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**NEURAL NETWORKS IN ENGLISH LANGUAGE PROCESSING**

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Today, neural networks inspired by the structure and functioning of the human brain are computational models composed of interconnected nodes, or neurons. These networks can be trained to recognize patterns, make decisions, and perform complex tasks by processing vast amounts of data. The backbone of this technology is in the ability to learn from examples, adapt, and improve over time. English data processing involves the manipulation and analysis of textual information in the English language. With the proliferation of digital content, the need for efficient methods to handle and derive insights from this data has become increasingly crucial. This is where neural networks step in, offering a powerful toolset for understanding and interpreting an English text [1].

One of the main applications of neural networks in data processing in English is natural language processing (NLP). NLP involves the development of algorithms and models that allow computers to understand, interpret and generate human-like language. Neural networks, especially recurrent neural networks (RNNs) and transformers, have demonstrated exceptional proficiency in tasks such as sentiment analysis, named object recognition, and language translation. Recurrent neural networks (RNNs) are used to process sequential data due to their ability to take into account the context and dependencies between sequence elements. They are widely used in natural language tasks such as machine translation, text analysis and speech generation. In the field of computer vision, RNN is used to analyze video and sequential images, for example, in gesture recognition or object tracking. RNNs are also successfully used in financial predictions, time series, and other tasks where working with sequential data and modeling long-term dependencies is important. Sentiment analysis, for example, uses neural networks to determine the emotional tone expressed in a text fragment. This opportunity is invaluable for companies seeking to assess customer satisfaction or to monitor social media sentiment in relation to a particular product or event [2]. The subtle understanding of language provided by neural networks allows for a more accurate analysis of moods, taking into account the context. Named Object Recognition (NER) involves identifying and classifying objects, such as names of people, organizations, and locations in text. Neural networks succeed in solving this problem by learning to recognize patterns and relationships in data. This feature is an integral part of information retrieval systems, where accurate identification of objects increases the efficiency of search algorithms.

In addition, the language translation has undergone a transformational evolution with the advent of neural machine translation (NMT) models. These models, often based on recurrent or transformer architectures, have significantly improved the quality of automatic translation between languages. The ability of neural networks to capture semantic nuances and context has led to translations that are more contextually accurate and linguistically natural. In addition to NLP, neural networks play a crucial role in image and speech processing. Convolutional neural networks (CNNs) are widely used in computer vision tasks such as image recognition and object detection. These networks can study hierarchical representations of visual features, which allows them to identify and classify objects in images with amazing accuracy. In the field of speech processing, neural networks, especially recurrent neural networks and long-term short-term memory networks, have played an important role in speech recognition and synthesis. These applications are used in virtual assistants, transcription services and special tools, making spoken language more accessible and effective in various contexts. The success of neural networks in processing data in English is supported by the availability of large labeled datasets. The process of neural network training involves processing huge amounts of data that allow us to study the underlying patterns and interactions [3].

The quality and variety of training data directly affect the performance and generalization ability of the model. However, problems in the field of neural networks and data processing in English remain. One of the significant problems is the interpretability of neural network solutions. Despite their remarkable performance, neural networks are often viewed as "black box" models (it makes it difficult to understand the rationale for their predictions). Efforts are currently underway to develop methods for interpreting and refining neural network outputs that promote transparency and accountability in their use. In addition, ethical considerations arise in the context of data privacy and bias. Neural networks trained on heterogeneous datasets can perpetuate and even exacerbate existing distortions in the output data they generate. Solving these ethical problems requires concerted efforts to select diverse and representative data sets and implement algorithms that take into account the fairness of accounting. Achieving a balance between using the capabilities of neural networks when processing data in English and ensuring responsible, ethical use is of paramount importance for the further development of this transformative technology [4]. At the same time, another notable difficulty in the field of neural networks is the need to maintain a balance between performance and the amount of training data. If the model is trained on insufficient data or on data that does not fully reflect real diversity, this can lead to over-training or insufficient training. Finding the right balance becomes a difficult task, especially in an environment where access to diverse and high-quality data is limited. One way to overcome this problem is to create and use diverse and representative datasets. Such datasets should include different dialects, sociocultural features, and communication styles. So, that neural networks can be trained and accurately reflect the diversity of the real world.

In conclusion, it should be noted that the integration of neural networks and data processing in English has opened a new era of computing capabilities. From understanding natural language to image recognition, these technologies have demonstrated their versatility and power. The symbiotic relationship between neural networks and data processing in English will undoubtedly shape the future landscape of artificial intelligence.

### References:

1. Sentimental analysis & Hate speech detection on English and German text collected from social media platforms using optimal feature extraction and hybrid diagonal gated recurrent neural network // Sciencedirect : site – URL: <https://www.sciencedirect.com/science/article/abs/pii/S0952197623013271> (accessed: 16.11.2023)
2. Quality-related English text classification based on recurrent neural network //Sciencedirect: site. – URL: <https://www.sciencedirect.com/science/article/abs/pii/S1047320319303451> (accessed: 16.11.2023)
3. Quantum neural network based machine translator for English to Hindi // Sciencedirect: site. – URL: <https://www.sciencedirect.com/science/article/abs/pii/S1568494615005323> (accessed: 18.11.2023)
4. Performance evaluation of feed-forward neural network with soft computing techniques for hand written English alphabets // Sciencedirect: site. – URL: <https://www.sciencedirect.com/science/article/abs/pii/S1568494610000608> (accessed: 18.11.2023)