

# PHILOLOGY AND LINGUISTICS

## Modern computational linguistics

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**Abstract.** Modern computational linguistics is a field that combines linguistics and computer science, focusing on the development of algorithms and technologies for natural language processing (NLP). It allows you to automate the analysis of texts, which opens up new opportunities for the study of linguistic phenomena, learning and interactive systems. Modern computational linguistics is an important field that combines linguistic research with technological innovation. Through the use of machine learning, NLP and big data analysis, she opens new horizons for the study of language, literature and culture. Despite challenges related to data quality and context, the potential of computational linguistics continues to grow, making significant contributions to scientific research and practical applications.

**Keywords:** *computational linguistics, mathematical linguistics, machine learning, Data Mining & Text Mining.*

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Mathematical linguistics is an interdisciplinary field that combines linguistics, mathematics, and computer science. She studies the formal structures of language, models language phenomena using mathematical tools, and develops algorithms for processing and analyzing large language data to train LLM [1, 2].

It should be noted separately that the combination of Big Data and machine linguistics are important components of modern innovative philological research in the field of natural language processing (NLP) and textual information analysis. With the growth of available text data, such as publications, social media, news and other resources, there is a need for new approaches and technologies for their processing and analysis [2, 3, 4, 5].

The author also emphasizes that data mining and computational linguistics are closely related fields that focus on the analysis of large volumes of data, including textual information. Both disciplines use algorithms and statistical methods to identify patterns and useful information, but their main goals and approaches differ [6,

## PHILOLOGY AND LINGUISTICS

7, 8, 9, 10].

Considering the above, machine learning [11, 12, 13, 14] and computational linguistics are closely related disciplines that are actively used for analysis, modeling and processing of natural language. Both fields contribute to the development of technologies that allow computers to understand and generate human language.

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### 1. Main directions of computational linguistics

Computational linguistics encompasses several key areas:

**Natural Language Processing (NLP):** Automation of processes involved in understanding, generating and processing human language. Basic tasks include morphological analysis, syntactic parsing, semantic analysis, and pragmatic analysis.

**Machine translation:** development of systems that automatically translate texts from one language to another. Modern methods are based on neural networks, which ensure high quality translation.

**Sentiment Analysis:** detection of the emotional tonality of texts (positive, negative or neutral). This direction is actively used in marketing and sociological research.

**Text classification:** automatic assignment of texts to certain categories or genres. Used to organize information, for example, in libraries or news resources.

**Text generation:** creation of new texts based on given parameters. This can include automatic news writing, poetry creation, or even code generation.

### 2. Methods and technologies

Modern computational linguistics uses a variety of methods:

**Machine learning:** algorithms that learn from data that allow systems to automatically improve their performance. Deep learning methods, in particular neural networks, are particularly popular [15, 16].

**Statistical methods:** statistical analysis of textual data that helps identify patterns and relationships between words and structures.

**Semantic networks and ontologies:** structures representing

## PHILOLOGY AND LINGUISTICS

knowledge about objects and their relationships are used to improve understanding of context.

Use of big data: analysis of huge volumes of textual data, which allows to identify new trends, changes in language and literature.

3. Examples of the application of computational linguistics

Automated translation systems: such as Google Translate, which use neural networks to improve translation quality.

Virtual assistants: Siri, Alexa and others that apply NLP to understand user requests and provide answers.

Social Media Analysis: Exploring sentiment and reactions to events through analysis of comments and posts on social media.

Researching Language Change: Using Computational Linguistics to Analyze Language Change Over Time Based on Large Text Corpora.

4. Advantages and challenges

Advantages:

Speed and efficiency: automated systems can process huge volumes of texts in a short time.

Deep analysis: modern methods make it possible to detect complex semantic and stylistic patterns.

Real-time application: Computational linguistics is actively used in online systems and services.

Challenges:

The need for large amounts of data: training models requires large and high-quality text corpora.

Contextual problems: difficulty understanding the context and ambiguity of words.

Ethical issues: processing of personal data and privacy issues in text analysis.

Big data and machine linguistics are key elements of modern research in the field of natural language processing. They contribute to the development of new technologies that allow deeper analysis of language phenomena, providing new opportunities for scientific research, business and society as a whole.

Data mining and machine linguistics are key elements in modern textual information analysis. They provide powerful tools for automating natural language processing and discovering valuable patterns in large volumes of data. This, in turn, promotes the development of new technologies that can have a significant impact on various fields, including

## PHILOLOGY AND LINGUISTICS

marketing, sociology, linguistics and computer science.

Machine learning and computational linguistics play a key role in the development of modern natural language processing technologies. Their combination makes it possible to create effective tools for the analysis of textual data, which opens up new opportunities for scientific research, business and society as a whole.

Modern computational linguistics is an important field that combines linguistic research with technological innovation. Through the use of machine learning, NLP and big data analysis, she opens new horizons for the study of language, literature and culture. Despite challenges related to data quality and context, the potential of computational linguistics continues to grow, making significant contributions to scientific research and practical applications.

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