

Preservation and Loss of Cultural Meaning in AI Translation: Evidence from Arabic-English Expressions

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Abstract:

This study examines how effectively AI-based translation tools preserve the cultural meaning of Arabic expressions in English translation. A purposively selected corpus of 20 culturally embedded expressions, including idioms, proverbs, euphemisms, and social expressions, was translated using Google Translate, ChatGPT (GPT-4o), and Gemini 2.5 Flash. Outputs were evaluated using a three-tier coding scheme based on cultural adequacy. The findings reveal clear performance differences, with ChatGPT and Gemini outperforming Google Translate, while idiomatic and high-context expressions remain especially prone to distortion.

Keywords: AI translation; cultural meaning; Arabic–English translation; idiomatic expressions; translation studies.

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1. INTRODUCTION

In recent years, Artificial Intelligence (AI) has become an increasingly dominant force in natural language processing, particularly in the field of machine translation (Sawicki et al., 2023). Tools such as Google Translate, ChatGPT, and Gemini have made multilingual communication more accessible, offering near-instantaneous translation between languages across a wide variety of digital platforms (Al-Salman & Haider, 2024; Gu, 2023). However, these tools often come at the expense of cultural nuance, a component central to the communicative and sociolinguistic integrity of many world languages (Naveen & Trojovský, 2024). This limitation underscores a longstanding recognition that translation is not merely a technical process of lexical substitution but a profoundly interpretive act shaped by culture, ideology, and context (Nida, 1964; Venuti, 1995). The current paper contributes to translation studies by extending classical equivalence theories to machine-mediated translation.

This study investigates a key controversy within AI translation systems: the difficulty of translating culturally embedded Arabic expressions into English while preserving their sociocultural meaning. Arabic, as a high-context language, relies heavily on shared background knowledge, implicit references, and culturally specific idioms (Hall, 1976). As such, many Arabic expressions seem vague when approached through a literal or purely structural lens. This presents a considerable challenge for AI systems, which are predominantly trained on large-

scale, low-context English corpora and optimized for general fluency rather than cultural fidelity (Yakhni & Chehab, 2025).

The central research question guiding this investigation is: To what extent do AI-based translation tools preserve, adapt, or distort the cultural meaning of Arabic expressions when translating into English? To address this question, the study evaluates the performance of three AI tools: Google Translate, ChatGPT (GPT-4o), and Gemini 2.5 Flash in translating a purposively sampled set of 20 culturally rich Arabic expressions. These expressions include idioms, proverbs, euphemisms, and social phrases, all of which were selected specifically because they carry semantic weight beyond their literal meaning.

Each translation was assessed using a three-tier coding scheme: “Preserved” for outputs that retained both cultural and literal meaning; “Adapted” for those that conveyed partial meaning or generalized the expression; and “Distorted” for outputs that misrepresented or failed to capture the cultural content. By analyzing both the quantitative distribution of these results and the qualitative nature of the shifts in meaning, this study offers insights into the limitations of current AI models and the broader implications for culturally sensitive translation in the age of AI.

2. Theoretical Framework

This study draws upon three key theoretical models to analyze the extent to which AI tools preserve the cultural integrity of Arabic expressions when translated into English: Venuti's (1995)



domestication and foreignization strategies, Nida's (1964) concepts of formal and dynamic equivalence, and Hall's (1976) theory of high- and low-context communication. Together, these frameworks provide a sound interpretive lens for assessing both the linguistic and cultural outputs of AI translations.

Venuti's (1995) distinction between domestication and foreignization addresses the translator's ideological position within the act of translation. Domestication refers to the strategy of rendering a source text in a manner that aligns with the target culture's linguistic norms, thus reducing its cultural "foreignness" to facilitate readability. Conversely, foreignization retains the cultural strangeness of the original, forcing the target audience to confront the otherness of the source culture (Venuti, 1995). In the context of AI translation, this framework helps evaluate whether AI tools prioritize fluency and user accessibility (domestication) at the expense of cultural specificity, or whether they attempt to preserve foreign cultural structures and references (foreignization), even if at the cost of clarity.

