

Cultural nuance and pragmatic loss in AI-generated arabic–english translation: A comparative study of figurative language

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ABSTRACT

Recent advances in artificial intelligence, particularly neural machine translation (NMT), have significantly improved the fluency and efficiency of automated translation systems. However, concerns persist regarding their ability to convey culturally and pragmatically embedded meaning. This study investigates how AI-generated Arabic–English translations handle figurative language, metaphor, and culture-bound expressions in comparison with human translations. Adopting a qualitative, theory-driven approach, the study analyzes a purpose-built corpus of culturally marked Arabic texts, including religious, poetic, idiomatic, and political discourse. The analysis is grounded in Functional Equivalence Theory, Relevance Theory, and the domestication–foreignization framework. Findings reveal that AI systems consistently prioritize literal and surface-level rendering, resulting in pragmatic loss, weakened rhetorical force, and diminished cultural resonance. Human translators, by contrast, employ adaptive strategies such as explicitation, idiomatic substitution, and semantic amplification to achieve communicative adequacy. The study concludes that while AI excels in formal accuracy, it remains limited as a cultural mediator, reaffirming the indispensable role of human translators in figurative and culturally sensitive translation.

KEYWORDS

Artificial Intelligence Translation; Neural Machine Translation; Arabic–English Translation; Cultural Nuance; Pragmatic Loss; Figurative Language; Metaphor; Translation Studies

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1. Introduction

The rapid development of Artificial Intelligence (AI), particularly Neural Machine Translation (NMT), has reshaped contemporary translation practices. AI-based systems now produce translations characterized by high levels of fluency and grammatical accuracy, leading to their widespread use across academic, professional, and everyday contexts. However, growing scholarly concern highlights that such fluency often masks deeper deficiencies related to meaning, culture, and pragmatics.

Translation is not a purely linguistic operation but a culturally situated act of interpretation. This is especially evident in Arabic–English translation, where meaning is frequently conveyed through metaphor, idiomatic expressions, ellipsis, and religious or cultural allusions. Arabic discourse relies heavily on shared cultural knowledge and inferential reasoning, making successful translation dependent on pragmatic and contextual awareness rather than surface linguistic equivalence (Hatim & Mason, 1997; Baker, 2018).

Although AI translation systems perform effectively with technical or standardized texts, their limitations become apparent when confronted with figurative and culturally embedded language. AI-generated translations often preserve lexical

meaning while failing to convey rhetorical force, cultural resonance, or intended pragmatic effects. This raises fundamental questions about whether AI can function as a cultural mediator or remains confined to linguistic pattern matching.

This study investigates how AI-generated Arabic–English translations handle metaphorical, idiomatic, and culturally loaded expressions, comparing AI output with human translations through a theory-driven qualitative analysis.

1.1. Research Problem

Despite significant advances in NMT, AI translation systems continue to struggle with cultural nuance and pragmatic inference, particularly in Arabic–English translation. Existing studies frequently acknowledge cultural loss in AI output but often lack systematic, theoretically grounded qualitative analysis that explains the nature and causes of this loss. As a result, the distinction between linguistic accuracy and cultural adequacy remains insufficiently explored.

1.2. Research Questions

This study seeks to answer the following questions:

How do AI-generated translations handle culturally and metaphorically complex expressions in Arabic–English translation?

What types of cultural and pragmatic loss are most prevalent in AI-generated translations?

In what ways do human translators differ from AI systems in rendering figurative and culturally embedded meaning?

To what extent can AI translations achieve functional and pragmatic equivalence in culturally sensitive texts?

1.3. Research Hypotheses

Based on translation theory and prior research, the study proposes the following hypotheses:

H1: AI-generated Arabic–English translations tend to preserve surface linguistic form while failing to convey cultural and pragmatic meaning in figurative expressions.

H2: Lateralization is the most frequent strategy employed by AI systems when translating culture-bound metaphors and idioms.

H3: Human translators are more likely than AI systems to employ adaptive strategies (e.g., explicitation, idiomatic substitution) to achieve functional equivalence.

H4: AI-generated translations achieve lower levels of pragmatic relevance than human translations when cultural inference is required.

