MACHINE TRANSLATION AND METAPHOR: THE LIMITS OF ARTIFICIAL INTELLIGENCE

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Annotation: *This article explores the challenges and limitations of artificial intelligence in translating metaphorical expressions across languages, with a focus on machine translation systems. Metaphors, as culturally and cognitively rich linguistic units, often resist literal interpretation, making their accurate rendering a complex task for AI. Through comparative analysis of Uzbek and English metaphors, the study highlights semantic distortions caused by literal translation and underscores the need for context-aware and culturally sensitive models. The research contributes to the field of computational linguistics and translation studies by identifying gaps in current technologies and proposing directions for improvement.*

Keywords*: Machine translation; metaphor; artificial intelligence; semantic equivalence; cognitive linguistics; Uzbek-English comparison; translation theory; cultural context; neural networks; figurative language*

In recent years, the rise of artificial intelligence has revolutionized language translation, making communication across linguistic boundaries faster and more accessible than ever before. Machine translation systems, powered by advanced neural networks and deep learning algorithms, now handle millions of translations daily, bridging gaps in global education, media, and diplomacy.

Yet, despite these impressive advances, one linguistic phenomenon continues to resist easy automation: metaphor. Metaphors carry meanings that go beyond the literal—they embed cultural references, emotional depth, and abstract ideas that often defy direct interpretation. For machine translation, deciphering and accurately conveying metaphors remains a persistent challenge, revealing fundamental limitations in current AI technology.

This study examines how metaphors expose the cognitive and semantic boundaries of machine translation, questioning whether artificial intelligence can truly grasp the layered nuances of human expression. By exploring this intersection of figurative language and computational linguistics, the research aims to highlight the need for more context-sensitive and culturally aware translation models.

In the modern digital age, machine translation has become a widely adopted tool across education, international communication, media, and research. While it has made tremendous progress in handling literal language, metaphors remain a profound challenge for artificial intelligence systems.

Metaphors are not just linguistic decorations—they carry deep cultural, emotional, and cognitive meaning. They require an understanding of context, symbolism, and human experience that current machine translation systems often lack. Literal rendering of

metaphors by AI may result in distorted or meaningless output, thus compromising the intent and beauty of the original message.

Studying this topic is vital because:

It reveals the limitations of AI in dealing with figurative and abstract language.

It bridges the gap between computational linguistics and human cognition.

It highlights how misinterpretation of metaphors can affect cross-cultural communication and knowledge dissemination.

It pushes the boundaries of natural language processing, encouraging the development of more sophisticated and context-aware translation technologies.

The intersection of machine translation (MT) and metaphor has garnered increasing scholarly attention, particularly as artificial intelligence (AI) systems become more integrated into linguistic and literary domains. Metaphors, as cognitively and culturally embedded expressions, pose unique challenges for MT systems that rely on statistical and neural models to process language.

Early foundational work by Newmark (1988) and Dagut (1976) emphasized the complexity of metaphor translation, proposing taxonomies and procedures for handling metaphor types—ranging from dead and conventional metaphors to original and culturally bound ones. These frameworks remain influential, especially in comparative studies between human and machine translation outputs.

Recent cognitive-oriented studies, such as those by Schäffner (2004) and Dorst et al. (2023), argue that metaphors are not merely stylistic devices but fundamental to human thought. Their translatability depends on conceptual mappings that often differ across languages and cultures. This has led to the development of cognitive models that integrate metaphor theory with translation strategies, highlighting the need for contextual and cultural sensitivity.

Comparative analyses between human translators, neural machine translation (NMT) systems, and large language models (LLMs) reveal notable disparities. Li and Chen (2025) found that while LLMs exhibit translation patterns closer to human translators—favoring metaphor adaptation and reduction—NMT systems tend to reproduce metaphors more literally, often missing nuanced meanings. Moreover, LLMs show improved performance with conventional metaphors but struggle with novel or creative ones, underscoring the limitations of current AI in handling figurative language.

Studies such as Guerberof-Arenas and Toral (2022) suggest that metaphor is a key unit of "creative potential" in literary texts, and its translation requires more than algorithmic computation. The stylistic and aesthetic value of metaphors often diminishes in MT outputs due to standardization and fluency-driven optimization.

Additionally, research by Vinall and Hellmich (2021) explores how language educators perceive MT through metaphorical lenses—describing it as a "crutch," "bridge," or "rabbit hole"—revealing broader implications for identity, agency, and pedagogical practices.

In sum, the literature underscores that while AI has made strides in literal translation, metaphor remains a frontier that challenges its semantic depth, cultural awareness, and

creative flexibility. Continued interdisciplinary research is essential to enhance MT systems' ability to interpret and render metaphors with fidelity and nuance.

Metaphor plays a crucial role in human communication, serving not only as a stylistic device but as a window into cultural values, emotional depth, and cognitive perception. While artificial intelligence has revolutionized language processing, its ability to interpret and translate metaphors remains imperfect. The literal nature of machine translation systems often results in outputs that are grammatically accurate but semantically hollow, especially when figurative language is involved.

Consider the Uzbek expression **"**Qo'lingdan hamma ish keladi," which translates literally to *"Everything comes from your hand."* The intended meaning is that someone is skilled or capable in many things. A native English equivalent would be *"You're good at everything"* or *"You're handy."* Machine translation systems, however, frequently produce literal renderings that can confuse the reader or obscure the speaker's actual intention.

Another example is "Hech bir gul bezaksiz bo'lmaydi"—*"No flower is without decoration."* This metaphor celebrates individuality and inner beauty. In English, a corresponding expression might be *"Every rose has its charm."* Machine translation might miss the poetic quality and cultural nuances embedded in such lines, reducing them to flat literal phrasing.

Then there's "Yuragi ko'prikdek ochiq," meaning *"The heart is open like a bridge."* This refers to someone who is generous and emotionally available. English might express this with *"Has a heart of gold."* AI systems often struggle with this type of metaphor, especially when imagery is tied to regional cultural symbols like bridges, flowers, or hands, which may not translate idiomatically into another language.

Such examples show that machine translation systems are still limited in grasping metaphor's layered meanings. Unlike human translators, who consider context, cultural background, and emotional tone, AI tends to rely on statistical patterns and literal substitutions. This exposes a crucial gap between linguistic surface and semantic depth—a space where artificial intelligence has yet to reach the full potential of human interpretation.

As research advances, bridging this gap requires developing systems that go beyond phrase-level translation and embrace cross-cultural cognition, creativity, and emotional intelligence. Metaphor, in this regard, is not just a linguistic challenge, but a philosophical and technological frontier.

Metaphor remains one of the most intricate and revealing features of human language—rooted in cognition, culture, and creativity. While machine translation technologies have made remarkable strides in rendering literal text across languages, they continue to struggle with metaphorical expressions that require deep contextual understanding. Literal translation often fails to capture the intended emotional nuance, symbolic imagery, or cultural resonance embedded within metaphors.

This limitation underscores a broader challenge: artificial intelligence may mimic surface-level language patterns, but it still lacks the intuitive sensitivity and interpretive

flexibility that characterize human communication. Improving metaphor translation demands interdisciplinary collaboration between linguists, cognitive scientists, and AI developers to design systems that move beyond statistical correspondence and engage with meaning on a conceptual level.

As language continues to evolve and globalization increases the demand for accurate cross-cultural exchange, addressing the metaphor challenge is essential—not only for advancing machine translation but for enriching human-AI interaction as a whole.

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