Complementing Venuti's theory, Nida's (1964) model of equivalence offers a more linguistically grounded lens to assess translation quality. Nida (1964) distinguishes between formal equivalence, which emphasizes structural and lexical fidelity to the source text, and dynamic equivalence, which seeks to reproduce the effect of the original on the target audience. In the context of this study, formal equivalence is of limited relevance, as literal renderings of culturally rich expressions typically result in distortion. Dynamic

equivalence, by contrast, aligns closely with the study's categories of "Preserved" and "Adapted," since it prioritizes conveying the intended cultural meaning, even if this requires rephrasing, idiomatic substitution, or explanation (Nida, 1964).

Hall's (1976) theory of high- and low-context communication provides further insight into the challenges of translating Arabic expressions. Hall (1976) characterizes high-context cultures as reliant on implicit communication, shared assumptions, and indirect cues, while low-context cultures prioritize explicitness and directness. In the context of this study, high-context cultures include those associated with Arabic-script languages like Arabic dialects. They are described as having rich cultural contexts characterized by dense idiomatic and symbolic expression. Conversely, low-context cultures are those for which existing translation datasets are frequently English-sourced and lack the informal linguistic features and cultural nuances critical for accurately capturing the deeply embedded cultural meaning found in dialects (Yakhni & Chehab, 2025). Yakhni and Chehab (2025) further corroborate that AI tools trained primarily on low-context language data are ill-equipped to recognize these implicit cues. For instance, an Arabic euphemism like "انتقل إلى رحمة الله" (he has passed away) is not just a literal statement but a culturally embedded way of expressing loss with respect and restraint. A literal translation that fails to acknowledge its euphemistic intent risks both miscommunication and cultural insensitivity.

Taken together, these theories frame the analysis by establishing clear benchmarks for evaluating cultural fidelity in translation. They shed light not only on how meaning is transferred (or lost) across languages, but also on why certain expressions are more prone to distortion. In this study, these frameworks guide the interpretation of results and help explain the patterns of preservation, adaptation, and distortion observed across different AI translations.

3. Methodology

3.1 Selection and Classification of Expressions

The dataset for this study consisted of 20 purposively sampled, culturally rich Arabic expressions, evenly distributed across four categories: idioms, proverbs, euphemisms, and social expressions. Each expression was selected based on its semantic opacity and cultural specificity, criteria that pose a known challenge for AI translation systems (Shahmerdanova, 2025; Vula & Tyfekçi, 2024). For instance, idiomatic phrases like “أكل بعقله حلوة” (literally, “he ate sweets in his mind”) were prioritized over more transparent expressions precisely because their meanings are not deducible from their literal translation. Expressions were selected from reliable Arabic idiom dictionaries and academic studies (Aladel, 2023; Maxos, 2016; Moussa, 2014), supplemented with expressions sourced from native speaker input and culturally oriented media content (e.g., YouTube videos of television programs), to ensure linguistic authenticity and contextual relevance.

Each expression was accompanied by metadata including: (1) its type, (2) its literal meaning, and (3) its cultural meaning in context. This allowed for a systematic evaluation of how AI tools process different types of culturally embedded expressions, each posing distinct semantic and pragmatic challenges.

3.2 Translation Tools and Data Collection

Three widely-used AI translation tools were tested:

- Google Translate: accessed via a web browser.
- ChatGPT: using version GPT-4o.
- Gemini: using version 2.5 Flash.

Each tool was used on the same date, August 4, 2025 at 7:00 PM, to ensure uniformity and eliminate temporal variations in model or version updates. While Google Translate does not publicly indicate model versioning, both ChatGPT and Gemini were accessed using their latest, free, publicly labeled versions at the time of data collection. These tools were selected to reflect both mainstream usage (Google) and the state-of-the-art in Large Language Models (LLMs) (ChatGPT and Gemini).

3.3 Coding Framework

Each English output was evaluated and assigned to one of three categories:

- Preserved: When the cultural meaning and contextual integrity of the original Arabic expression were fully retained.
- Adapted: When the translation conveyed partial meaning or employed a generalized equivalent, losing some cultural nuance.
- Distorted: When the translation failed to reflect the intended cultural meaning or introduced significant misinterpretation.

This coding was performed manually, drawing on the authors' own native speaker intuition, sociolinguistic analysis, and cross-comparison with established English idioms. Special care was taken to distinguish between literal accuracy and cultural fidelity. Cases in which literal translations were technically correct but culturally meaningless were marked as Distorted.

