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ARTIFICIAL INTELLIGENCE IN TRANSLATION OF SCIENTIFIC AND TECHNICAL TEXTS

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The rapid development of artificial intelligence (AI) has significantly transformed professional translation practices, particularly in the field of scientific and technical translation. Neural machine translation, large language models, and AI-assisted post-editing tools have improved translation speed, consistency, and accessibility. However, challenges related to terminology precision, contextual adequacy, and domain-specific knowledge remain relevant. This paper examines the role of AI in scientific and technical translation, identifies its advantages and limitations, and discusses the importance of human-AI collaboration in specialized translation.

The globalization of science and technology has created an increasing demand for high-quality translation of specialized texts. Scientific articles, technical manuals, patents, engineering documentation, and research reports require linguistic precision and terminological consistency. In recent years, artificial intelligence has become one of the key technological drivers in translation studies.

According to Zhixing Tan and colleagues, “end-to-end neural machine translation has achieved great success and has become the new mainstream method in practical MT systems” [5] This statement demonstrates the transition from rule-based and statistical systems toward neural machine translation (NMT), which now dominates professional translation workflows.

AI-based translation systems rely primarily on neural networks and deep learning models. Modern systems analyze entire sentences rather than isolated words, enabling better contextual interpretation. A landmark study by Dzmitry Bahdanau, Kyunghyun Cho, and Yoshua Bengio introduced attention-based neural translation models, fundamentally changing machine translation research. Today, tools such as Google Translate, DeepL, and AI-based large language models use NMT architectures to process scientific and technical texts. Recent research confirms that neural models continue improving specialized translation performance. A 2024 study in Applied Mathematics and Nonlinear Sciences reports that an improved NMT model “improves the BLEU value by 1.06” in scientific and technical translation tasks. [2]

Artificial intelligence provides several important advantages in specialized translation:

1. Speed and Productivity

AI systems can process large volumes of technical documentation in seconds, significantly reducing project turnaround time. According to research on AI-assisted post-editing, intelligent systems can achieve “a 52.9% speedup in translation time compared to translating from scratch.” [7]

This productivity increase is particularly important for industries such as engineering, medicine, and information technology.

2. Terminological Consistency

Scientific texts often contain repetitive terminology. AI systems trained on domain-specific corpora can maintain consistency across documents.

Jennifer Vardaro and colleagues note that neural post-editing improves the identification and correction of systematic translation errors in professional workflows. [8]

3. Accessibility of Scientific Knowledge

Machine translation makes scientific information available to international audiences. A 2024 study published in Information investigates machine translation in scholarly communication and confirms the growing usability of machine-translated scientific texts. [3]

Despite significant progress, AI still faces important limitations:

1. Terminological Ambiguity

Scientific terminology may vary depending on discipline and context. AI systems may generate technically plausible but contextually incorrect translations. Researchers emphasize that “insufficient redundancy or excessive redundancy… affect[s] the quality of machine translation.” [2]

2. Lack of Domain Expertise

AI cannot fully replace expert knowledge required for highly specialized texts such as patents, pharmaceutical documentation, or engineering safety instructions.

According to recent research on scientific translation, specialized translation requires not only linguistic competence but also subject-field expertise. [4]

3. Need for Human Post-Editing

AI-generated translations often require human revision to ensure accuracy, stylistic adequacy, and compliance with industry standards. A recent study on AI-generated technical translations states that post-editing remains "a critical stage for ensuring accuracy, terminological consistency, and contextual adequacy." [9]

Rather than replacing professional translators, AI increasingly functions as a collaborative tool.

Modern translation workflows combine:

- AI-generated draft translation;
- terminology management systems;
- CAT-tools;
- human post-editing;
- quality assurance procedures.

This hybrid approach allows translators to focus on semantic precision, domain-specific adaptation, and stylistic refinement. As current research shows, the future of scientific translation lies not in replacing human translators, but in integrating human expertise with AI technologies. [6]

Artificial intelligence has become an essential component of scientific and technical translation. Neural machine translation significantly improves translation speed, consistency, and accessibility of specialized knowledge. However, AI systems still face challenges related to terminological ambiguity, contextual interpretation, and domain-specific expertise.

Therefore, the most effective model of specialized translation is human-AI collaboration, where artificial intelligence supports productivity while professional translators ensure accuracy, reliability, and communicative adequacy.

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MULTIMODAL COMMUNICATION IN DELIVERY ROBOT SYSTEMS: LINGUISTIC AND TECHNOLOGICAL ASPECTS OF HUMAN-ROBOT INTERACTION

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The rapid integration of autonomous delivery robots into urban environments represents one of the most visible frontiers of applied robotics Fig.1. We can see that companies such as Starship Technologies, Nuro, and Amazon have already deployed ground-based delivery robots across university campuses and city streets, creating new situations in which people must interact with machines as part of their everyday lives. Unlike industrial robots confined to factory floors, delivery robots operate in busy public spaces, alongside pedestrians, cyclists, and drivers who may have no prior experience with robotic systems. This shift raises pressing questions not only for engineers, but for linguists and communication scholars as well.

The term "multimodal communication" refers to the simultaneous use of multiple channels such as speech, gesture, visual display, sound, and movement, to convey meaning. In human-robot interaction (HRI), multimodality is particularly important