
Machine Translation vs. Human Translation: A Comparative Study of Translation Quality

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Abstract

This research is deeply rooted into the ongoing debate surrounding machine translation (MT) and human translation (HT) by conducting a comprehensive comparative study of translation quality between the two methodologies. With the rapid advancements in artificial intelligence and natural language processing, machine translation systems have made significant progress towards the solution of real-life problems. By raising questions about their efficacy compared to the nuanced understanding and linguistic finesse inherent in human translation. Through a meticulous examination of various linguistic aspects such as accuracy, fluency, cultural sensitivity, and context comprehension, this study aims to provide empirical evidence on the strengths and limitations of both MT and HT. By analyzing a diverse set of text samples across multiple languages and domains, including literature, technical documents, and colloquial speech, we endeavor to offer insights into the relative performance of MT and HT in different translation scenarios. Furthermore, this research seeks to explore the evolving roles of MT and HT in the contemporary translation landscape and their potential implications for language professionals, technology developers, and end-users. Ultimately, this comparative study endeavors to contribute to a deeper understanding of the complex dynamics between machine and human translation, shedding light on the optimal utilization of both approaches to achieve superior translation outcomes.

Keywords: Machine Translation (MT), Human Translation (HT), Translation Quality, Artificial Intelligence (AI), Natural Language Processing (NLP)

Introduction

This is the era of digital interconnectedness and globalization, the demand for accurate and efficient translation services has never been neglected. Language barriers pose significant challenges to communication, commerce, diplomacy, and cultural exchange, while driving the need for effective translation solutions. Traditionally, human translators have been the cornerstone of linguistic mediation, leveraging their linguistic proficiency, cultural insights, and contextual understanding to deliver high-quality translations. However, with the rapid advancement of artificial intelligence and natural language processing technologies, machine translation (MT) systems have emerged as viable alternatives, promising automated, scalable, and cost-effective translation solutions.

The rise of MT systems, ranging from rule-based approaches to statistical and neural machine translation models, has sparked considerable interest and debate within the translation community and beyond. Advocates tout the potential of MT to streamline translation workflows, enhance productivity, and facilitate multilingual communication on a global scale. Yet, detractors raise concerns about the quality, accuracy, and cultural nuances lost in machine-generated translations, emphasizing the irreplaceable value of human intuition and creativity in translation. This ongoing discourse between proponents of MT and defenders of human translation (HT) underscores the need for a comprehensive comparative analysis of translation quality between the two methodologies. While numerous studies have examined specific aspects of MT and HT performance, there remains a lack of consensus regarding their relative strengths and limitations across diverse linguistic contexts and domains. Addressing this gap, the present research endeavors to conduct a rigorous comparative study, aiming to elucidate the nuanced dynamics of translation quality in MT and HT. Central to this comparative analysis is an exploration of various linguistic dimensions that contribute to translation quality, including accuracy, fluency, cultural sensitivity, and context comprehension. Accuracy refers to the fidelity of the translation to the source text, encompassing lexical, grammatical, and semantic fidelity. Fluency, on the other hand, pertains to the naturalness and readability of the translated text, reflecting the coherence and stylistic appropriateness of the language. Cultural sensitivity involves the ability of the translator to navigate cultural nuances, idiomatic expressions, and socio-political contexts inherent in the source and target languages. Context comprehension encompasses the translator's capacity to infer and convey the intended meaning of the source text within its broader linguistic, situational, and communicative context. To facilitate a comprehensive analysis, this research will employ a diverse set of text samples spanning multiple languages, genres, and domains, including literary works, technical documents, legal texts, and colloquial speech. Each text sample will undergo evaluation by both human translators and MT systems, with assessments conducted based on predefined criteria for translation quality. The comparative analysis will consider not only the quantitative metrics of translation accuracy and fluency but also qualitative aspects such as cultural fidelity, register appropriateness, and communicative effectiveness.

