AUTOMATIC SPEECH RECOGNITION AND NATURAL

LANGUAGE PROCESSING

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Annotation. The integration model of Automatic Speech Recognition (ASR) and Natural Language Processing (NLP) has become one of the critical issues in technological development in recent years. This study examines the importance of artificial intelligence algorithms in converting speech to text and analyzing it. The application, efficiency, and technological capabilities of the model are deeply analyzed. Furthermore, it demonstrates how the integration of automatic speech recognition algorithms with natural language processing systems opens the door to new opportunities for next-generation data processing technologies.

Аннотация.Модель интеграции автоматического распознавания речи (ASR) и обработки естественного языка (NLP) стала одной из ключевых проблем технологического развития в последние годы. В данном исследовании рассматривается важность алгоритмов искусственного интеллекта для преобразования речи в текст и ее анализа. Применение, эффективность и технологические возможности модели тщательно анализируются. Кроме того, показано, как интеграция алгоритмов автоматического распознавания речи с системами обработки естественного языка открывает новые возможности для технологий обработки данных следующего поколения.

Key words: NLP, ASR, BERT, GPT

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In recent years, Automatic Speech Recognition (ASR) and Natural Language Processing (NLP) have been at the core of technological development. These fields are reaching new heights with the help of artificial intelligence, deep learning, and data analysis methods. ASR technologies enable the conversion of human speech into text, its analysis, and processing. At the same time, NLP algorithms perform tasks such as text analysis, translation, and comprehension. The integration of these two technologies opens the door to creating more effective tools in modern artificial intelligence systems. The aim of this work is to study the theoretical and practical aspects of integrating these two technologies to ensure their efficient utilization.

Automatic Speech Recognition (ASR) Technologies. Automatic Speech Recognition systems serve to receive human speech in the form of digital signals and convert it into text format. These technologies are applied in various fields, including voice command control, transcription, and data collection. Deep learning-based models, particularly those operating on RNN, LSTM, and Transformer architectures, have achieved significant advancements in the field of ASR.

Natural Language Processing (NLP) Technologies. NLP algorithms are designed to perform tasks related to human language, such as sentence analysis, translation, text

generation, and identifying logical connections in language. Approaches based on Transformer models, such as BERT and GPT, have revolutionized NLP in recent years.

Applications and Impacts.

- **Healthcare:** Voice-assisted technologies can help medical professionals with patient notes and record-keeping, voice-controlled devices in hospitals.
- **Education:** NLP can help build intelligent tutoring systems, automatic grading, and speech-based learning tools.
- **Commerce:** Voice-based shopping assistants and customer support systems enhance the consumer experience.
- **Automated Transcription Services:** Accurate transcription of meetings, lectures, and legal proceedings.

Future Trends and Research Directions.

- **More Accurate and Context-Aware Speech Recognition:** Overcoming challenges like accents, background noise, and dialects.

- **Better Language Models:** Development of models that understand multiple languages and nuances in speech.
- **Increased Personalization:** AI systems that understand individual preferences, moods, and contexts better than ever.

Advantages of the Integration Model. The integration of ASR and NLP technologies enables the creation of systems that can understand and respond to human speech. For example, virtual assistants like Google Assistant and Alexa are practical examples of this approach. The integration results in the following advantages:

- The speed of data processing increases.
- The potential for creating multilingual systems expands.
- The accuracy of natural language interfaces and user experience improves.

Conclusion. The integration of Automatic Speech Recognition (ASR) and Natural Language Processing (NLP) technologies represents an important step in the development of artificial intelligence. The findings of this research contribute to opening new opportunities in modern technological systems, including in the fields of education, healthcare, and commerce. With the advancement of these technologies, it is expected that the scope of research in this area will expand further, paving the way for the creation of systems that are tailored to user needs.

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