

Abstract—Depression has become an increasingly pervasive mental health issue in Indonesia, with many individuals expressing emotional distress through social media platforms such as X. The informal, unstructured, and context-dependent nature of social media language presents challenges for automatic detection using natural language processing (NLP). This study proposes a hybrid deep learning model combining Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN) to identify depressive indications in Indonesian tweets. A total of 58,115 tweets were collected and manually labeled into two classes: depressed and non-depressed. The text data underwent preprocessing steps including cleaning, case folding, normalization, stopword removal, stemming, and tokenization. Features were extracted using Term Frequency-Inverse Document Frequency (TF-IDF), and semantic relationships were enriched through FastText embeddings. The FastText model was trained on three corpora—Tweet, IndoNews, and a combined Tweet+IndoNews—resulting in a similarity corpus of 339,128 entries. Hyperparameter optimization was conducted using Genetic Algorithm (GA), tuning learning rate, layer size, and dropout rate. The best-performing configuration used three 1D convolutional layers (kernel sizes 3, 5, 7), a SimpleRNN layer with 32 units, a dropout rate of 0.6, and a learning rate of 0.001. This model achieved an accuracy of 85.54%, an increase of 2.13% from the baseline of 83.41%. The results demonstrate that integrating CNN-RNN architecture with semantic feature expansion and GA-based optimization enhances depression detection in informal social media texts. Furthermore, the proposed approach supports long-term sustainability by utilizing open-source tools and lightweight neural architectures, making it adaptable to evolving language patterns and scalable for digital mental health monitoring systems in the Indonesian context.

Keywords—*depression detection, x, CNN-RNN, fasttext, genetic algorithm.*