Literature Review

Early studies comparing MT and HT often focused on rule-based and statistical machine translation systems, which dominated the landscape before the advent of neural machine translation (NMT) models. One seminal study by Hutchins and Somers (1992) evaluated the performance of MT systems across different languages and text types, highlighting challenges related to lexical ambiguity, syntactic complexity, and idiomatic expressions. While MT systems showed promise in handling simple, well-structured texts, they struggled with nuances and ambiguities inherent in natural language. Wu et al. (2016) conducted a comparative evaluation of statistical and neural MT systems, finding that NMT outperformed its predecessors in terms of fluency and adequacy, particularly for language pairs with large training datasets. However, NMT systems still exhibited limitations in handling rare or unseen vocabulary, domain-specific terminology, and stylistic variations. Pym (2013) argues that HT is essential for tasks requiring deep semantic understanding, pragmatic interpretation, and intercultural mediation, particularly in domains such as literature, marketing, and legal translation. Human translators possess the cognitive and socio-cultural expertise to navigate the complexities of language, context, and discourse, enabling them to produce

Carl and Schaeffer (2017) propose a post-editing framework wherein human translators revise machine-generated translations to improve accuracy, fluency, and cultural fidelity. By integrating human intervention into the MT workflow, this hybrid approach aims to enhance translation efficiency while maintaining quality standards. Similarly, Koehn et al. (2017) advocate for interactive translation systems that facilitate collaboration between human translators and MT algorithms, allowing for real-time feedback and refinement during the translation process.

Impact on Translators (García, 2020)

García (2020) addresses how the rise of MT affects the role of professional translators. With the increasing integration of MT technologies into translation workflows, translators face evolving demands and challenges. While MT can streamline certain aspects of translation tasks, it also highlights the importance of translators' specialized skills and expertise. García emphasizes the need for continuous professional development among translators to stay abreast of technological advancements and to specialize in areas where human intuition and cultural understanding are indispensable. This suggests that while MT may automate certain routine tasks, translators must adapt by enhancing their proficiency in areas where human judgment and creativity are essential, such as literary translation or trans creation.

Hatzivassiloglou and Klavans (2013) investigate how end-users perceive and interact with MT systems. Their study focuses on user preferences, usability, and factors influencing user satisfaction with MT-generated translations. The researchers highlight the importance of usability features such as customization options and post-editing capabilities in enhancing user experience. Customization allows users to tailor MT systems to their specific needs, while post-editing functionalities enable users to refine machine-generated translations to better align with their expectations or the context of use. By understanding user preferences and perceptions, developers can design MT systems that prioritize usability and user satisfaction, thereby promoting wider acceptance and adoption of MT technologies. In essence, these studies shed light on the broader implications of MT and HT beyond translation quality alone. They underscore the evolving role of translators in the age of automation and the importance of user-centric design in MT system development. By addressing these practical implications, researchers and practitioners can better navigate the complex landscape of translation technologies and ensure that advancements in MT are leveraged effectively to enhance translation workflows and user experiences. Overall, the comparative study of translation quality between MT and HT continues to evolve with advancements in technology, methodology, and interdisciplinary collaboration. While MT systems have made significant strides in recent years, human translators remain irreplaceable for tasks requiring nuanced linguistic analysis, cultural adaptation, and creative interpretation. Hybrid approaches that leverage the complementary strengths of both methodologies offer promising avenues for improving translation efficiency and effectiveness in an increasingly globalized and multilingual world.

Research Objectives

The research objectives of the current research are as follows:

1. To compare the translation quality of machine translation (MT) systems and human translators (HT) across linguistic dimensions, focusing on diverse text types and domains.
2. To identify the strengths and limitations of MT systems and HT in handling linguistic complexities, including syntax, semantics, and cultural nuances.

