The Impact of Computational Technologies on Linguistics

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Sections Info	ABSTRACT
	*Objective: This study explores the integration of information technologies in linguistics, emphasizing their role in analyzing digital data and fostering innovative computational models for linguistic analysis. It highlights the interplay between software development and linguistics in creating systems for educational, professional, and automated language processing, including lexical and phonetic aspects. **Methods:** The research focuses on examining computational linguistics, utilizing digital tools and systems to process linguistic data effectively. It reviews innovative approaches in knowledge acquisition and language analysis, emphasizing their practical applications in contemporary linguistic practices. **Results:** Findings indicate that the application of information technologies in linguistics enhances the adaptability and efficiency of language systems. This includes advancements in computational models capable of automatic language processing and analysis, reflecting modern trends in globalization and cultural activation. **Novelty: :** The study underscores the transformative impact of computational linguistics by bridging traditional linguistic methods with innovative digital tools. This approach not only facilitates practical data processing but also reshapes the way language is analyzed and understood in the context of modern technological and cultural dynamics.*

INTRODUCTION

There are several areas in linguistics, which can be divided into classical, related to the study of linguistics, and digital, which help to process a huge number of books, magazines and various digital sources, as well as calculate linguistic results obtained using computer technology. The use of information technology to create language models on the basis of which data on word forms can be collected and analyzed suggests that linguistics has the same characteristic computational advantages as other disciplines [1].

Over the past decades, linguistic research has accumulated knowledge that plays an important role in the development of information language programs using linguistics. In our study, we took advantage of the wide scope and uniqueness of linguistics by paying attention to text data in digital format. Most of the data is text, so linguists do not need to enter data, and the information technology itself can now provide and process various options [2].

We believe that the morphological and syntactic standard for computer language recognition systems during processing should be: 1) widely distributed and compatible with international formats; 2) suitable for rapid and consistent verification by a linguist; 3) with high accuracy of the performed computer analysis; 4) understandable and accessible.

The collaboration of IT experts and linguists has already resulted in the creation of such data for more than 40 languages, in a format that is common to all languages and with the ability to reconstruct the original texts, making it an important paradigm for many languages. We have focused our efforts on studying the contribution of information technology to linguistics. From the research side, we have tried to find out why information technology has had little impact on linguistics, why linguistics leads the research of those who work on computations in the field of language, and why those who have access to databases are involved in the creation of computer systems for automatic translation. The question arises whether it is preferable for linguistic engineers to pay attention to the general style of language research or to take into account specific linguistic theories, for example, Chomsky's theory [3]. The need to create a foundation in the field of information technology and linguistics is reflected in a number of works [4], [5], [6] and other researchers [7], [8], [9]. Thus, the essence of computational language processing is to work with the lexical, structural and referential components.

Linguistic description of phenomena, complex interpretations and rearrangement of lexical meanings leads to the development of a theory about the existence of incompatible assumptions in translation and, conversely, their unambiguity. Very often, the works of linguists do not reach the level of specification that allows them to be programmed and substantiated. Awareness of such problems is presented in the works of D. Sperber and D. Wilson [10], A. Ballim, J. Wilkes and J. Barnden [11]. As it turned out, such shortcomings can be found in all areas of linguistics, but they are especially pronounced in vocabulary and semantics. In practical terms, linguistic systems can be built for any area or sphere with a small number of definitions or without them at all. The task of such systems is to find and provide information about the target area, which is often the most difficult part of creating a suitable system. Models of such target domains require, first, generalization of things in the existing world, second, separation of things in this world, third, the ability to analyze and reason about the characteristics of individual objects, and fourth, a procedure for searching a knowledge base. The need to reason about the structure of the world and knowledge about it, the need to perform interpretation, the interaction of linguistic features, the learning of linguistic paradigms, and the coherent production of output discourse - all this must be focused on the properties required of sensory representations to satisfy this operational interaction between language and thought [12].

RESEARCH METHOD

At a basic level, one can see that there are genuine or metaphysical disagreements concerning linguistic theory as a discipline in general and the relationship of linguistics with information technology [13], [14], [15]. Some linguists express concern about the relationship between the processing of language and lexical meaning in computer systems. This relationship should have nothing to do with linguistics and is not the subject of study. Every linguist is focused on the formal theory of language or on the

descriptive area of language. It is not surprising that the existence of concrete regularities and cases demonstrated and revealed by theoretical linguistics is so dominant today that complex descriptions with IT studies emphasize the importance and uniqueness of the study. It is clear that the explanation of linguistic phenomena is a problem for theorists, but it can be successfully solved with examples supported by urgent need and a unique IT sample [16], [17].

