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(57) Abstract :

Climate change presents a pressing global challenge, making it essential to analyze public sentiment and discourse for informed policymaking. Social media platforms, particularly Twitter, offer a wealth of data reflecting public perception. This study proposes a novel sentiment analysis framework utilizing ClimateBERT for domain-specific feature extraction, followed by a hybrid Bidirectional Gated Recurrent Unit (BiGRU) network with an attention mechanism for sentiment classification. The primary objective is to classify climate change-related tweets into positive, negative, and neutral sentiments, offering actionable insights for stakeholders. A dataset comprising climate-related tweets from January 2022 to February 2023 was collected using Snsrape and annotated using Label Studio with expert assistance. Random Oversampling was applied to address class imbalance. ClimateBERT-generated embeddings captured nuanced contextual information, which the BiGRU network processed to model sequential dependencies. The attention mechanism further refined the classification by emphasizing relevant textual features. Evaluation metrics such as accuracy, precision, recall, and F1-score were used to assess the model's performance. The proposed ClimateBERT-BiGRU-Attention model achieved an accuracy of 96.45%, precision of 94.33%, recall of 85.22%, and an F1-score of 85.47%, outperforming traditional classifiers. The results demonstrate the model's effectiveness in extracting and analyzing public sentiment on climate change.

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