Research Questions

Research Questions of current study are as

1. How does machine translation (MT) systems and human translators (HT) compare in terms of translation quality across linguistic dimensions, when applied to diverse text types and domains?
2. What are the specific strengths and limitations of machine translation (MT) systems and human translators (HT) in handling linguistic complexities?

Significance of the Research

This research is significant in addressing the growing demand for accurate and efficient translation in an increasingly globalized world. By comparing machine translation (MT) systems and human translators (HT), the study contributes to translation studies by examining their effectiveness across linguistic dimensions and text types. It offers practical insights for industries reliant on translation, such as education, healthcare, and business, helping stakeholders choose suitable approaches based on specific needs. Additionally, the findings will guide the optimization of translation practices by integrating the speed and scalability of MT with the contextual accuracy and cultural sensitivity of HT. The research also provides valuable feedback for improving MT systems, particularly in handling linguistic complexities, while emphasizing the crucial role of human expertise in preserving cultural and linguistic diversity.

Theoretical Framework

The present research comprises the theoretical framework as follows:

Nida's Equivalence Theory (1964): This theory distinguishes between formal equivalence (faithful adherence to the source text structure) and dynamic equivalence (focusing on the target audience's response). It is relevant for evaluating the ability of MT and HT to preserve meaning and cultural relevance. Main points of this theory are as under.

Formal Equivalence

Emphasizes a literal, word-for-word translation, retaining the source text's structure, grammar, and lexical choices. It is often used in contexts requiring precision, such as legal or religious texts.

Dynamic Equivalence

Focuses on naturalness and fluency, ensuring the target audience understands and responds to the translation as the original audience would. It adapts cultural nuances and is commonly applied in literary or cultural works.

Key Principles

- **Receiver Focus:** Prioritizes the understanding of the target audience.
- **Cultural Relevance:** Adapts cultural elements to make the translation meaningful.
- **Functional Similarity:** Ensures the translation conveys the same effect as the original.

While influential and widely applied, the theory has faced criticism for oversimplifying translation approaches and risking the loss of source text integrity in dynamic equivalence.

Relevance Theory (Sperber & Wilson, 1986): This theory focuses on how contextual meaning and implicit information are conveyed in communication, which is critical in analyzing the strengths and limitations of MT and HT. Its main points are:

Main Points

1. **Cognitive Principle of Relevance**
Humans prioritize processing information that provides maximum relevance with minimal effort.
2. **Communicative Principle of Relevance**
Every communicative act conveys an assumption of relevance, guiding how listeners interpret messages.
3. **Optimal Relevance**
Effective communication provides meaningful information with minimal cognitive effort for the listener.
4. **Contextual Effects**
Relevance depends on how new information interacts with existing knowledge, adding value or resolving ambiguities.
5. **Explicit and Implicit Meaning**
Communication involves both stated (explicit) and implied (implicit) meanings, derived through contextual inference.

Pragmatic Theory of Translation: This emphasizes the role of context, cultural nuances, and intended meaning, which are often challenging for MT systems but essential for human translators.

Main Points

1. **Contextual Meaning**
Translation must account for the situational and cultural context of both the source and target texts, ensuring the message is meaningful and appropriate.
2. **Intent of the Text**
The translator must preserve the original intent of the text (e.g., to inform, persuade, entertain) and adapt it for the target audience.
3. **Focus on the Receiver**
The translation should prioritize the needs and expectations of the target audience, ensuring that the text is relevant and easily understood.
4. **Cultural Adaptation**
Pragmatic theory recognizes that cultural differences influence communication. Translators must adapt idioms, references, and expressions to suit the cultural background of the target audience.
5. **Implicit vs. Explicit Meaning**
The theory stresses the importance of accurately conveying both the explicit (literal) meaning and the implicit (implied) meaning, often requiring inferential interpretation by the translator.

6. Pragmatic Equivalence

The focus is on achieving equivalence in the effect or response of the target audience, rather than a word-for-word translation.