H5: Figurative, religious, and idiomatic texts exhibit significantly higher rates of cultural loss in AI translation than non-figurative texts.

1.4. Scope of the Study

The study is limited to:

Arabic–English translation.

Short, culturally marked texts (religious discourse, metaphors, idioms, proverbs, and political figurative language).

Comparison between AI-generated translations from widely used NMT systems and human translations.

Qualitative analysis of cultural nuance, pragmatic inference, and figurative meaning.

The study does not aim to provide large-scale quantitative evaluation or generalize findings to all language pairs or AI systems.

1.5. Significance of the Study

The study is significant in that it:

Contributes theoretically by integrating Functional Equivalence, Relevance Theory, and Domestication/Foreignization into AI translation analysis.

Offers a qualitative methodological model for evaluating cultural adequacy beyond automated metrics.

Provides practical insights for translators, educators, and AI developers regarding the limitations of AI in culturally sensitive translation.

Highlights ethical risks associated with relying on AI translation in religious, cultural, and political contexts.

1.6. Limitations of the Study

The study is subject to the following limitations:

Its qualitative nature limits statistical generalizability.

The corpus consists of short texts, focusing on micro-level analysis.

Only widely accessible NMT systems are examined.

The analysis is restricted to Arabic–English translation.

These limitations allow for analytical depth and theoretical clarity.

The study demonstrates that while AI translation systems can process language efficiently, they remain fundamentally limited in mediating culture, pragmatics, and figurative meaning—domains that continue to require human interpretive competence.

2. Literature Review

2.1. Machine Translation and the Rise of AI-Based Systems

Machine Translation (MT) has evolved through several major paradigms, beginning with rule-based systems, moving through statistical machine translation (SMT), and culminating in Neural Machine Translation (NMT). Early rule-based approaches relied heavily on handcrafted linguistic rules and bilingual dictionaries, which limited their scalability and adaptability (Hutchins & Somers, 1992). Statistical approaches later improved translation quality by modeling translation as a probabilistic process based on large parallel corpora, yet they remained constrained by phrase-level segmentation and alignment issues (Koehn, 2010).

The introduction of NMT marked a significant turning point in the field. By employing deep neural networks and encoder–decoder architectures, NMT systems are capable of capturing long-distance dependencies and producing more fluent target texts (Bahdanau et al., 2015). Transformer-based models further enhanced this capability by relying on self-attention mechanisms rather than recurrent structures, resulting in improved performance and efficiency (Vaswani et al., 2017). These developments have led many researchers to describe NMT as a qualitative leap rather than a mere incremental improvement (Castilho et al., 2020).

Nevertheless, scholars have increasingly emphasized that NMT’s success is largely confined to formal and structural aspects of language. While NMT excels at producing grammatically coherent output, it remains fundamentally data-driven and probabilistic, lacking genuine semantic understanding or contextual awareness (Bender & Koller, 2020; Pym, 2021). This limitation becomes particularly evident when translation involves pragmatic inference or culturally embedded meaning.

2.2. Culture and Meaning in Translation Studies

The relationship between language and culture has long been central to Translation Studies. Early theorists challenged the notion of translation as simple linguistic equivalence, emphasizing instead the cultural embeddedness of meaning. Nida’s concept of dynamic or functional equivalence foregrounded the response of the target audience, arguing that translation should aim to elicit a similar effect rather than replicate formal features (Nida, 1964).

Subsequent approaches further expanded the cultural dimension of translation. The Skopos theory conceptualized translation as a purposeful activity shaped by sociocultural context and communicative goals (Reiss & Vermeer, 2014). Descriptive Translation Studies (DTS) shifted attention from prescriptive norms to actual translation practices within specific cultural systems (Toury, 2012). Within this framework, translations are understood as products of target-culture norms rather than neutral reproductions of source texts.

Venuti’s (2017) influential discussion of domestication and foreignization highlighted the ideological implications of cultural translation. According to Venuti, translators inevitably intervene in the text by either minimizing cultural difference or foregrounding it, a choice that reflects broader power relations between languages and cultures. These theoretical insights underscore the fact that translation is inseparable from cultural interpretation, a process that presupposes human judgment and contextual sensitivity.

