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AN ANALYTICAL APPROACH TO THE CHALLENGES OF ARTIFICIAL INTELLIGENCE IN CROSS-LINGUISTIC TRANSLATION FROM ENGLISH INTO OTHER LANGUAGES (ON THE EXAMPLE OF ENGLISH-RUSSIAN TRANSLATION)

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Abstract

The rapid advancement of artificial intelligence (AI) has significantly transformed the field of translation, particularly in the context of cross-linguistic communication. AI-based translation systems, including neural machine translation (NMT), have improved accessibility and efficiency in multilingual information exchange. However, despite these technological advancements, numerous challenges persist, especially when translating texts from English into structurally and culturally diverse languages. This study aims to analyze the linguistic, cultural, and technological challenges associated with AI-driven translation. The research employs a qualitative analytical approach, examining typical translation outputs and identifying recurring issues such as semantic ambiguity, contextual misinterpretation, and cultural mismatch. The findings reveal that while AI systems demonstrate high performance in handling general language structures, they struggle with idiomatic expressions, stylistic nuances, and culturally embedded meanings. The study highlights the necessity of integrating linguistic knowledge and human expertise into AI systems to improve translation quality and reliability.

Keywords: artificial intelligence, machine translation, cross-linguistic communication, translation challenges, neural networks

INGLIZ TILIDAN BOSHQA TILLARGA (INGLIZCHA-RUSCHA TARJIMA MISOLIDA) TILLARARO TARJIMADA SUN'IY INTELLEKTDAN FOYDALANISH MUAMMOLARIGA ANALITIK YONDASHUV

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Annotatsiya

Sun’iy intellekt (SI) ning jadal rivojlanishi tarjima sohasini sezilarli darajada o‘zgartirdi, ayniqsa tillararo kommunikatsiya kontekstida. SI asosidagi tarjima tizimlari, jumladan neyron mashina tarjimasi (NMT), ko‘p tilli axborot almashinuvida qulaylik va samaradorlikni oshirdi. Biroq, ushbu texnologik yutuqlarga qaramay, ayniqsa ingliz tilidan strukturaviy va madaniy jihatdan farq qiluvchi tillarga tarjima qilishda bir qator muammolar saqlanib qolmoqda.

Mazkur tadqiqot SI yordamida amalga oshiriladigan tarjima bilan bog‘liq lingvistik, madaniy va texnologik muammolarni tahlil qilishga qaratilgan. Tadqiqotda sifatli tahliliy yondashuv qo‘llanilib, tipik tarjima natijalari o‘rganiladi hamda semantik noaniqlik, kontekstni noto‘g‘ri talqin qilish va madaniy nomuvofiqlik kabi takrorlanuvchi muammolar aniqlanadi.

Natijalar shuni ko‘rsatadiki, SI tizimlari umumiy til tuzilmalarini qayta ishlashda yuqori samaradorlikni namoyon etsa-da, idiomatik ifodalar, uslubiy nozikliklar va madaniy jihatdan bog‘langan ma’nolarni uzatishda qiyinchiliklarga duch keladi. Tadqiqot tarjima sifatini va ishonchliligini oshirish uchun SI tizimlariga lingvistik bilimlar va inson tajribasini integratsiya qilish zarurligini ta’kidlaydi.

Kalit so‘zlar: sun’iy intellekt, mashina tarjimasi, tillararo kommunikatsiya, tarjima muammolari, neyron tarmoqlar

АНАЛИТИЧЕСКИЙ ПОДХОД К ПРОБЛЕМАМ ИСПОЛЬЗОВАНИЯ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В МЕЖЪЯЗЫКОВОМ ПЕРЕВОДЕ С АНГЛИЙСКОГО ЯЗЫКА НА ДРУГИЕ ЯЗЫКИ (НА ПРИМЕРЕ АНГЛО-РУССКОГО ПЕРЕВОДА)

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Аннотация

Стремительное развитие искусственного интеллекта (ИИ) значительно трансформировало сферу перевода, особенно в контексте межъязыковой коммуникации. Системы перевода на основе ИИ, включая нейронный машинный перевод (NMT), повысили доступность и эффективность обмена информацией в многоязычной среде. Однако, несмотря на эти технологические достижения, сохраняется ряд проблем, особенно при переводе текстов с английского языка на структурно и культурно отличающиеся языки.

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Данное исследование направлено на анализ лингвистических, культурных и технологических проблем, связанных с переводом, осуществляемым с помощью ИИ. В работе используется качественный аналитический подход, основанный на изучении типичных переводов и выявлении повторяющихся ошибок, таких как семантическая неоднозначность, неверная интерпретация контекста и культурные несоответствия.

В исследовании подчеркивается необходимость интеграции лингвистических знаний и человеческой экспертизы в системы ИИ для повышения качества и надежности перевода.

Ключевые слова: искусственный интеллект, машинный перевод, межъязыковая коммуникация, проблемы перевода, нейронные сети

Introduction

The increasing globalization of communication has created a growing demand for efficient and accurate translation across languages. In response to this demand, artificial intelligence has emerged as a powerful tool in the field of translation [2, p. 12]. AI-driven systems, particularly neural machine translation models, have revolutionized the way texts are translated, offering fast and cost-effective solutions for multilingual communication [1, p. 45].

Despite these advantages, the use of AI in translation raises significant concerns regarding accuracy, reliability, and cultural sensitivity [9, p. 67]. English, as a global lingua franca, often serves as the source language in translation processes. However, translating from English into other languages presents complex challenges due to differences in grammar, semantics, and cultural context.