Research Methodology

This study employs a mixed-methods approach to comprehensively evaluate and compare the quality of translations produced by machine translation systems and human translators across various linguistic dimensions and text types. The methodology consists of three main stages: data collection, evaluation metrics selection, and analysis.

Data Analysis

Here is a data with 24 sentences, the analysis of the data is as the first column is telling the type of the sentence, the second column contains the Urdu sentences, there is the translation in English language in two columns comprises the machine-translated (MT) and human-translated (HT) versions. In the last column there is a potential difference between MT and HT translations, along with a basic data analysis:

Text Type	Source Text (Urdu)	MT Output (English)	HT Output (English)	Analysis
Literary Text	"اس ناول کا ختم بہت ہی متاثر کن ہے۔"	"The end of this novel is very impactful."	"The ending of this novel is very impressive."	Both MT and HT outputs convey a similar meaning, with slight differences in word choice.
Technical Document	"یہ ویب سائٹ ڈیزائن میں ماہر ہیں۔"	"They are expert in website design."	"They are experts in website design."	MT output uses singular "expert," while HT output uses plural "experts," indicating a difference in interpretation or grammatical agreement.
Legal Content	"اس عقد کے شرائط اور ضوابط سخت ہیں۔"	"The terms and conditions of this contract are very strict."	"The terms and conditions of this agreement are stringent."	MT output uses "contract," while HT output uses "agreement," indicating a semantic difference.
Colloquial Speech	"میں اپنے دوست سے بات کر رہا تھا۔"	"I was talking to my friend."	"I was having a conversation with my friend."	MT output is more literal, while HT output provides a more idiomatic translation.
Literary Text	"اس کہانی نے مجھے روک لیا۔"	"This story stopped me."	"This story moved me."	MT output is less idiomatic compared to HT output.

Text Type	Source Text (Urdu)	MT Output (English)	HT Output (English)	Analysis
Technical Document	یہ ایک اہم تجربہ تھا۔	"This was an important experience."	"This was a significant experiment."	MT output translates "تجربہ" as "experience," while HT output translates it as "experiment," indicating a difference in interpretation.
Legal Content	میں اس پر قانون سے زیادہ بھروسہ کرتا ہوں۔	"I trust it more than the law."	"I trust it more than the legal system."	MT output translates "قانون" as "law," while HT output translates it as "legal system," indicating a difference in interpretation.
Colloquial Speech	تمہیں اس بات پر فخر ہونا چاہیے۔	"You should be proud of it."	"You should feel proud of it."	Both MT and HT outputs convey a similar meaning with slight differences in phrasing.
Literary Text	یہ کتاب پڑھنے کے قابل ہے۔	"This book is worth reading."	"This book is readable."	MT output uses "worth reading," while HT output uses "readable," indicating a difference in phrasing.
Technical Document	ایک مہمان ویب سائٹ بنایا گیا ہے۔	"A guest website has been created."	"A temporary website has been created."	MT output translates "مہمان" as "guest," while HT output translates it as "temporary," indicating a difference in interpretation.
Legal Content	اس سوال کا جواب ضروری ہے۔	"The answer to this question is essential."	"The response to this question is imperative."	Both MT and HT outputs convey a similar meaning, with slight differences in phrasing.
Colloquial Speech	مجھے اس موقع پر فخر ہوا۔	"I felt proud of this opportunity."	"I was proud of this opportunity."	Both MT and HT outputs convey a similar meaning, with slight differences in phrasing.
Literary Text	یہ کہانی دلچسپ ہے۔	"This story is interesting."	"This story is intriguing."	Both MT and HT outputs convey a similar meaning, with slight differences in word choice.

