

which works by adjusting the class weights based on the existing data distribution, also shows an improvement compared to the baseline, but the results are not as significant as those obtained with SMOTE. This reflects that SMOTE provides a stronger approach to addressing data imbalance issues. Additionally, the application of feature expansion techniques on BiLSTM, using TF-IDF and FastText, demonstrates that while embedding-based features can provide richer word representations, the results are highly dependent on the balancing technique used. In other words, although TF-IDF and FastText provide better word representations, the application of data balancing techniques such as SMOTE has a much greater impact on improving classification performance.

Previous research on geo-sentiment analysis has largely focused on specific social issues, such as responses to government programs or community dynamics [24], [25]. However, this study expands that approach by integrating BiLSTM techniques with data balancing methods to develop a model for location-based sentiment analysis on complex datasets. The improvements in accuracy and F1-Score achieved in this study demonstrate the effectiveness of the applied approach, particularly in addressing the challenge of data imbalance, which is often a limitation in sentiment analysis. These findings contribute to advancing methodologies in sentiment analysis, emphasizing the importance of integrating natural language processing (NLP) techniques with geographical dimensions.

5. CONCLUSION

This research highlights the importance of geo-sentiment analysis in understanding public opinion, especially regarding politically sensitive topics like the documentary film *Dirty Vote*. By incorporating geographic information, we can observe how sentiment varies across different regions, with a notable concentration of negative sentiment in urban areas such as Jakarta. This geographic perspective is crucial for gaining deeper insights into how public sentiment is influenced by regional factors and how it evolves over time, particularly during significant events such as the documentary release and presidential elections.

Based on the results of the three testing scenarios conducted, it can be concluded that the application of data balancing techniques has a considerable influence on the accuracy of the classification model. The use of the SMOTE technique has proven to provide better results compared to Class Weight in terms of accuracy and F1-Score, particularly in imbalanced datasets. While TF-IDF and FastText provide richer and deeper word representations, the application of data balancing techniques such as SMOTE has a greater overall impact on improving classification performance. The results of this study indicate that when addressing class imbalance, data balancing techniques are a key factor that supports the effectiveness of the classification model, even more significantly than enriching embedding feature representations. Therefore, to improve model performance on imbalanced datasets, a combination of techniques such as SMOTE and FastText can be an optimal approach.

This research contributes to the field of informatics by showing that the combination of the Bi-LSTM model with data balancing techniques can significantly improve the accuracy of sentiment analysis on geotagged data. The integration of geographic information with sentiment analysis offers a new approach that can be applied to various fields. Future research can explore other deep learning models, such as transformers or hybrid models that can improve classification performance.

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