

و لكنه رد عليها بطريقة لا يتقنها غير الجزائريين: مادمت ضيفا عند الرئاسة...روحي لعند بن جديد "يسربلك". و مضى ليتركها مذهولة

GPT-4

But he replied in a way only Algerians could master: "As long as you are a guest at the presidency... Go to the New Gate and ask for Yacine, he will take care of you." And he left, leaving her stunned.

↻ Regenerate Response

Figure 9: GPT screenshot, 08:22 PM 19/05/2024 (Table 2)

C Chaima Hider

it's raining cats and dogs

GPT-4o

Il pleut des cordes

Figure 10:GPT screenshot, 8:24 PM 19/ 05/ 2024 (Table 2)

C Chaima Hider

It's raining cats and dogs

GPT-4o

انها تمطر بغزارة

↻ Regenerate Response

Figure 11: GPT screenshot, 11:37 PM 15/05/2024 (Table 6)

GPT-4

The translation of the given Arabic text " عثر على بعض الادوات داخل الترسبات النهرية الحصوية" to English is:

"Some tools were found inside the gravelly river deposits."

Figure 12: GPT screenshot, 03:29 PM 18/05/2024 (Table 7)

GPT-4

The classification of the Old Stone Era in the Middle East is still under question.

إن تصنيف عصر الحجر القديم في الشرق الأوسط مازال قيد السؤال. :In Arabic

Figure 13: GPT screenshot, 8:19PM 19/05/2024 (Table 3)

Chaima Hider

انها تمطر كأفواه القرب

GPT-4o

It's raining like the mouths of proximity.

Figure 14: GPT screenshot, 08:27 PM 19/0502024 (Table 5)

Figure 15: GPT screenshot, 08:04 PM 23/05/2024 (Table 20)

Figure 16: GPT screenshot 01:43 PM 17/05/2024 (Table 26)

Figure 17: GPT screenshot, 03:29 PM 24/05/2024 (Table 11)

C Chaima Hider

« Les virus sont infectieux et potentiellement pathogènes ; ce sont des entités nucléoprotéiques possédant un seul type d'acide nucléique ADN (acide désoxyribonucléique) ou ARN (acide ribonucléique) ; ils sont reproduits par la cel-lule à partir de leur matériel génétique ; ils sont incapables de croître et de se diviser »

GPT-4o

الفيروسات معدية وقد تكون ضارة للصحة: إنها كيانات نووية بروتينية تحتوي على نوع واحد من تتكاثر (RNA) أو حمض الريبونوكليك (DNA) الحمض النووي، إما حمض الديوكسي ريبونوكليك بواسطة الخلية من خلال استخدام المواد الوراثية الخاصة بها: وهي غير قادرة على النمو والانقسام.

Figure 18: GPR screenshot, 01:20 PM 17/05/ 2024 (Table 24)

C Chaima Hider

يتعهد الطالب بالإلتزام بميثاق الآداب و الأخلاقيات الجامعية

GPT-4o

The student undertakes to adhere to the code of conduct and university ethics.

Figure 19: GPT screenshot, 01:32 AM 22/05/2024 (Table 16)

C Chaima Hider

WHO has published Q&As on ventilation and air conditioning for both the general public and people who manage public spaces and buildings

GPT-4o

نشرت أسئلة وأجوبة حول التهوية والتكييف لكل من الجمهور العام (WHO) منظمة الصحة العالمية والأشخاص الذين يديرون الأماكن العامة والمباني.

Figure 20: GPT screenshot, 12: 56 AM 22/05/2024 (Table 22)

C Chaima Hider
Une demande de financement dûment signée suivant le modéle BNA.

GPT-4o
A funding request duly signed according to the BNA template.

Figure 21:GPT screenshot, 11:42 PM 21/05/2024 (Table 12)

C Chaima Hider
وصول رئيس البعثة إلى سورية و الزيارات الإستكشافية التي قام بها

GPT-4o
The arrival of the mission's leader to Syria and the exploratory visits they conducted.

Figure 22: GPT screenshot, 11:30 AM 19/ 05/ 2024 (Table 13)

C Chaima Hider
عبد المجيد تبون قال: القضية الفلسطينية قضيتنا جميعا و أسديت تعليمات للتكفل بالطلبة
الفلسطينيين بالجزائر

GPT-4
Abdelmadjid Tebboune said: The Palestinian cause is our cause, and I have given
instructions to take care of Palestinian students in Algeria.

