

ABSTRACT

Sentiment analysis is a key task in natural language processing (NLP) with applications across domains. This study examines the impact of self-attention and global attention placement in CNN-BiLSTM and CNN-LSTM models, exploring their effectiveness when positioned before, after, or both before and after BiLSTM/LSTM, particularly for texts of different lengths. Instead of applying attention mechanisms in a fixed position, this research explores the most suitable attention type and placement to improve model understanding and adaptability across datasets with different text lengths. Experiments were conducted using the IMDB Movie Reviews dataset (long texts) and the Twitter US Airline Sentiment dataset (short texts). Results show that for long texts, CNN-BiLSTM with self-attention before and after BiLSTM achieves an F1-Score of 93.77% (+2.72%), while for short texts, it reaches 82.70% (+2.24%). Applying data augmentation further improves the Twitter dataset performance to 86.67% (+7.08%), demonstrating the importance of attention mechanisms combined with data augmentation in handling imbalanced data. These findings highlight that optimal attention placement significantly enhances sentiment classification accuracy. The study provides insights into designing more effective hybrid deep learning models and contributes to future research on multilingual and multi-domain sentiment analysis, where attention mechanisms can be adapted to different textual structures.

Keywords: Sentiment Analysis, Attention Mechanism, Hybrid Deep Learning, CNN-BiLSTM, Text Classification