# SECTION 17.
PHILOLOGY AND JOURNALISM

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## MODERN INNOVATIVE MACHINE LINGUISTICS

**Introduction.**

Modern innovative Data Mining in machine linguistics is one of the key areas of research, which is aimed at extracting useful information from large volumes of linguistic data. Data mining is used to identify regularities, structures and trends in text and language data [1, 2, 3], which allows to automate and improve natural language analysis processes. This approach is based on advanced methods of statistics, artificial intelligence (AI), machine learning (ML) [4, 5, 6] and natural language processing (NLP).

Modern machine learning in machine linguistics has greatly expanded the capabilities of automated natural language processing (NLP), which is critical to many industries. Due to the rapid development of machine learning (ML) [7] and deep learning (DL) [8, 9] technologies, machine linguistics has reached new heights in tasks such as automatic translation, speech recognition, text generation, text analysis, and others.

Also, the author emphasizes that a sufficient amount of high-quality and prepared Big Data [10, 11, 12] (as an important prerequisite for deep machine learning in linguistics) plays a decisive role in the development of modern language technologies. Thanks to large volumes of data and progress in computing power, machine learning, especially deep learning (Deep Learning), has become possible at a new level [13, 14], which has affected the effectiveness of solutions in linguistics, such as automatic translation, speech recognition, text generation and others.

**The Main Part.**

Modern innovative machine linguistics (or computational linguistics) is a field of research that combines the methods of linguistics, artificial intelligence (AI), computer science and statistics for automated analysis and processing of natural language (NLP — Natural Language Processing) [15] . The latest innovations in

this field are largely related to the development of deep learning, neural networks and big data, which allows solving various tasks related to text processing [16], speech and other linguistic data.

The main directions and innovations of machine linguistics:

1. Neural networks and deep learning

- Deep neural networks (DL), in particular transformers, have become one of the most powerful technologies in machine linguistics. Models based on transformers, such as BERT (Bidirectional Encoder Representations from Transformers), GPT-4 (Generative Pre-trained Transformer), RoBERTa and T5, have radically changed the way text data is processed [17].

- Models of transformers are able to take into account the context at the level of phrases and sentences, which allows to obtain more accurate results for such tasks [18] as machine translation, text classification, text generation, answering questions and recognizing text tonality.

2. Machine translation

- Earlier approaches to machine translation were based on statistical methods and phrase matching, but modern translation systems such as Google Translate use deep neural networks and transformer models for contextual translation, which allows for better accuracy and naturalness of translated texts.

- Innovations also concern the possibility of learning without a teacher (unsupervised learning), where models can be trained on unlabeled data, which allows to reduce dependence on manually created translation corpora.

3. Speech recognition and synthesis

- Automatic Speech Recognition (ASR) has become extremely accurate thanks to neural networks [19] and big data processing. This has made it possible to improve the work of voice assistants such as Siri, Alexa, and Google Assistant, which are able to recognize speech even in difficult acoustic conditions.

- Speech synthesis using technologies such as Google's WaveNet allows the human voice to be produced with high naturalness, opening up new possibilities for creating voice interfaces and use in audiobooks or voiceovers.

4. Analysis of emotions and tonality of the text

- Innovative NLP models are able to determine the emotional state of the author of the text or the consumer of the content by analyzing the tonality of the text. For example, with the help of analysis of comments in social networks, you can determine the mood of the audience regarding a certain event or product.

- Deep recurrent networks (RNNs) and transformer-based models analyze the tone of text based on context, allowing for more accurate results.

5. Processing and generation of natural language

- AI-based text generation models such as GPT-3 and GPT-4 are capable of generating large volumes of text based on inputted content. These models are widely used in copywriting, writing articles, creating dialogues and other tasks related to the automation of the creative process.

- Automated Question Answering (QA) has also greatly improved with models such as BERT able to accurately answer queries based on large text corpora.

6. Language resources and knowledge

- Word Embeddings: A vector word representation technique such as Word2Vec, GloVe or FastText allows you to model the meaning of words in a vector space based on their context in the text. This allows neural networks to better "understand" the meaning of words in different contexts.

- Knowledge Modeling: Innovative models such as Knowledge Graphs help link semantic concepts, which facilitates the processing of complex information structures.

7. Multimodal systems

- Multimodal systems integrate information from different sources, such as text, images, video and sounds, for complex data processing. This allows the creation of systems that can analyze both text and images simultaneously, for example in image description tasks or multimodal chatbots.

8. Ethical aspects and explainability of models

- Modern innovative machine linguistics also draws attention to ethical issues regarding the use of AI in the analysis of language data. For example, issues of data privacy, model bias, and transparency of results are important areas of research.

- The development of explainable AI systems (Explainable AI) allows users to understand why and how the model makes certain decisions in language analysis.

**Conclusions.**

Modern innovative Data Mining in machine linguistics opens up new horizons for the processing and analysis of language data, allowing to quickly and efficiently solve tasks related to text analysis, emotion detection, text classification and natural language processing. The use of deep learning and the latest methods, such as transformers, allow to achieve high accuracy and automate processes, which opens up new opportunities for research and practical applications in various industries.

Modern machine learning is revolutionizing machine linguistics by providing powerful tools for automated text and speech analysis. Innovations in neural networks, such as transformers and word vectorization, enable high accuracy and performance in many linguistic tasks, from machine translation to emotion analysis.

Technologies are rapidly developing, making them increasingly efficient and accessible for use in real-world business tasks and research.

Big Data is a key prerequisite for the development of deep machine learning in linguistics. With large amounts of data used to train models, machine linguistics technologies have reached new heights in understanding, generating, and processing natural language. The trend toward using ever larger and more complex deep learning models continues to grow, opening new horizons in speech and text processing.

Modern innovative machine linguistics has become a powerful tool for solving complex tasks related to the analysis and processing of natural language. The development of deep learning, neural networks and transformers has opened new horizons for improving the quality of machine translation, speech recognition, text generation and much more. Innovation in this field is also driving the development of new technologies that are significantly impacting industries such as education, marketing, market research, legal services, and media.

**Discussion and prospects for further research.**

The author separately emphasizes that evolutionary computing is a powerful tool for machine linguistics, as it allows you to effectively solve optimization tasks in complex search spaces that often arise in the analysis and processing of linguistic data. They can be successfully applied in such areas as machine translation, morphological analysis, speech recognition, text classification and speech synthesis. They make it possible to automate processes and improve the quality of natural language processing, using biologically inspired approaches to solving problems [20, 21, 22]. In other words, evolutionary computing in machine linguistics is an approach that applies methods of evolutionary algorithms, such as genetic algorithms, genetic programming, and other bio-inspired methods to solve problems in computational linguistics. These algorithms draw inspiration from principles of biological evolution, such as selection, mutation, and crossover, and allow finding optimal or approximate solutions in the complex search spaces often encountered in language tasks.

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