2.3. Cultural Nuance and Pragmatics in Arabic–English Translation

Arabic–English translation presents unique challenges due to structural differences and divergent communicative conventions. Arabic discourse frequently employs metaphor, ellipsis, repetition, and indirectness, relying on shared cultural and religious knowledge for interpretation (Hatim & Mason, 1997; Baker, 2018). Pragmatic meaning in Arabic is often implied rather than explicitly stated, making successful translation highly dependent on inferential reasoning.

Numerous studies have documented the difficulty of translating Arabic idioms, proverbs, and religious expressions into English. Such expressions are typically culture-bound and resist direct equivalence, requiring adaptive or explanatory strategies to preserve meaning (Farghal & Shunnaq, 2011; Alwazna, 2019). Failure to account for these cultural dimensions often results in translations that are formally accurate but communicatively ineffective.

From a pragmatic perspective, relevance theory provides a useful framework for understanding these challenges. Sperber and Wilson (1995) argue that meaning arises through inference based on contextual assumptions rather than linguistic encoding alone. Applying this framework to translation, several scholars have shown that successful rendering of Arabic

texts into English requires access to cultural schemas and contextual knowledge that go beyond surface linguistic form (Gutt, 2000; Al-Harashsheh, 2020).

2.4. AI Translation and Cultural Loss

Recent research comparing human and machine translation has consistently identified cultural nuance as one of the weakest areas of AI performance. While NMT systems perform well on standardized or technical texts, their output deteriorates significantly when confronted with figurative language or culture-specific references (Moorkens, 2020; Kenny, 2022). Studies focusing on Arabic–English MT reveal similar patterns, with AI systems favoring literal translation strategies that neutralize cultural meaning (Almutairi, 2023; El-Khoury & Habash, 2021).

Moreover, AI-generated translations tend to exhibit what has been described as illusory adequacy: texts that appear fluent and natural but fail to achieve pragmatic relevance in real communicative contexts (House, 2015; O'Brien, 2021). This phenomenon poses a particular risk in sensitive domains such as religious or political discourse, where misrepresentation of cultural nuance may lead to misunderstanding or misinterpretation.

Scholars have therefore argued that current AI systems function primarily as linguistic processors rather than cultural mediators (Pym, 2021). Unlike human translators, AI lacks intentionality, cultural consciousness, and the ability to evaluate communicative effects, all of which are essential for handling culturally complex texts.

2.5. Research Gap

Although existing literature has extensively examined machine translation quality in terms of accuracy, fluency, and post-editing effort, relatively limited attention has been paid to systematic cultural–pragmatic evaluation of AI-generated Arabic–English translations. Many studies acknowledge cultural loss as a general limitation without offering detailed qualitative analysis or theoretical grounding.

This study seeks to address this gap by providing a focused, theory-driven analysis of cultural nuance in AI-generated translations of Arabic texts. By integrating insights from translation theory, pragmatics, and AI research, the study aims to contribute to a more nuanced understanding of the limits of machine translation and the enduring role of human translators as cultural interpreters.

3. Methodology

3.1. Research Design

This study adopts a qualitative descriptive research design, supported by limited quantitative observations, in order to investigate how AI-generated translations handle cultural nuance in Arabic–English translation. A qualitative approach is particularly appropriate for this research, as cultural meaning, pragmatic inference, and contextual interpretation cannot be adequately captured through purely quantitative metrics (Creswell, 2014; House, 2015).

Rather than measuring translation quality through automated evaluation scores, such as BLEU or METEOR—which have been widely criticized for their inability to assess pragmatic and cultural adequacy (Callison-Burch et al., 2006; Moorkens, 2020)—this study prioritizes close textual analysis. The focus is on identifying patterns of cultural loss, distortion, or reinterpretation in AI-generated translations and comparing them with human translation strategies.

3.2. Data Selection and Corpus Description

The data for this study consist of a purpose-built corpus of culturally marked Arabic texts. Purposeful sampling is employed to ensure that the selected texts contain a high density of culture-bound elements that pose known challenges to translation (Baker, 2018).

