A Comprehensive Survey of Evolving Algorithms, Architectures and Evaluation Metrics in Text Summarization Techniques

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Abstract

The exponential growth of unstructured textual data across digital platforms presents a significant challenge in information retrieval, comprehension, and decision-making. Automatic text summarization, a subfield of natural language processing (NLP), addresses this challenge by generating concise summaries that retain the essential content of the original text. This paper presents a comprehensive study on the evolution of summarization techniques, tracing the transition from early rule-based and statistical models to advanced deep learning and transformer-based architectures such as BERT, GPT, and T5. The research investigates the architectural developments, domain-specific adaptations, and comparative performance of various models using evaluation metrics including ROUGE, BLEU, METEOR, BERTScore and others. Special attention is given to summarization applications in diverse domains such as healthcare, law, finance, and academia. By identifying existing limitation such as factual inconsistency, poor domain generalization, and metric insufficiency this study highlights the need for human-centered evaluation, interpretability, and real-time deployment. The findings offer valuable insights and a structured foundation for future innovations in intelligent summarization systems.

Keywords

Natural Language Processing (NLP), Deep Learning, Domain Adaptation, Evaluation Metrics.