Figure 23:GPT screenshot, 11:53PM 23/05/2024 (Table 19)

Chaima Hider

Conformément à la loi N°: 08-09 du 25 02 2008 et conformément aux dernières modifications du code civil N°: 07-05 du 13 05 2007

GPT-4o

In accordance with Law No: 08-09 of 25 February 2008 and in accordance with the latest amendments of Civil Code No: 07-05 of 13 May 2007.
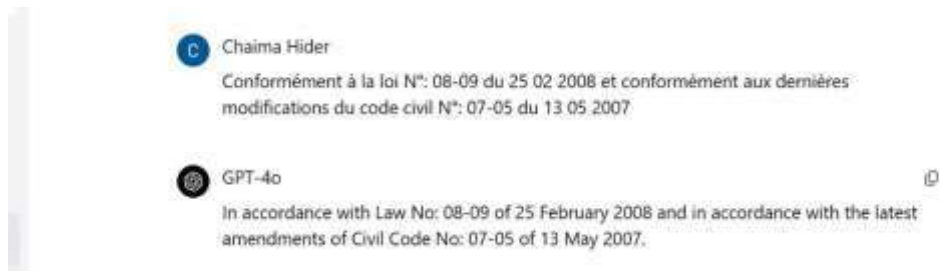
Figure 24: GPT screenshot, 3:23 PM 24/05/2024 (Table 11)

Chaima Hider

« Les virus sont infectieux et potentiellement pathogènes ; ce sont des entités nucléoprotéiques possédant un seul type d'acide nucléique ADN (acide désoxyribonucléique) ou ARN (acide ribonucléique) ; ils sont reproduits par la cel-lule à partir de leur matériel génétique ; ils sont incapables de croître et de se diviser »

GPT-4o

The text translates to: "Viruses are infectious and potentially pathogenic; they are nucleoprotein entities possessing a single type of nucleic acid, either DNA (deoxyribonucleic acid) or RNA (ribonucleic acid); they are reproduced by the cell from their genetic material; they are incapable of growing and dividing."

Figure 25: GPT screenshot, 06:09PM 20/05/2024 (Table 17)

Chaima Hider

Notwithstanding any other term or condition expressed or implied

GPT-4

بعض النظر عن أي شرط آخر معبّر عنه أو مُقدم كمفروض

Figure 26: GPT screenshot, 01:08 PM 17/05/2024 (Table 23)

Figure 27: GPT screenshot, 06:15 AM 31/05/2024 (Table 18)

Figure 28: GPT screenshot, 08:21 PM 19/05/2024 (Table 10)

Figure 29: GPT screenshot, 08:01 PM 18/05/2024 (Table 14)

C Chaima Hider

استقبل مدير جامعة الجزائر 3، خالد رواسكي، يوم الخميس، سفير جمهورية بنغلادش بالجزائر، محمد ذو
القرنين. حيث شكل اللقاء فرصة لتعزيز العلاقات بين هذه المؤسسة الجامعية الجزائرية والجامعات
البنغالية وكذا السعي لإبرام مذكرة تفاهم لبعث التبادل الأكاديمي وترقية البحث العلمي بين البلدين،
حسب ما أفاد به بيان لجامعة الجزائر 3.

GPT-4

The president of the University of Algiers 3, Khalid Ruwaski, received on Thursday the
Ambassador of the People's Republic of Bangladesh to Algeria, Muhammad Zu Al-
Qarnayn. The meeting served as an opportunity to strengthen relations between this
Algerian university and Bangladeshi universities, as well as to strive for the signing of a
memorandum of understanding to promote academic exchange and enhance scientific
research between the two countries, according to a statement by the University of Algiers
3.

⟳ Regenerate Response

Figure 30: GPT screenshot, 03:29 PM 18/05/2024 (Table 7)

C Chaima Hider

إن تصنيف العصر الحجري القديم في الشرق الأوسط مازال قيد السؤال

GPT-4

The classification of the Old Stone Era in the Middle East is still under question.

Figure 31: GPT screenshot, 07: 26 PM 18/05/2024 (Table 9)

C Chaima Hider

The contagious virus is spread by coughing and sneezing.

GPT-4
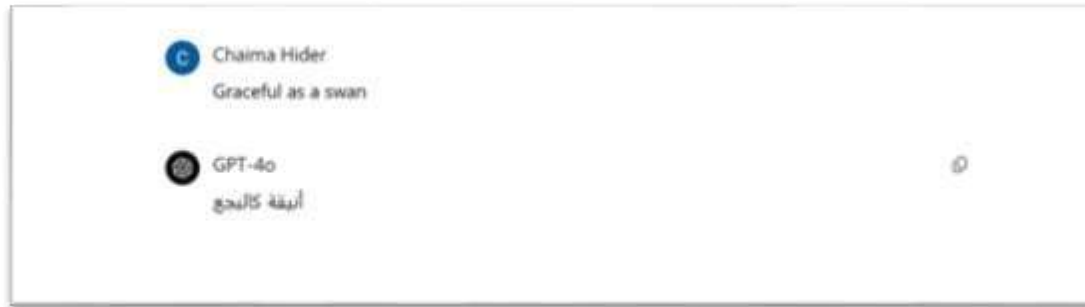
يتم نقل الفيروس المعدٍ بواسطة السعال والعطس.