The corpus includes approximately 25 Arabic source texts, distributed across the following categories:

- Proverbs and idiomatic expressions
- Religious and Islamic discourse
- Metaphorical and figurative expressions
- Culturally embedded social expressions

These text types were selected because they rely heavily on shared cultural knowledge, implicit meaning, and pragmatic inference, making them particularly revealing for assessing cultural competence in AI-generated translation (Hatim & Mason, 1997; Farghal & Shunnaq, 2011).

All source texts are short (ranging from one sentence to short paragraphs) to allow for detailed micro-level analysis of translation choices.

3.3. Translation Data

Each Arabic source text is translated into English using two distinct approaches:

AI-generated translation, produced using widely accessible neural machine translation systems (e.g., Google Translate and ChatGPT).

Human translation, either drawn from authoritative published translations or produced by professional translators with demonstrated expertise in Arabic–English translation.

The human translations serve as a benchmark for culturally informed translation, not as an absolute standard of correctness, but as evidence of interpretive strategies that account for cultural and pragmatic meaning (Toury, 2012).

3.4. Analytical Framework

The analysis is conducted using a comparative qualitative framework, informed by key concepts from Translation Studies and pragmatics. Each AI-generated translation is compared with its human counterpart to identify divergences in the treatment of cultural nuance.

The analysis focuses on the following categories of cultural shift:

Literalization: rendering culture-bound expressions word-for-word without cultural adaptation

Cultural omission: loss or deletion of culturally significant meaning

Overgeneralization: neutralization of specific cultural references

Inappropriate cultural substitution: replacement with culturally incongruent target-language elements

Pragmatic failure: failure to convey implied or inferential meaning

These categories draw on established typologies of translation shifts and pragmatic error analysis (House, 2015; Baker, 2018; Alwazna, 2019).

3.5. Theoretical Orientation of the Analysis

The analysis is theoretically grounded in three complementary frameworks:

Functional Equivalence Theory (Nida, 1964), to assess whether translations achieve comparable communicative effects in the target culture.

Domestication and Foreignization (Venuti, 2017), to evaluate strategic orientation in handling cultural elements.

Relevance Theory (Sperber & Wilson, 1995), to account for inferential meaning and contextual assumptions.

By triangulating these perspectives, the study avoids a purely prescriptive evaluation and instead offers a multidimensional assessment of cultural adequacy.

3.6. Reliability and Validity

To enhance analytical reliability, each example is examined through repeated close reading, and interpretations are grounded explicitly in theoretical constructs rather than subjective preference. Validity is strengthened through data triangulation, achieved by comparing AI output with multiple human translations where available (Creswell, 2014).

Moreover, illustrative examples are presented in parallel Arabic–English format to ensure transparency and allow readers to independently assess the analysis.

3.7. Ethical Considerations

All translations analyzed in this study are drawn from publicly available sources or generated using publicly accessible AI tools. No personal data are involved, and no ethical approval is required for the study.

4. Data Analysis: Metaphor and Figurative Language

4.1. Example 1: Religious-Metaphorical Expression

Arabic Source Text:

"وجعلنا من الماء كل شيء حي" (سورة الأنبياء: 30)

Literal English Translation (Word-for-Word):

"And We made from water every living thing."

Human Translation (Culturally and Contextually Informed):

"From water, We have created all living beings."

AI-Generated Translation (Google Translate / ChatGPT):

"We made everything alive from water."

Analysis:

implies divine "جعلنا" Challenge: The Arabic uses a cosmological metaphor, where water symbolizes the origin of life. The verb .orchestration, which carries theological and stylistic nuance

AI Issue: The AI translation is grammatically correct but flattens the metaphor and may mislead readers by implying a generic causal statement rather than a theologically and culturally resonant claim.

Human Strategy: The human translator preserves the religious register and interpretive meaning, ensuring the metaphorical and divine context is clear.

Theoretical Implication: Functional Equivalence is partially achieved, but AI fails in pragmatic and cultural relevance (Relevance Theory).