Because the study relied on interpretive qualitative analysis, the coding was conducted manually by the first author. To improve consistency, all translations were initially coded and then reviewed again one week later before the final categorization was confirmed. Particular attention was given to borderline cases between “Adapted” and “Preserved.” In this study, “Adapted” referred to translations that conveyed the general communicative intent of the expression but reduced or generalized important figurative, cultural, or pragmatic elements. For example, the expression “طلع من المولد بلا حمص” was sometimes translated into broadly understandable paraphrases such as

“ended up empty-handed.” While this rendering preserved the general meaning of loss or disappointment, it omitted the culturally specific imagery associated with the Muslim festival expression. Such cases were therefore classified as “Adapted” rather than fully “Preserved.”

3.4 Analytical Procedure

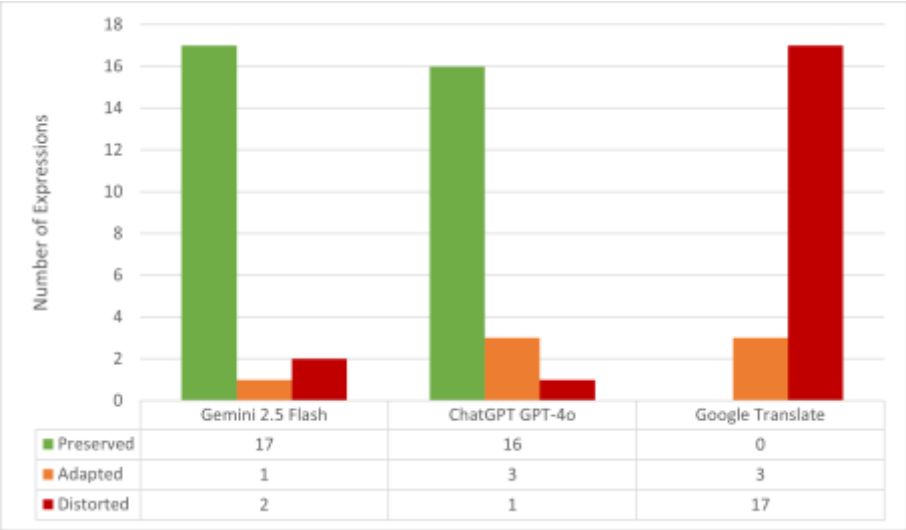
A mixed-methods approach was employed to analyze the collected data. First, the distribution of codes (Preserved / Adapted / Distorted) was analyzed quantitatively to assess overall tool performance and compare across categories. Second, a qualitative discourse analysis was conducted to explore selected cases in depth, focusing on instances where tools either failed dramatically or succeeded unexpectedly in preserving cultural nuance. By combining numerical coding patterns with interpretive linguistic analysis, the study provides a comprehensive evaluation of how each tool navigates the cultural challenges of Arabic-English translation.

4. Results

4.1 Tool Performance Overview

The evaluation of 20 culturally rich Arabic expressions revealed significant disparities among the three AI tools in their ability to preserve cultural meaning. As shown in Figure 1, Gemini achieved the highest rate of cultural meaning preservation, correctly preserving 85% of the expressions (17 out of 20), followed closely by ChatGPT at 80% (16 out of 20). Google Translate, by contrast, failed to preserve the

cultural meaning of any expression, yielding an 85% distortion rate and



only 15% adaptation.

