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NEURAL NETWORKS AND THEIR IMPACT ON THE QUALITY OF MACHINE TRANSLATION

The implementation of neural networks in machine translation has marked a revolutionary step in the field of automated translation. Traditional statistical and phrase-based systems have been supplanted by neural network models (Neural

Machine Translation, NMT), which deliver a higher-quality reproduction of content and a more natural syntax in translations.

NMT employs deep learning architectures, including recurrent neural networks (RNN), convolutional neural networks (CNN), and transformers (such as BERT, GPT, T5). The key advancement lies in the ability to analyze the context of an entire sentence rather than isolated phrases, significantly enhancing the adequacy of translations.

Advantages of neural machine translation include:

- contextual coherence (understanding the meaning of words within the context of the whole sentence);
- grammatical accuracy (fewer syntactic errors);
- language naturalness (translations sound more human-like, as the model is trained on vast amounts of text);
- automatic style adaptation (depending on the context and text type, the system can employ various linguistic styles).

Challenges and limitations of neural network translation include:

- issues with rare languages (NMT performs best for popular language pairs, while less common languages are translated less accurately due to insufficient training data);
 - loss of precision in technical and legal texts;
 - difficulties in translating idioms and phraseological units (literal translation remains problematic, especially for expressions with figurative meanings).
- lack of creativity (while NMT handles standard phrases well, it cannot generate original texts or adapt artistic imagery).

Applications of neural networks in modern translation refer to:

- popular services (Google Translate, DeepL, and Microsoft Translator are widely used services based on neural networks);
- CAT (Computer-Assisted Translation) Tools (the integration of NMT into professional translation systems (e.g., Trados, Smartcat, MemoQ) significantly enhances translator productivity);
- localization and subtitling (companies use NMT for rapid adaptation of content for the international market).

The future of neural machine translation is connected with:

- development of adaptive models (systems will be able to learn autonomously based on user feedback);
- improved semantic analysis (future models will better recognize metaphors, humor, and cultural nuances);
- integration of NMT with human editing (post-editing of neural network translations is becoming a standard practice in many professional fields).

Thus, neural networks have substantially improved the quality of machine translation, making it more accurate and natural. However, they still cannot fully

replace human translation for complex texts, especially in specialized domains. Further advancements in NMT will focus on enhancing context comprehension, adapting to stylistic nuances, and expanding capabilities for less commonly used languages.