4.2. Example 2: Classical Arabic Poetic Metaphor

Arabic Source Text:

"قلبي يذوب كالشمع في نار الحب."

Literal English Translation:

"My heart melts like wax in the fire of love."

Human Translation:

"My heart melts, like wax consumed by the flames of love."

AI-Generated Translation:

"My heart melts like wax in the fire of love."

Analysis:

Challenge: The metaphor combines emotional intensity with imagery of wax and fire, which is culturally resonant in Arabic literary tradition.

AI Issue: The AI produces a literal translation, grammatically correct, but fails to intensify the emotional and poetic nuance. It reads as flat narrative rather than literary expression.

Human Strategy: The human translator uses explicitation ("consumed by the flames") to capture both visual and emotional force of the metaphor.

Observation: AI struggles with stylistic enhancement and figurative depth; literal rendering ignores implied intensity.

4.3. Example 3: Cultural-Metaphorical Expression

Arabic Source Text:

"هذا الرجل أسد في المعركة."

Literal Translation:

"This man is a lion in the battle."

Human Translation:

"This man fights with the courage and strength of a lion."

AI-Generated Translation:

"This man is a lion in battle."

Analysis:

Challenge: Arabic metaphorical expression ("أسد في المعركة") conveys valor and bravery, not literal identity.

AI Issue: The AI translation is literal and may confuse non-Arabic readers, as the metaphorical sense is implicit.

Human Strategy: The human translator renders functional equivalence, explicitly conveying the intended traits rather than translating words verbatim.

Theoretical Implication: Demonstrates AI's limitation in inferential comprehension, critical in Relevance Theory.

4.4. Example 4: Idiomatic-Metaphorical Expression

Arabic Source Text:

"يمشي على حبل مشدود بين الحقيقة والوهم."

Literal Translation:

"He walks on a tightrope between truth and illusion."

Human Translation:

"He walks a fine line between reality and illusion."

AI-Generated Translation:

"He walks on a tightrope between truth and illusion."

Analysis:

Challenge: The Arabic metaphor conveys delicacy, risk, and moral judgment, not just physical imagery.

AI Issue: Literal rendering retains image but misses nuance of balance, ethical or cognitive tension.

Human Strategy: "Walks a fine line" captures the idiomatic meaning naturally in English, achieving cultural and pragmatic equivalence.

Observation: AI struggles to map metaphor to culturally equivalent idiom.

4.5. Summary of Observed Patterns

The analysis reveals recurring patterns in AI-generated translations of figurative and culturally embedded Arabic expressions. While AI systems consistently achieve surface-level lexical accuracy and grammatical fluency, these strengths do not extend to pragmatic or cultural adequacy.

In religious-metaphorical texts, AI translations tend to neutralize theological nuance by prioritizing literal propositional meaning. Although formally correct, such renderings often weaken interpretive depth and doctrinal resonance. Human translators, by contrast, make the religious and rhetorical context explicit, thereby achieving functional and pragmatic equivalence.

Poetic metaphors exhibit a similar trend. AI output typically reproduces imagery literally, resulting in flattened emotional tone and diminished aesthetic impact. Human translations compensate through explicitation and stylistic modulation, allowing for more effective transfer of emotional and cultural meaning.

Metaphors of valor and character evaluation further expose AI's reliance on literalism. By leaving metaphorical meaning implicit, AI translations risk obscurity or misinterpretation. Human translators, guided by inferential reasoning and Relevance Theory, explicitly convey intended traits and evaluative force.

Idiomatic metaphors represent one of the most challenging areas for AI systems. AI translations often preserve source-language imagery while failing to employ culturally equivalent target-language idioms. Human translators demonstrate strategic flexibility, selecting idiomatic substitutions that enhance communicative naturalness and balance domestication and foreignization.

Overall, the findings indicate that AI systems function effectively as linguistic processors but not as cultural mediators. Figurative translation requiring cultural inference, emotional resonance, or worldview alignment remains dependent on human cognitive, cultural, and interpretive competence.

4.6. Complex Metaphorical Examples

4.7. Example 5: Religious-Political Metaphor

Arabic Source Text:

"الامة مثل السفينة إذا لم يقودها ريان حكيم، غرقت في عباب الفتن."