Figure 32: GPT screenshot, 01:33 AM 18/05/2024 (Table 23)

Figure 33: GPT screenshot, 01:35 PM 17/05/2024 (Table 23)
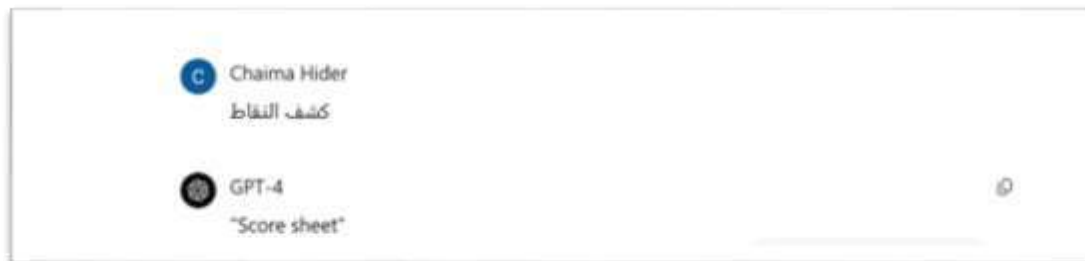
Figure 34: GPT screenshot, 01:28 PM 17/05/2024 (Table 21)

Figure 35: GPT screenshot; 01:14 PM 17/05/2024 (Table 25)

> **C** Chaima Hider
> تنبيه: لا تمنح إلا نسخة واحدة من هذه الشهادة
>
> **GPT-4**
> "Warning: Only one copy of this certificate will be issued"

Figure 36: GPT screenshot; 03:58 PM 18/05/2024 (Table 8)

> **C** Chaima Hider
> قام جاري رولفسون بعمل حفر اختبارية في الموقع
>
> **GPT-4**
> Jerry Rolfson conducted test excavations at the site.

Figure 37: GPT screenshot, 11:18 PM 19/05/2024 (Table 15)

> **C** Chaima Hider
> " الفريق أول شنقريحة يشرف على تمرين تكتيكي بالذخيرة الحية " الحصن 2024
>
> **GPT-4**
> The first team Shangriha supervises a tactical training with live ammunition "Al-Hussein 2024."

Figure 38: GPT screenshot, 07/51 PM 23/05/2024 (Table 19)

C Chaima Hider

Conformément à la loi N°: 08-09 du 25 02 2008 et conformément aux dernières modifications du code civil N°: 07-05 du 13 05 2007

GPT-4o

وفقاً للقانون رقم: 08-09 مؤرخ في 25 فبراير 2008 ووفقاً لآخر تعديلات للمدني رقم: 07-05 مؤرخ في 13. مايو 2007

Figure 39: GPT screenshot, 08:19 PM 19/05/2024 (Table 3)

C Chaima Hider

انها تمطر كأفواه القرب

GPT-4o

It's raining like the mouths of proximity.

Figure 40: GPT screenshot, 01:32 AM 22/05/2024 (Table 16)

C Chaima Hider

WHO has published Q&As on ventilation and air condition-ing for both the general public and people who manage public spaces and buildings

GPT-4o

L'OMS a publié des questions-réponses sur la ventilation et la climatisation à la fois pour le grand public et les personnes chargées de la gestion des espaces publics et des bâtiments.

Appendix I:

Table	Source
1	Chaal, H. (2024, April). The literary translation challenges in translating Ahlem Mosteghanmi's novel "Chaos of the Senses" by Baria Ahmar Sreih. *ResearchGate*. https://www.researchgate.net/publication/380486589
2 3 4 5 9 10	Our knowledge
6 7 8	Al-Muhiesen, E. M., & Al-Ajrami, M. A. H. (2019). Challenges in translating technical texts. Dirasat: Human and Social Sciences, 46(1), 302-303.
11	Hamouda, A. N. (2021). Étude ethnobotanique des plantes médicinales utilisées dans le traitement et la prévention de la COVID-19 dans la région du sud-est algérien (région de Ouargla comme modèle) [Master's thesis, Université de Kasdi Merbah Ouargla, Faculté des Mathématiques et Sciences de la Matière, Département de Chimie].
12	Arab League (2012). Report of the Head of the League of Arab States Observer Mission to Syria for the period from 24December 2011 to 18 January 2012. Retrieved from http://www.voltairenet.org/article172598.html
13 14 15	https://www.elbilad.net/national/%D8%A7%D9%84%D9%81%D8%B1%D9%8A%D9%82-%D8%A3%D9%88%D9%84-%D8%B4%D9%86%D9%82%D8%B1%D9%8A%D8%AD%D8%A9-%D9%8A%D8%B4%D8%B1%D9%81-%D8%B9%D9%84%D9%89-%D8%AA%D9%85%D8%B1%D9%8A%D9%86-%D8%A7%D9%84%D8%AD%D8%B5%D9%86-2024-128991

16	WHO. (2021a). Advice for the public. https://www.who.int/emergen-cies/diseases/novel-coronavirus2019/advice-for-public
17 18	Altarabin, M. (2018, May). Translating English Legal Lexical Features into Arabic: Challenges and Possibilities. Arab World English Journal For Translation and Literary Studies. https://doi.org/10.24093/awejtls/vol2no2.14
19 20 21 22 23 24 25 26	Personal documents