Fig.1. Translation Outcomes by Tool

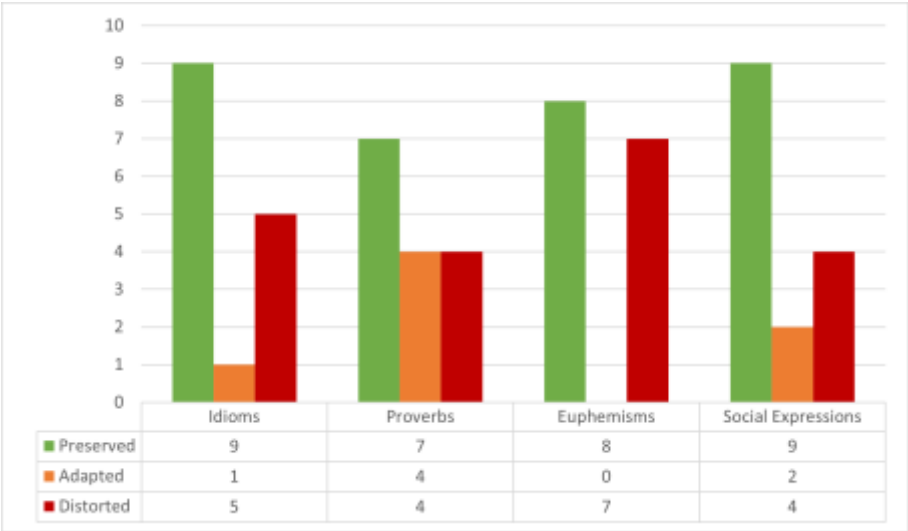
Source: Authors, 2025

These results point to a clear performance hierarchy. Gemini and ChatGPT consistently demonstrated greater contextual awareness and semantic flexibility, often substituting literal phrasing with culturally or functionally equivalent expressions. Google Translate, in contrast, displayed a persistent reliance on literalism, frequently yielding outputs that were either confusing or entirely unintelligible in cultural context. This contrast is especially noteworthy, as the LLMs (ChatGPT and Gemini) were not built primarily as translation systems, yet they outperformed Google Translate, a tool explicitly designed for translation, in preserving cultural meaning.

4.2 Patterns by Expression Type

Performance also varied noticeably by expression category. Idioms remained among the most challenging. Out of fifteen instances, nine were preserved, but five were distorted, often due to literal renderings that failed to capture cultural nuance. Yet some were handled well: Gemini successfully rendered “أكل بعقله حلاوة” as “pulling the wool over his eyes,” an English idiomatic equivalent that preserved the cultural sense of manipulation.

Fig.2. Distribution of outcomes across expression types



Source: Authors, 2025

Proverbs showed a relatively balanced profile. Seven were preserved, but four were adapted and another four distorted. This indicates that while proverbs are generally easier for AI tools to process, especially when they align with universal moral or metaphorical

structures, they still pose difficulties. For instance, “من جدّ وجد” (He who strives, finds) was consistently well-translated, but “طلع من المولد بلا حمص” (literally “left the festival without chickpeas,” meaning “ended up empty-handed”) often slipped into distortion when rendered too literally.

Euphemisms showed a split pattern of performance. Eight were preserved, while seven were distorted, and none were adapted. In other words, euphemisms were either translated smoothly into appropriate English equivalents or reduced to literal outputs that failed to capture their intended meaning.

Social expressions were generally the most successfully preserved. Nine were preserved and only four distorted, with two falling into adapted renderings. Blessings and conventional expressions, such as “صحتين وعافية” (“bon appétit”), were usually translated appropriately by ChatGPT and Gemini. However, some still suffered distortion. Google Translate, for instance, mistranslated “شدّ حيلك” as “strengthen your tricks,” altering its encouraging tone into something misleading.

4.3 Notable Translation Examples

Several examples illustrate both the strengths and limitations of the tested tools:

- Success-Gemini: For “أكل بعقله حلاوة” (To manipulate someone easily), Gemini offered “*He’s pulling the wool over his eyes*”, a culturally comparable English idiom that preserved both tone and meaning.



- Success-ChatGPT: For “ضرب أخماساً في أسداس”, ChatGPT translated it as “*He is plotting something complicated and scheming behind the scenes*”, capturing the underlying deceitful connotation effectively.
- Failure-Google Translate: The phrase “شَدَّ حِيَاك”, an encouragement often offered during hardship, was translated by Google as “*Strengthen your tricks*”, inadvertently altering the sentiment into something pejorative.
- Universal Failure: “نائم في العسل” was mistranslated by all tools. While ChatGPT and Google Translate rendered it literally, Gemini attempted a partial paraphrase (“*Sound asleep*”), yet none conveyed the idiom’s deeper implication of obliviousness.

4.4 Key Trends

The analysis points to three key trends:

1. Literalism is a core weakness, especially for Google Translate, whose outputs failed to recognize idiomatic or metaphorical content in every tested case.
2. Context-aware tools like ChatGPT and Gemini show promising capacity for cultural reasoning, particularly when dealing with social expressions and proverbs.
3. Idioms remain among the most vulnerable to distortion, revealing that non-literal, high-context expressions continue to

exceed the semantic modeling capacity of even the most advanced AI systems.

Overall, the results reveal consistent patterns in how AI tools handle culturally embedded expressions across categories, highlighting systematic variation in preservation, adaptation, and distortion rates.

