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Machine learning techniques for sentiment analysis classification: A comparative study

Communication Info

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Abstract

Sentiment analysis has become an essential task in Natural Language Processing (NLP) due to the exponential growth of social media [1]. This paper presents a comparative study of machine learning, deep learning, and transformer-based methods applied to the Sentiment140 dataset, which contains 1.6 million annotated tweets [2]. Preprocessing included cleaning, tokenization, and feature extraction using TF-IDF, Word2Vec, and GloVe. Traditional classifiers such as Naïve Bayes and SVM were compared to deep learning models including CNN, RNN, LSTM, and BiLSTM [3]. Transformer models such as BERT and RoBERTa, as well as hybrid approaches (NB-SVM-ME, RoBERTa-LSTM), were also evaluated [4]. Results show that BERT achieved the highest accuracy (92.76%), confirming the superiority of transformer architectures in capturing contextual semantics [5]. Hybrid models such as NB-SVM-ME (90%) and RoBERTa-LSTM (89.70%) provided competitive performance, highlighting the continued relevance of feature-based and ensemble methods.

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