The aim of this study is to provide an analytical overview of the challenges faced by AI systems in cross-linguistic translation from English into other languages. The research focuses on identifying key problem areas and evaluating the limitations of current AI technologies in handling linguistic diversity [8, p. 159].

Literature Review

The development of artificial intelligence in translation studies has been shaped by both **linguistic theory** and **computational advancements**. Early approaches to translation were primarily rule-based and relied heavily on linguistic knowledge. Foundational works such as Eugene A. Nida's *Toward a Science of Translating* (1964) [8, p.25] and Peter Newmark's *A Textbook of Translation* (1988) [7, p.12] established the importance of semantic equivalence, cultural context, and communicative purpose in translation. These principles remain central even in modern AI-driven systems.

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The shift toward computational methods began with statistical models, as described in Philipp Koehn's *Statistical Machine Translation* (2010) [5, p. 78], which introduced probabilistic approaches to translation based on large bilingual corpora. Earlier comprehensive overviews, such as W. John Hutchins and Harold Somers (1992) [6, p. 102], highlighted the limitations of rule-based systems and anticipated the need for more adaptive technologies.

A major breakthrough in machine translation occurred with the emergence of **neural machine translation (NMT)**. The work of Dzmitry Bahdanau, Kyunghyun Cho, and Yoshua Bengio (2014) [3, p. 5] introduced attention mechanisms, enabling models to dynamically focus on relevant parts of the input sequence. This innovation was further advanced by Ashish Vaswani et al. (2017) [4, p. 6000], whose Transformer architecture significantly improved translation quality by relying entirely on attention mechanisms rather than recurrent structures.

Contemporary research in natural language processing, as reflected in Daniel Jurafsky and James H. Martin (2023) [2, p. 134], emphasizes the role of deep learning models in achieving near-human performance in certain translation tasks. However, despite these technological advances, significant challenges remain, particularly in handling ambiguity, pragmatics, and cultural nuance [9, p. 89].

From a translation studies perspective, scholars such as Juliane House (2015) and Gideon Toury (1995) have stressed the importance of translation quality assessment and the influence of norms and context on translation outcomes. Similarly, Jean-Paul Vinay and Jean Darbelnet (1995) provided a comparative stylistic framework that highlights structural and cultural differences between languages—factors that remain difficult for AI systems to process effectively.

Methods

This study adopts a qualitative analytical methodology. The research is based on the examination of AI-generated translations produced by widely used machine translation systems [1, p. 67]. A selection of English texts of varying complexity was translated into several target languages, including languages with different grammatical and cultural structures.

The analysis focuses on three main dimensions:

- **Linguistic accuracy** (grammar, syntax, and vocabulary)
- **Semantic equivalence** (meaning preservation)
- **Cultural and contextual adequacy**

Examples of translation outputs were systematically analyzed to identify recurring patterns of errors. Comparative analysis was also employed to evaluate differences between human and AI translations [9, p. 120].

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Analysis and Results

The analysis revealed several significant challenges in AI-based translation:

1.Semantic Ambiguity

AI systems frequently struggle with words that have multiple meanings. Without sufficient contextual understanding, translations may result in incorrect interpretations. For example, polysemous words in English often require deep contextual analysis, which AI systems do not always successfully perform [2, p. 134].

One of the most common issues in AI-based translation arises from **polysemy**, where a single word has multiple meanings depending on context.

Example 1: *Sentence:* "She sat by the bank and watched the water."

Possible meanings of the word "*bank*":

- **river bank** (берег реки)
- **financial institution** (банк)

AI systems may incorrectly translate this as: *"Она сидела у банка и смотрела на воду"* instead of the correct: *"Она сидела на берегу реки и смотрела на воду"*

Example 2: *Sentence:* "This bag is very light."

Possible meanings of the world "*light*":

- **not heavy** (лёгкий)
- **illumination** (свет)

Incorrect AI translation may produce: *"Эта сумка очень светлая"* instead of *"Эта сумка очень лёгкая"*

2.Idiomatic and Figurative Language

Idioms, metaphors, and culturally specific expressions present a major difficulty for AI translation systems [7, p. 89]. These expressions are often translated literally, leading to unnatural or misleading results.

Example 1: "It's raining cats and dogs"

- Literal AI translation: *"Идёт дождь из кошек и собак"*
- Correct meaning: *"Идёт сильный дождь / ливень"*

Problem: AI interprets the expression word-for-word instead of recognizing it as an idiom.

Example 2: "He tried to break the ice at the meeting."

- Incorrect AI translation: *"Он пытался сломать лёд на встрече"*
- Correct translation: *"Он пытался разрядить обстановку / начать разговор"*

3.Structural Differences Between Languages

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Languages vary significantly in syntax and grammatical structure [11, p. 92]. AI systems sometimes fail to adapt sentence structures appropriately, especially when translating into languages with flexible word order or complex morphology [12, p. 34].

Example 1: Word order differences

Sentence: "I only told her the truth."

Possible meanings (depending on focus):

- Only I told her (никто кроме меня)
- I told only her (никому другому)
- I told her only the truth

AI translation often ignores emphasis: *"Я только сказал ей правду"* (ambiguous / inaccurate). Correct variants depend on context: *"Только я сказал ей правду" or "Я сказал правду только ей".*

Conclusion

This study has examined the key challenges associated with the use of artificial intelligence in cross-linguistic translation from English into other languages [2, p. 145; 9, p. 133]. The analysis has shown that despite significant technological progress, AI systems still face limitations in handling semantic complexity, cultural context, and stylistic variation.

Future research should focus on enhancing AI models through interdisciplinary approaches that incorporate linguistic theory, cultural studies, and human feedback. The development of more context-aware and culturally sensitive translation systems remains a critical goal for the advancement of AI in translation.

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