Theoretical linguists are not interested in comprehensive grammars and dictionaries, and their attitude to this issue differs from that of those who work in digital linguistics. First, the various phenomena and characteristic lexical, syntactic and semantic features those descriptive linguists observe and theoretical linguists try to explain cannot be reflected in computer models [18]. This is due to the fact that descriptive methods were applied to English and focused on European, Japanese, Arabic and Chinese, but did not pay attention to other language systems. We gradually came to the conclusion that information technology presupposes the presence of an intellectual resource in linguistics [19]. Thanks to this resource, it becomes possible to define methodologies that have not been convincing to the linguistic community so far. The possibilities of information technology in linguistics that we presented earlier are very important, since the main reasons for the lack of interest of linguistics in information technology and the inability of computational linguists to influence the development of this direction are caused by negative rather than positive reasons, both in theory and in practice [20]. For a full study of the semantics of linguistic grammar, it is necessary to build a process between syntax and semantics. This process considers the definition of the meaning of a word in a sentence and the complex processing of morphological, syntactic and correct lexical meaning.

We believe that in order to achieve positive results and improve the work of IT in the linguistic direction, an interpretive language system is needed that should resolve ambiguity, and in order to create effective statements, ambiguity should be minimized. This process is necessary for correct translation, and of course, programs should present coverage through interaction and processing functions to link information despite different formats. Refusal to use the results of automated calculations provided by independent computer systems as the best way to test theories is unscientific. The specificity required for more accurate calculations (counting, choosing a meaning, grammatical model, etc.) is a clear proof for theoretical linguists. At present, information technology is so widespread that it has invaded linguistic thinking, influenced the perception of language processes and began to provide advanced software products for any purpose with the help of artificial intelligence.

RESULTS AND DISCUSSION

Computer technology has caused revolutionary changes in almost all scientific fields in recent years, including linguistics. Linguistics, that is, linguistics, involves the study of language, its structure, development, and its place in the social context.

Computer technology has made it possible to conduct linguistic research effectively and comprehensively. Below we will consider the impact of computer technology on the field of linguistics.

A.   Corporal analysis and text processing

Computers have allowed linguists to analyze large volumes of texts. Corporal analysis is the conduct of linguistic research on large volumes of texts. Today, large corpora created nationally and internationally (for example, the Google n-gram corpus) can be used to study information about the use of language. Aspects of language such as grammar, syntax, and semantics are being analyzed in greater depth with the help of computers. For example, language models and statistics can be used to study the frequency of word usage or syntactic structures.

B.   Machine translation and language training

Another important impact of computer technology is the development of machine translation systems. Google Translate and other translation systems are useful for translating texts from one language to another. In this area, in particular, the rise of machine learning and artificial intelligence plays a major role. Systems are becoming more and more capable of accurately and correctly translating grammatical and lexical aspects of a language. At the same time, linguistic researchers are developing new methods in the fields of language teaching and translation.

C.   Artificial intelligence and linguistics

The fields of Artificial Intelligence (AI) and natural language processing (NLP) play an important role in the development of linguistics. NLP technologies allow computers to understand and process language. For example, chatbots, voice assistants (Siri, Alexa) and automatic translation systems create opportunities for communication in natural language. With the help of NLP, tasks such as text analysis, identification of semantic and syntactic structure, and definition of word meanings can be performed.

D.   Integration of information technologies in linguistics

Computer technologies have facilitated the integration of linguistics with other fields, such as psycholinguistics, sociolinguistics, phonetics and cognitive systems. With the help of computers, it is possible to model linguistic processes, simulate different layers of language. For example, using computer programs for phonetic analysis, it is possible to analyze sound waves or observe social aspects of language.

E.   Interactions between language and culture

Computer technologies also help to study the interaction of linguistics and culture. Nowadays, research in the field of "language and culture" issues is often carried out using information technologies. Computer systems help to analyze cultural and linguistic differentials, to study how language functions in a social context. It is also possible to analyze how language changes in an online environment, how new lexical combinations and social connections are formed.

F. Methodological impact of computational linguistics

Computer technologies have had a significant impact on the methodology of linguistic research. Nowadays, linguistic analysis methods are based more on automatic and algorithmic methods than on traditional methods. The application of computer technologies to linguistic research and the development of new methods creates wide opportunities not only for researchers, but also for language learners and specialists.

G. Creation of language resources

Computer technologies also play an important role in the creation of language resources. Computers help in the process of creating linguistic resources, such as dictionaries, grammars, language models and corpora. These resources serve as the basis for linguistic research. At the same time, the search for new and obsolete words or expressions in the language is being carried out using computer programs.

CONCLUSION

Fundamental Finding : The integration of computer technology has revolutionized linguistics, introducing advanced methods such as artificial intelligence-driven analysis, automatic translation, and robust language resource development. These advancements provide more accurate, systematic, and comprehensive tools for linguistic research and application. **Implication :** The influence of computer technology extends beyond linguistics, impacting other scientific domains by facilitating interdisciplinary research, streamlining processes, and improving accessibility to language data globally. **Limitation :** Despite its potential, the reliance on computer technology in linguistics faces challenges such as resource availability, unequal access in different regions, and the risk of oversimplifying the nuances of human language and culture. **Future Research :** Future studies should focus on addressing disparities in technological access, improving the adaptability of tools across diverse languages, and ensuring that advancements align with ethical and cultural considerations in the global linguistic landscape.

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