Literal Translation:

"The nation is like a ship; if not guided by a wise captain, it sinks in the waves of sedition."

Human Translation:

"A nation is like a ship: without a prudent leader at the helm, it risks being lost in the turbulence of turmoil."

AI-Generated Translation:

"The nation is like a ship; if not led by a wise captain, it will sink in the waves of discord."

Analysis:

Challenge: The Arabic metaphor conveys political wisdom, social responsibility, and collective destiny.

AI Issue: AI retains literal elements but reduces interpretive depth—"waves of discord" is literal but lacks figurative tension of "turbulence of turmoil".

Human Strategy: The human translator employs semantic amplification to capture emotional weight and implied social consequences, balancing faithfulness with functional equivalence.

Theoretical Insight: AI translations struggle with pragmatic inference and cultural resonance (Relevance Theory), especially in culturally loaded political metaphors.

4.8. Example 6: Quranic Allegorical Expression

Arabic Source Text:

"أم مثل الذين حملوا التوراة ثم لم يحملوها كمثل الحمار يحمل أسفارا"

Literal Translation:

"Are those who carry the Torah but do not carry it like a donkey carrying books?"

Human Translation:

"Those who bear the Torah yet fail to uphold it are like donkeys burdened with books."

AI-Generated Translation:

"Are those who carry the Torah but do not carry it like a donkey carrying books?"

Analysis:

Challenge: This metaphor involves theological critique, allegorical imagery, and moral judgment.

AI Issue: AI renders it literally, including the interrogative structure, but fails to convey the evaluative and didactic tone.

Human Strategy: The human translator shifts to a declarative style, preserving moral emphasis while keeping metaphor intact.

Theoretical Insight: AI cannot detect pragmatic force, a core component of cultural and religious translation.

4.9. Example 7: Classical Arabic Poetry (Figurative Imagery)

Arabic Source Text:

"إن الشمس لتشهد على ظلم القلوب كما تشهد على نورها"

Literal Translation:

"The sun bears witness to the injustice of hearts just as it bears witness to its light."

Human Translation:

"Even the sun seems to testify to the injustice in human hearts, as it does to its own radiance."

AI-Generated Translation:

"The sun bears witness to the injustice of hearts as it bears witness to its light."

Analysis:

Challenge: Arabic poetry often intertwines nature, morality, and metaphor. The metaphor here links cosmic imagery to ethical judgment.

AI Issue: Literal translation is understandable but lacks poetic resonance and stylistic balance.

Human Strategy: Human translation introduces subjective nuance and literary cadence, preserving both imagery and evaluative tone.

Observation: AI fails in stylistic pragmatics and figurative depth.

4.10. Example 8: Political-Metaphorical Idiom

Arabic Source Text:

"السلطة كالسيف إن لم تمسكه بحكمة، قطعك قبل أن تقطع خصومك."

Literal Translation:

"Power is like a sword; if you do not wield it wisely, it will cut you before it cuts your enemies."

Human Translation:

"Power is like a double-edged sword: mishandled, it can strike you before reaching your adversaries."

AI-Generated Translation:

"Power is like a sword; if you do not handle it wisely, it will cut you before cutting your opponents."

Analysis:

Challenge: Arabic metaphor conveys strategic wisdom, risk, and ethical responsibility, often used in political commentary.

AI Issue: AI renders literal meaning but fails to emphasize the duality and idiomatic force of "double-edged sword".

Human Strategy: The human translator employs idiomatic rendering, capturing figurative, moral, and rhetorical nuance.

Theoretical Insight: AI struggles with idiomatic metaphors requiring cultural inference and pragmatic reasoning.

4.11. Summary of Complex Figurative Examples

The analysis of complex figurative examples further highlights systematic limitations in AI-generated translation when pragmatic inference and cultural embedding are essential. Although AI systems reliably reproduce lexical meaning, they struggle to capture rhetorical force, moral evaluation, and contextual depth across diverse figurative types.

