1. Introduction

In this era of globalisation, the use of the Internet has become a daily activity for all people in Indonesia, as cited by the Data Reporting page at the beginning of 2024, there were 185.3 million active Internet users in Indonesia[1]. However, there are differences with what the Indonesian Internet Service Providers Association, or APJII, says. According to APJII, the number of internet users in Indonesia in 2024 will reach 221 million out of the total population of Indonesia of 278 million[2]. Furthermore, Data Reportal shows data that Indonesia has 139 million social media users in January 2024, or 49.9% of the total population of Indonesia. There is also a presentation of the number of active users of X or Twitter in Indonesia as much as 24.69 million and X's advertising planning tool recorded an increase of 693 thousand in the span of early 2023 to early 2024[1]. Based on the data above, it can be said that the majority of Indonesians use social media to commmunicate with each other, one of which is X.

Communication is closely related to emotions in Human's lives as social beings. Emotion is a person's expression of a condition. Several studies have been conducted to classify a person's emotions based on tweets on social media X, one of the studies using natural language processing (NLP).

One of the important focuses in NLP is emotion classification, especially in understanding human emotions expressed through text. The basic emotion theory, as proposed by Simeng Gu et al [13], provides the theoretical foundation for this study that there are 4 basic emotions including ‘happy’, ‘sad’, ‘anger’, and ‘fear’. This research used Bidirectional Encoder Represantions from Transformers (BERT) to process natural language and classify emotions based on user tweets on X social media. BERT is a bidirectional natural language processing technique, so BERT pre-trains can be customised with only one output layer for sophisticated models [1]. A research by Adine Nayla et al [2] used BERT to detect the level of hate speech on X resulting in an accuracy of 78.69%. A research by Linkai Huo and Yue Wang [3] used BERT and then classified emotions into 3 groups to get 79.1% results for the ‘Friends’ test set and 86.2% for the ‘Emotion Push’ test set. A research by Sharath Chander P [4] conducted research on emotion classification and intensity prediction on X using BERTv4 to get an accuracy of 84.15%. A research by Andrea Chiorrini et al [5] conducted emotion prediction and sentiment analysis on uploads on X using BERT and then produced an accuracy value of 92% for sentiment analysis and 90% for emotion prediction. A research by Mahsa Hadikhah M et al [6] show that BERT produces higher performance with an F1-Score value of 86% compared to the GRU model with an F1-Score value of 80% and LSTM with an F1-Score value of 33%, due to BERT's ability to comprehensively understand context. Based on the comparison of six studies conducted using BERT, GRU, and LSTM, the majority of researchers get BERT accuracy results above 75% and better than other natural language processing algorithm models. In this research, the BERT method is used to classify emotions to determine the performance and hyperparamater that affect the results..

[1] https://datareportal.com/
[2] https://apjii.or.id/