Text Type	Source Text (Urdu)	MT Output (English)	HT Output (English)	Analysis
Technical Document	پروٹوکول کی معمولی مثالیں موجود ہیں۔	"There are ordinary exemplary examples of the protocol."	"There are typical examples of the protocol."	Both MT and HT outputs convey a similar meaning, with slight differences in phrasing.
Legal Content	یہ فیصلہ سختی سے انفعال میں لیا گیا۔	"This decision was taken in extreme agitation."	"This decision was taken with utmost seriousness."	MT output translates "انفعال" as "agitation," while HT output translates it as "seriousness," indicating a difference in interpretation.
Colloquial Speech	میں نے تمہیں کہا تھا، لیکن تم نے مانا نہیں۔	"I told you, but you didn't agree."	"I told you, but you didn't listen."	MT output translates "مانا" as "agree," while HT output translates it as "listen," indicating a difference in interpretation.
Literary Text	اس کتاب کا اختتام انتہائی متاثر کن ہے۔	"The end of this book is extremely impressive."	"The conclusion of this book is profoundly impressive."	Both MT and HT outputs convey a similar meaning, with slight differences in phrasing.
Technical Document	اس پروجیکٹ کا موقع انتہائی اہم ہے۔	"The opportunity of this project is extremely important."	"The opportunity of this project is crucial."	Both MT and HT outputs convey a similar meaning, with slight differences in phrasing.
Legal Content	میں ان کے موقع کو مانتا ہوں، لیکن میں سوچ رہا ہوں۔	"I accept their position, but I'm thinking."	"I accept their stance, but I'm contemplating."	MT output translates "موقع" as "position," while HT output translates it as "stance," indicating a difference in interpretation.
Colloquial Speech	تم نے اُسے کیا کہا؟	"What did you say to him?"	"What did you tell him?"	Both MT and HT outputs convey a similar meaning, with slight differences in phrasing.
Literary Text	اس کہانی کی نوئیں خوبصورتی ہے۔	"The beauty of this story is in its novelty."	"The beauty of this story lies in its novelty."	Both MT and HT outputs convey a similar meaning, with slight differences in phrasing.

Text Type	Source Text (Urdu)	MT Output (English)	HT Output (English)	Analysis
Technical Document	اس پروجیکٹ کی انجامیہ انتہائی اہم ہے۔	"The completion of this project is extremely important."	"The conclusion of this project is crucial."	MT output translates "انجامیہ" as "completion," while HT output translates it as "conclusion," indicating a difference in interpretation.
Legal Content	اس مقدمے کا نتیجہ اہم ہوگا۔	"The result of this case will be important."	"The outcome of this case will be significant."	Both MT and HT outputs convey a similar meaning, with slight differences in phrasing.
Colloquial Speech	میں نے اُسے وہ کتاب دی تھی، لیکن وہ نہیں پڑھتا۔	"I gave him that book, but he doesn't read it."	"I gave him that book, but he doesn't read."	Both MT and HT outputs convey a similar meaning, with slight differences in phrasing.

In this dataset, each sentence is provided in Urdu along with its machine-translated and human-translated versions in English. A basic analysis has been conducted to highlight differences between MT and HT outputs, such as differences in word choice, phrasing, or interpretation. These differences can be further analyzed and evaluated to assess the quality and effectiveness of machine translation compared to human translation.

Finding and Conclusion

In conclusion, this research highlights the strengths and limitations of both machine translation systems and human translators in producing high-quality translations across various linguistic dimensions and text types. While machine translation has made significant advancements and offers a fast and cost-effective solution for certain translation tasks, human translators remain indispensable for achieving nuanced, accurate, and culturally sensitive translations, especially in contexts where context comprehension and cultural understanding are paramount. Moving forward, it is essential to continue refining machine translation algorithms to improve accuracy, fluency, and context comprehension. Additionally, human translators should focus on leveraging their expertise in domains requiring specialized knowledge and cultural sensitivity. Ultimately, a collaborative approach that integrates the strengths of both machine translation systems and human translators holds promise for achieving optimal translation outcomes in diverse linguistic and cultural contexts.

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