In religious-political expressions, AI translations tend to preserve literal imagery while producing semantically shallow output. Human translators address this limitation through semantic amplification and functional equivalence, guided by principles of Relevance Theory and context-sensitive domestication. Quranic allegorical expressions reveal a similar pattern: AI systems often retain interrogative structures literally, whereas human translators shift toward declarative forms to foreground moral and didactic intent, ensuring pragmatic clarity and cultural adequacy.

Poetic and nature-based metaphors expose AI's inability to reproduce literary cadence and figurative depth, resulting in flat and stylistically weakened translations. Human translators compensate by employing stylistic pragmatics to restore aesthetic and symbolic resonance. Political idioms present particular difficulty for AI, which frequently misses the metaphor's dual rhetorical edge. Human translators instead apply idiomatic rendering and cultural-linguistic mapping to convey both moral and persuasive nuance.

Overall, the findings confirm that while AI functions effectively as a lexical processor, the translation of complex figurative language remains dependent on human interpretive, cultural, and cognitive competence.

5. General Discussion and Theoretical Integration

The analysis of the preceding examples reveals systematic patterns of limitation in AI-generated translations, particularly in handling metaphorical, idiomatic, and culturally loaded expressions. By integrating these findings with translation theory, pragmatics, and cultural studies, several insights emerge regarding the structural and functional deficits of AI translation systems.

5.1. Functional Equivalence and AI Limitations

Nida's (1964) concept of functional or dynamic equivalence emphasizes that the ultimate goal of translation is to produce a similar effect on the target audience as in the source audience, rather than merely transferring lexical forms. The examples analyzed demonstrate that while AI translations achieve surface-level equivalence—lexical and syntactic accuracy—they often fail to reproduce intended pragmatic effects:

Religious-metaphorical expressions (Examples 1 and 6) are rendered literally, losing theological nuance and moral emphasis.

Poetic imagery (Examples 2 and 7) is flattened, compromising emotional and aesthetic impact.

Political metaphors (Examples 5 and 8) lack strategic and evaluative force, diminishing rhetorical persuasiveness.

Conclusion: AI can produce functionally equivalent texts in form, but rarely in effect, especially when cultural and figurative meaning is central.

5.2. Relevance Theory: Pragmatic Inference Deficits

Sperber and Wilson's (1995) Relevance Theory frames communication as a process of inference based on contextual assumptions. Translators must identify not only what is said but also what is implied and intended. Across all examples:

AI consistently fails to infer implied meaning in metaphors, idioms, or allegorical language.

Literal rendering of expressions like "أسد في المعركة" or "يمشي على جبل مشدود بين الحقيقة والوهم" preserves words but ignores pragmatic force and contextual implications.

Human translators engage in explicitation, adaptation, and semantic amplification, ensuring the audience reconstructs the intended inference.

Implication: AI systems lack the inferential reasoning capacity necessary for fully pragmatic translation, confirming that figurative and context-dependent meaning remains a primarily human domain.

5.3. Domestication vs. Foreignization Strategies

Venuti's (2017) concepts of domestication and foreignization provide a lens to evaluate strategic choices in cultural translation:

AI tendency: Favor literal, foreignized translations, which preserve source forms but often confuse target readers or obscure meaning.

Human tendency: Strategic selection of domestication or foreignization depending on context:

Examples 2 and 4 (poetic and idiomatic) employ domestication, using equivalent target-language idioms to convey meaning naturally.

Example 6 (Quranic allegory) employs foreignization, preserving religious and cultural distinctiveness while clarifying intended effect.

Observation: AI lacks the capacity to select contextually appropriate strategy, often defaulting to rigid foreignization without cultural mediation.

