

ABSTRAK

Penelitian ini bertujuan untuk menganalisis perbandingan kinerja algoritma *Support Vector Machine* (SVM) dengan model ansambel yang menggabungkan *Random Forest* dan *AdaBoost* dalam mengklasifikasikan tingkat stres berdasarkan sinyal *Electroencephalogram* (EEG). Data penelitian dikumpulkan dari 21 orang partisipan di Lapas Binjai, di mana proses perekaman EEG dilakukan secara terkendali. Tahapan penelitian mencakup pra-pemrosesan data, proses klasifikasi, serta evaluasi performa model dengan menggunakan metrik akurasi, presisi, *recall*, *Area Under Curve* (AUC), dan *Minimum Classification Error* (MCE). Berdasarkan hasil pengujian, model ansambel menunjukkan performa paling unggul dengan akurasi 97%, presisi 97%, *recall* 97%, nilai AUC mencapai 1,00, dan MCE sebesar 0,03. Sebaliknya, algoritma SVM hanya memperoleh akurasi 81%, presisi 72%, *recall* 81%, dan MCE sebesar 0,16. Hasil ini menyatakan bahwa metode ansambel lebih efektif untuk klasifikasi stres multi-level (stres, rileks, netral) serta lebih adaptif terhadap variasi sinyal EEG di kondisi nyata. Penelitian ini diharapkan dapat memberikan kontribusi terhadap pengembangan sistem deteksi stres berbasis EEG yang lebih akurat dan aplikatif.

Kata kunci: EEG, stres, *Support Vector Machine*, *Random Forest*, *AdaBoost*, klasifikasi ansambel, MCE, AUC.

ABSTRACT

This study aims to compare the performance of the *Support Vector Machine* (SVM) algorithm with an ensemble model that integrates *Random Forest* and *AdaBoost* in classifying stress levels from *Electroencephalogram* (EEG) signals. The data were gathered from 21 participants at the Binjai Correctional Facility under controlled recording conditions. The research process involved data pre-processing, classification, and evaluation of model performance based on accuracy, precision, recall, *Area Under the Curve* (AUC), and *Minimum Classification Error* (MCE). The experiment results showed that the ensemble model produced the best performance, with 97% accuracy, 97% precision, 97% recall, an AUC value of 1.00, and an MCE of 0.03. In contrast, the SVM model only achieved 81% accuracy, 72% precision, 81% recall, and an MCE of 0.16. These outcomes indicate that the ensemble approach is more reliable for multi-level stress classification (stress, relaxed, neutral) and demonstrates higher resilience in dealing with EEG signal variability in real-world scenarios. This research is expected to support the development of accurate and practical EEG-based stress detection systems.

Keywords: EEG, stress, *Support Vector Machine*, *Random Forest*, *AdaBoost*, ensemble classification, MCE, AUC.