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THE EVALUTION OF MACHINE TRANSLATION: FROM ALGORITHMIC RULES TO NEURAL NETWORK

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Abstract

Machine Translation (MT) has evolved from a Cold War-era cryptographic experiment into an ubiquitous global utility. This article traces the paradigm shifts in MT: Rule-Based Machine Translation (RBMT), Statistical Machine Translation (SMT), and Neural Machine Translation (NMT). By contextualizing these technological milestones within foundational translation literature—such as Eugene Nida's equivalence theories and Roman Jakobson's semiotics—this paper examines how computational models have attempted to decode the complexities of human language. Finally, the article addresses the ongoing challenge of translating "the untranslatable"—literary texts, realia, and cultural lacunae.

Key words: automate translation, human languages, secret codes, *intralingual* (rewording), *interlingual* (between languages), and *intersemiotic* (between sign systems).

Аннотация

Машинный перевод (МП) прошел путь от криптографического эксперимента эпохи холодной войны до повсеместно используемого глобального инструмента. В данной статье прослеживается смена парадигм в области МП: машинный перевод на основе правил (RBMT), статистический машинный перевод (SMT) и нейронный машинный перевод (NMT). Путем контекстуализации этих технологических вех в рамках фундаментальной переводческой литературы — такой как теории эквивалентности Юджина Найды и семиотика Романа Якобсона — в работе исследуется, как вычислительные модели пытались расшифровать сложные структуры человеческого языка. Наконец, в статье рассматривается актуальная проблема перевода «непереводимого» — художественных текстов, реалий и культурных лакун.

Ключевые слова: автоматизированный перевод, человеческие языки, секретные коды, внутриязыковой перевод (перефразирование), межязыковой перевод (между языками) и межсемиотический перевод (между знаковыми системами).

Annotatsiya

Mashina tarjimasi (MT) Sovuq urush davridagi kriptografik eksperimentdan bugungi kunda hamma joyda qo‘llaniladigan global vositagacha bo‘lgan evolyutsion yo‘lni bosib o‘tdi. Ushbu maqolada mashina tarjimasidagi paradigmalar almashinuvi tahlil qilinadi: qoidalarga asoslangan mashina tarjimasi (RBMT), statistik mashina tarjimasi (SMT) va neyron mashina tarjimasi (NMT). Ushbu texnologik burilish nuqtalarini tarjimashunoslikning fundamental adabiyotlari — masalan, Evgeniy Naydaning ekvivalentlik nazariyalari va Roman Yakobsonning semiotikasi kontekstiga bog‘lagan holda, ushbu ishda kompyuter modellari inson tilining murakkab qirralarini qanday qilib dekodlashga (ochishga) harakat qilgani tadqiq etiladi. Yakunda maqolada badiiy matnlar, realiyalar va madaniy lakunalar kabi "tarjima qilib bo‘lmas" tushunchalarni o‘girishning dolzarb muammolariga to‘xtalib o‘tiladi.

Kalit so‘zlar: avtomatlashtirilgan tarjima, inson tillari, maxfiy kodlar, ichki lisoniy tarjima (qayta so‘zlash), tillararo tarjima (tillar o‘rtasidagi) va konseptual/boshqa belgili tizimlararo tarjima (belgilar tizimlari o‘rtasidagi).

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The quest to automate translation is as old as modern computing. In 1949, Warren Weaver's famous "Memorandum on Translation" treated human languages as secret codes, suggesting that an algorithm could decode Chinese into English using cryptographic techniques.

However, language is not merely a code; it is an organic, culturally embedded phenomenon. In translation literature, Roman Jakobson (1959) categorized translation into three types: *intralingual* (rewording), *interlingual* (between languages), and *intersemiotic* (between sign systems). Machine translation primarily operates in the interlingual realm, attempting to map the semantic and syntactic values of a source language (SL) onto a target language (TL).