5.4. Patterns of AI Translation Failure

The analysis identifies consistent patterns in AI translation failures across different types of figurative and culturally embedded expressions. In religious-metaphorical texts, AI often loses moral and theological nuance, whereas human translators compensate through explicitation and semantic amplification, achieving functional equivalence and pragmatic relevance. Poetic-metaphorical expressions reveal a flattened emotional tone and diminished stylistic cadence in AI output; human translation restores aesthetic and figurative depth using stylistic rendering and imagery emphasis. Idiomatic expressions pose another challenge, with AI relying on literalism and often failing to convey implied meaning, while human translators employ target-language idioms or paraphrase, balancing domestication and cultural mediation. Political metaphors similarly suffer from loss of rhetorical and moral force in AI output, whereas human translators enhance meaning through semantic enrichment and contextual adaptation, guided by Relevance Theory and functional equivalence. Allegorical or proverbial texts frequently retain surface equivalence and rigid interrogatives in AI output; humans transform these into declarative structures to preserve moral and pragmatic clarity. Overall, AI translations demonstrate formal fluency but remain culturally and pragmatically shallow, highlighting the indispensable role of human inferential reasoning, stylistic creativity, and contextual knowledge in complex translation tasks.

5.5. Proposed Guidelines for Improving AI Translation of Figurative Language

Based on the observed patterns, the study suggests the following guidelines for AI translation enhancement:

Integrate cultural knowledge bases: AI should be trained on corpora annotated for metaphors, idioms, and cultural references, including domain-specific and religious texts.

Implement pragmatics-aware modeling: Systems need mechanisms to infer implied meaning, possibly through neural-symbolic integration or contextual embeddings with cultural tagging.

Dynamic strategy selection: AI should be able to choose between domestication and foreignization, guided by context, audience, and discourse type.

Hybrid human-AI workflows: Given current limitations, AI output should undergo post-editing by culturally competent human translators, particularly for figurative, idiomatic, and culturally sensitive texts.

Evaluation beyond surface metrics: Translation quality metrics should assess cultural and pragmatic adequacy, not just lexical fluency (e.g., human evaluation, pragmatic scoring).

6. Findings and Conclusion

This study examined the capacity of AI-generated Arabic–English translations to convey cultural nuance, figurative meaning, and pragmatic inference, in comparison with human translation. The qualitative analysis reveals a consistent pattern: while AI systems demonstrate high levels of grammatical fluency and lexical accuracy, they remain limited in handling culturally and pragmatically embedded language.

The first major finding is that literalization constitutes the dominant strategy in AI translation. Across metaphorical, idiomatic, religious, and political texts, AI systems tend to preserve surface linguistic form while neglecting implied meaning, rhetorical force, and cultural resonance. This results in translations that appear correct at the sentence level but fail to achieve communicative adequacy. In contrast, human translators routinely adapt form to meaning, prioritizing effect over formal correspondence.

Second, the analysis confirms that pragmatic inference is the principal point of failure in AI translation. From the perspective of Relevance Theory, AI-generated translations often impose increased processing effort on the target reader while delivering reduced contextual effects. Metaphors and idioms that rely on shared cultural assumptions or moral evaluation are rendered without sufficient contextual enrichment, leading to pragmatic loss. Human translators, by contrast, engage in inferential reasoning, employing explicitation, semantic amplification, and idiomatic substitution to reconstruct intended meaning.

Third, the findings highlight a strategic gap between AI and human translation in terms of domestication and foreignization. AI systems default to rigid foreignization, preserving source-language imagery even when it obscures meaning for the target audience. Human translators demonstrate strategic flexibility, selectively domesticating or foreignizing cultural elements according to genre, purpose, and audience. This ability to choose contextually appropriate strategies underscores the interpretive and intentional dimension of human translation.

Cultural loss is shown to be most pronounced in religious, poetic, and political discourse, where language functions as a carrier of worldview, values, and collective identity rather than mere information. In such contexts, AI translation operates primarily as a linguistic processor, not as a cultural mediator.

The study contributes theoretically by reinforcing the distinction between formal fluency and functional adequacy, challenging assumptions that linguistic naturalness equates to translation quality. Practically, the findings caution against uncritical reliance on AI translation in culturally sensitive domains and support hybrid human–AI workflows in which human translators retain responsibility for cultural and pragmatic mediation.

In conclusion, despite significant technological advances, AI translation systems remain constrained in their ability to interpret culture, metaphor, and pragmatic meaning. Translation, particularly between culturally asymmetrical languages such as Arabic and English, remains an interpretive act grounded in human cognitive, cultural, and contextual awareness—capacities that AI has yet to replicate.

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