5. Discussion

The findings of this study confirm a clear performance gap among the three AI tools evaluated. Gemini and ChatGPT outperformed Google Translate by a wide margin in preserving the cultural meaning of Arabic expressions, yet both still demonstrated significant limitations when confronted with idioms and culturally opaque phrases. To better understand the dynamics underlying these results, this section interprets the findings through the lens of the three key theoretical frameworks of the study.

5.1 Nida's Dynamic vs. Formal Equivalence

Nida's (1964) distinction between formal equivalence and dynamic equivalence offers a useful lens for evaluating how each tool approached translation. Google Translate's outputs clearly reflect a preference for formal equivalence, producing literal, word-for-word translations that align structurally with the source text but often fail semantically. For example, its translation of “نائم في العسل” as “sleeping in honey” is formally accurate but culturally meaningless in English, lacking any communicative function beyond the superficial.



Conversely, ChatGPT and Gemini demonstrated efforts toward dynamic equivalence, particularly in their ability to preserve idiomatic meaning by rephrasing or substituting with culturally comparable expressions. Gemini's rendering of "أكل بعقله حلاوة" as "He's pulling the wool over his eyes" exemplifies this strategy. While the phrase does not mirror the Arabic structure, it succeeds in preserving both the tone and intent of the original, namely, easy manipulation through persuasion. Similarly, ChatGPT's translation of "ضرب أخماسًا في أسداس" as "He is plotting something complicated and scheming behind the scenes" maintains the interpretive depth of the Arabic idiom, even if it departs from literal translation.

These examples suggest that models such as Gemini and ChatGPT are capable of mimicking the behavior of human translators who prioritize communicative function over structural fidelity, a key principle of Nida's dynamic equivalence. However, their inconsistency across different expressions, especially idioms with highly localized or vague meanings, indicates that their processing of meaning might remain probabilistic rather than contextually grounded.

Beyond semantic meaning, the findings also point to the importance of pragmatic equivalence, particularly in relation to register and social effect. In several social expressions, the AI tools succeeded in conveying the general communicative intent while varying in degrees of formality and cultural tone. For example, the expression "صحتين وعافية" was sometimes rendered using culturally familiar formulas such

as “bon appétit” rather than more neutral alternatives like “Good health and wellness.” Although both preserve the core function of the expression, they carry different sociolinguistic associations and levels of formality.

5.2 Venuti’s Strategies: Cultural Visibility and the AI Translator

Venuti’s (1995) theory of domestication and foreignization interrogates the ideological role of translation: whether it assimilates the foreign into the familiar or preserves cultural otherness. Notably, Google Translate’s approach, despite its literalism, aligns more closely with a distorted form of domestication. Not because it actively bridges cultural gaps, but because it erases them. By offering translations devoid of explanatory context or cultural scaffolding, it produces homogenized outputs that render the source culture unintelligible.

By contrast, ChatGPT and Gemini employ a hybrid strategy. When they offer culturally equivalent idioms such as replacing “أكل بعقله حلاوة” with a native English metaphor, they engage in domestication that fosters cultural accessibility. When they opt for explanatory paraphrasing, as ChatGPT did with “ضرب أخماسًا في أسداس” they practice foreignization, deliberately introducing unfamiliar concepts while maintaining their integrity. This strategy respects the cultural density of the source material, albeit through semantic unpacking rather than lexical substitution.



The implication here is significant: while AI systems do not make ideological choices consciously, their training data and algorithmic architecture might simulate ideological stances, often defaulting to fluency over cultural retention. The ability of advanced models to switch between domestication and foreignization (whether intentionally or not) suggests growing flexibility but also the absence of consistent translation ethics or cultural intentionality.

5.3 Hall's High- and Low-Context Communication: Cultural Drift in AI

Hall's (1976) framework of high- and low-context communication offers further insight into the difficulty AI systems face when translating culturally rich content. Arabic, as a high-context language, depends on shared assumptions, symbolic references, and implicated expression (Altahmazi et al., 2023). English, by contrast, is typically low-context, demanding explicitness and clarity (Abdul Baki, 2024).

Culturally embedded expressions such as “تائم في العسل” and “خفيف الظل” (light-hearted or charming) rely heavily on implicit meanings that are evident only to culturally immersed interlocutors. AI systems, which lack situated cultural experience and interpret text based on pattern recognition, are prone to defaulting to literalism or overly generic paraphrase (Yakhni & Chehab, 2025). Even when semantic structures are recognized, the pragmatic function (tone, intent, register) is often lost.

