ABSTRACT

Natural Language Processing (NLP) has evolved from rule-based methods to sophisticated neural models, transforming how machines understand and generate human language. Traditional NLP excels in structured linguistic tasks, offering interpretability and reliability, whereas Generative AI, driven by transformer-based models like GPT and BERT, provides contextual fluency and creative text generation. This paper explores a hybrid approach that integrates the precision of traditional NLP techniques with the adaptability of Generative AI to enhance robustness in text processing.

We outline the historical evolution of NLP, discuss core techniques for combining rule-based systems with deep learning architectures, and present a case study showcasing hybrid text generation for factual accuracy. The applications of such systems span multiple domains, including healthcare, education, and customer support, demonstrating improved efficiency and contextual accuracy. However, challenges such as data dependency, computational costs, and ethical risks must be addressed.

Future directions include optimizing hybrid NLP models for low-resource languages, ensuring fairness and bias mitigation, and expanding multimodal capabilities. This research highlights the potential of hybrid NLP systems to balance structure and creativity, paving the way for more reliable and scalable AI-driven text generation and analysis.

CONTENTS

LIST OF FIGURES

LIST OF TABLES