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FEATURES, ADVANTAGES, AND DISADVANTAGES OF MACHINE TRANSLATION USING DEEP NEURAL NETWORK TOOLS

Introduction. Machine translation is an important task in the field of artificial intelligence, which allows you to automatically convert text from one language to another. Traditional approaches, such as statistical machine translation (SMT) [1], have limitations in accuracy and flexibility.

Modern machine translation is one of the key areas of natural language processing (NLP) and is actively developing due to the introduction of deep neural networks (DNN). Deep neural networks allow you to achieve higher-quality translation due to the ability to model complex language dependencies and take into account context at a deeper level [2]. Modern approaches to machine translation include neural architectures, such as recurrent neural networks (RNN), long-term short-term memory (LSTM), attention mechanism (Attention) and transformers (Transformers). However, currently, the main technology that provides the modern level of MT is transformers, which implement powerful architectures [3], in particular BERT, GPT, T5, and their modifications.

Advantages of neural machine translation:

- high accuracy due to context-awareness;
- flexibility in working with different languages and styles;
- ability to self-improve through retraining on specific texts.

Challenges of neural machine translation:

- high computational costs, the need for powerful hardware;
- difficulties with rare languages, limited training data;
- problems with long contexts and the possibility of generating inconsistent phrases.

Prospects for the development of neural machine translation:

- integration with multimodal models that combine text, images and audio;
- model optimization, reducing computational costs through quantized transformers;
- expanding support for rare languages using adaptive learning and synthetic data.

Conclusions. Deep neural networks have revolutionized machine translation, making it more accurate and flexible. The use of transformers has improved the quality of translation, although there are challenges such as high resource consumption and the problem of consistency of long texts. Further research is aimed at optimizing architectures and expanding the capabilities of machine translation for all languages of the world.

References:

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