From Hall's perspective, these distortions are not merely translation inaccuracies but mismatches in communication style. When AI systems translate high-context expressions literally, they effectively force culturally implicit messages into a low-context interpretive frame that demands explicit semantic transparency. As a result, expressions that rely on shared cultural assumptions become stripped of their symbolic and interpersonal dimensions, often producing outputs that appear overly explicit, unnatural, or unintentionally absurd in English. In this sense, the distortion reflects a category error in communication style: the AI system applies low-context decoding strategies to expressions whose meaning depends primarily on high-context cultural inference.

The more advanced models (ChatGPT and Gemini) appear to mitigate this drift by leveraging vast datasets and inferential learning to approximate meaning. Yet, their failures in translating figurative expressions with abstract metaphorical structures suggest that high-context sensitivity remains underdeveloped in current AI systems. In particular, idioms function as compressed cultural narratives; without an understanding of the sociohistorical context, AI can only gesture toward their meaning without fully capturing it.

5.4 Implications for AI Translation and Cross-Cultural Communication

The findings carry important implications for the development and application of AI tools in translation settings. First, they highlight the necessity of training models on culturally rich, multilingual corpora

that include high-context language data, not merely for linguistic diversity, but for cultural representativeness as well. Second, the observed inconsistency in preserving figurative meaning signals the need for hybrid models that incorporate both neural translation systems and symbolic reasoning, especially when tasked with translating culturally opaque phrases.

Perhaps most strikingly, this study shows that LLMs, though not designed primarily for translation, outperformed Google Translate, a dedicated translation system. This underscores the importance of broad, context-rich AI training in enabling cultural reasoning, suggesting that translation competence may emerge more reliably from general-purpose linguistic modeling than from narrow translation-specific optimization.

A possible implication of these findings concerns the role of user prompting in AI-assisted translation. Although this study did not experimentally test prompt variation, the observed sensitivity of LLMs to contextual interpretation suggests that future research could investigate whether explicitly requesting the preservation of cultural tone or the explanation of idiomatic meaning influences translation quality. Such user-guided prompting strategies remain hypothetical within the scope of the present study but may represent a productive direction for future research on culturally sensitive AI translation.

Additionally, future AI translation systems may benefit from mechanisms capable of identifying culturally embedded expressions

and offering optional context-sensitive translation modes (e.g., preserving cultural tone or explaining idiomatic meaning). While this proposal remains speculative and was not directly tested in the present study, it emerges logically from the recurring difficulties observed in translating high-context expressions across the evaluated systems.

Lastly, these findings reaffirm the critical insight that translation is not merely a technical act but a cultural one, and as such, should be guided by principles of intercultural ethics, not just algorithmic efficiency.

6. Conclusion

This study investigated the extent to which AI-powered tools preserve the cultural integrity of Arabic expressions when translated into English. Through a targeted analysis of 20 culturally embedded phrases ranging from idioms and proverbs to euphemisms and social expressions, it became clear that significant disparities exist among widely used AI models. Gemini and ChatGPT demonstrated superior performance, achieving 85% and 80% preservation rates respectively, while Google Translate consistently failed to capture cultural nuance, distorting 85% of expressions. These findings affirm the hypothesis that AI translation systems struggle to manage culturally embedded, high-context language, particularly when relying on literal or structural equivalence.

Framed within the theories of Nida, Venuti, and Hall, the results illustrate that machine translations are often shaped by algorithmic



defaults to formal equivalence and domestication, resulting in cultural flattening. While more advanced tools showed evidence of dynamic equivalence and selective foreignization, their performance remained inconsistent, particularly when handling abstract metaphor or culturally specific idioms. These limitations underscore a broader issue in cross-cultural machine translation: the absence of deep contextual awareness in current AI models.

Practically, this study highlights the need for culturally enriched training data, hybrid translation strategies, and user-centered design features that value contextual nuance in translation outputs. For instance, incorporating options to explain idioms or adjust for cultural tone could significantly enhance communicative clarity and cultural fidelity.

Future research is recommended to expand the linguistic scope by including other high-context languages and evaluating whether similar translation dynamics persist across diverse cultural paradigms. Furthermore, longitudinal studies that track updates in AI models over time could shed light on how rapidly (or unevenly) translation accuracy evolves across cultural domains. Ultimately, this study contributes to a growing body of evidence suggesting that cultural competence must be a core component of ethical and effective AI translation design.

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