The technological trajectory of MT can be divided into three distinct generations, each reflecting the dominant computational and linguistic philosophies of its time.

1. Rule- based Machine Translation (RBMT) - Dominant from the 1950s to the 1980s, RBMT relied on explicit linguistic rules drafted by human experts. It utilized bilingual dictionaries and complex grammatical frameworks to map sentences from SL to TL

2. Statistic Machine Translation (SMT) - In the late 1980s, IBM researchers revolutionized the field by abandoning linguistic rules in favor of probability. SMT treats translation as a prediction problem based on massive parallel corpora (matching texts in two languages).

3. Neural Machine Translation (NMT) - Introduced around 2014 and supercharged by the Transformer architecture (Vaswani et al., 2017), NMT uses deep artificial neural networks to translate sentences as a whole unit, rather than breaking them into disjointed phrases.

Despite the remarkable fluency of modern NMT, literature remains the ultimate barrier for artificial intelligence. Translating poetry, prose, and philosophy requires capturing what Walter Benjamin (1923) called the *"kinship of languages"* and the *"poetic aura."* Three distinct linguistic barriers prevent MT from achieving human-level literary translation:

1. Realia and Cultural Specificity

As established by S. Vlakhov and S. Florin (1980), *realia* are words denoting objects, customs, or concepts unique to a specific culture (e.g., the Uzbek *chapan* or *sumalak*). Because MT relies on data patterns, it often mistranslates realia by substituting them with inaccurate Western equivalents or omitting them entirely.

2. Linguacultural Lacunae

A *lacuna* represents a blank space or an unmapped concept in a language's vocabulary (Markovina & Sorokin, 2006). When a source language expresses an idea in one word (e.g., the German *Schadenfreude*) that requires a whole phrase in the target language, MT models often hallucinate or produce clumsy, literal translations that violate the text's aesthetic value.

3. Polysemy and Subtext

In literature, words frequently carry multiple layers of meaning simultaneously. SMT and early NMT models tend to opt for the most statistically probable meaning, thereby flattening the metaphoric and symbolic layers intended by the author.

Machine Translation has progressed from rigid, rule-bound structures to statistical probability, and finally to intuitive, contextual neural mapping. However, literature reminds us that translation is fundamentally a human act of interpretation.

As translation scholar Susan Bassnett (1980) noted, translation involves a complex series of negotiations between text and culture. While NMT serves as an incredibly powerful tool for localized content, technical manuals, and rapid cross-lingual communication, the translation of literary masterpieces still requires the empathetic, creative, and culturally conscious mind of a human translator. The future belongs to "Computer-Assisted Literary Translation" (CALT), a symbiotic relationship where the machine provides the structural scaffolding, and the human provides the soul.

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References

1. **Bassnett, S.** (1980). *Translation Studies*. Routledge.
2. **Benjamin, W.** (1923). *The Task of the Translator*.
3. **Chomsky, N.** (1957). *Syntactic Structures*. Mouton & Co.
4. **Firth, J. R.** (1957). *Papers in Linguistics 1934–1951*. Oxford University Press.
5. **Jakobson, R.** (1959). On Linguistic Aspects of Translation. *On Translation*, 232-239.
6. **Markovina, I. Yu., & Sorokin, Yu. A.** (2006). *Kultura i tekst. Vvedenie v lakunologiyu* [Culture and text. Introduction to lacunology]. GEOTAR-Media.
7. **Nida, E. A.** (1964). *Toward a Science of Translating*. E.J. Brill.
8. **Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., ... & Polosukhin, I.** (2017). Attention is all you need. *Advances in Neural Information Processing Systems*, 30, 5998-6008.
9. **Vlakhov, S., & Florin, S.** (1980). *Neperevodimoe v perevode* [The untranslatable in translation]. Mezhdunarodnye otnosheniya.
10. **Weaver, W.** (1949). *Translation* (Memorandum). Machine Translation of Languages, 15-23.