PROJECT NAME: TWITTER SENTIMENT ANALYSIS

Problem statement:

The main aim of this project is to create a robust system that can effectively identify instances of hate speech within tweets. In this context, hate speech refers to content that displays racist or sexist sentiments. The objective is to develop a classification model capable of distinguishing tweets containing such harmful language from those that don't. This model should be capable of effectively assigning labels to unseen tweets in a provided test dataset based on the presence or absence of hate speech.

Rationale of Target Variable Selection:

The target variables are crucial in capturing the essence the task. The binary target variable for hate speech detection ('1' indicating hate speech and '0' indicating non-hate speech) encapsulates the essence of isolating harmful content. The selection of this target variable is grounded in the intention to create a comprehensive understanding of both hate speech occurrences and the emotional sentiment spectrum within tweets.

Suitable Machine learning algorithms:

This problem calls for a combination of classification and sentiment analysis. For the classification bit, we can use supervised algorithms and for the sentiment analysis bit we can employ NLP models. We have chosen these for this problem statement:

1. SVM Classifier
2. Random Forest Classifier
3. XGboost

Problems to be addressed:

Deciphering the emotions weaved inside sentences: properly anticipating the emotional context of elaborate phrases formed by intertwining different words. This challenge asks you to identify the emotions in sentences that may contain negating words, words that change the intensity, or terms that describe degrees. additionally, handling the task of sentiment analysis for whole phrases and even shorter messages such as tweets, where contextual understanding and compact expression can make the process more difficult.

Anticipated Challenges and Considerations:

- A notable challenge revolves around effectively leveraging the Twitter API and Tweepy to access real-time tweets while also retrieving historical offline tweets from the past. This dual-purpose data acquisition process requires careful implementation and coordination.

Scope for future work:

1. Exploring ensemble methods to combine predictions from multiple models for improved hate speech detection and sentiment analysis.
2. Extending the analysis to other languages to create a multilingual sentiment analysis model.

Conclusion:

We employed multiple training models to make predictions and endeavored to identify the most suitable model for our dataset. By utilizing distinct vectorization methods such as TF-IDF and Count Vectorizer, we observed variations in the outcomes.

In evaluating the performance of diverse models like SVM, Random Forest, and XGBoost across a range of extracted features including Bag of Words, Word2Vec, Doc2Vec, and TF-IDF, we considered the F1 score as our evaluation metric.

Among these models, our top-performing one proved to be XGBoost, utilizing tuned parameters applied to Word2Vec features, achieving an F1 score of 0.66 and accuracy of 0.96.

	Model_ID	F1Score	Accuracy
0	XGBOOST	0.657168	0.959850
1	Support Vector Classifier	0.623839	0.949317
2	Random Forest Classifier	0.519535	0.952550