INTISARI

Penelitian ini bertujuan untuk melakukan studi komparatif antara dua algoritma klasifikasi, yaitu *Support Vector Machine One-Versus-Rest* (SVM OVR) dan *Multinomial Logistic Regression* (MLR) serta menganalisis dampak reduksi dimensi *Principal Component Analysis* (PCA) pada kedua algoritma. Penelitian dilakukan menggunakan data sekunder dari BCIC IV Dataset 2a yang terdiri dari rekaman EEG MI empat kelas dari 9 subjek. Metodologi penelitian meliputi tahap *preprocessing*, ekstraksi fitur dengan *Filter Bank Common Spatial Pattern* (FBCSP), dan seleksi fitur menggunakan *Mutual Information Best Individual Feature* (MIBIF). Reduksi dimensi diterapkan menggunakan PCA dengan ambang batas preservasi varians sebesar 95%. Evaluasi performa dilakukan menggunakan skema *10 fold cross validation* dengan parameter uji meliputi akurasi, *Cohen's Kappa*, dan uji signifikansi T-Test. Hasil eksperimen menunjukkan bahwa pada skenario dengan PCA, algoritma MLR mencatatkan rata-rata akurasi sebesar 74,61% dan SVM OVR sebesar 74,57%. T-test membuktikan tidak terdapat perbedaan signifikan antara kedua metode yang mengindikasikan bahwa kemampuan generalisasi keduanya setara. Namun, MLR menunjukkan keunggulan dalam stabilitas model dengan standar deviasi yang lebih rendah. Hasil nilai Kappa baik pada SVM OVR dan MLR menunjukkan bahwa kedua algoritma masuk dalam kategori *Substantial Agreement*. Berdasarkan uji T-test, penerapan PCA pada SVM OVR dan MLR tidak menunjukkan peningkatan akurasi yang signifikan. Namun, PCA berhasil meningkatkan kualitas informasi fitur lewat transformasinya.

Kata kunci : *Brain Computer Interface*, *Motor Imagery*, *Support Vector Machine*, *Multinomial Logistic Regression*, *Principal Component Analysis*

ABSTRACT

This study aims to conduct a comparative study between two classification algorithms, namely Support Vector Machine One-Versus-Rest (SVM OVR) andMultinomial Logistic Regression (MLR), and to analyze the impact of dimensional reduction using Principal Component Analysis (PCA) on both algorithms. The research was conducted using secondary data from the BCIC IV Dataset 2a which consists of four classes of MI EEG recordings from 9 subjects. The research methodology included preprocessing, feature extraction using Filter Bank Common Spatial Pattern (FBCSP), and feature selection using Mutual Information Best Individual Feature (MIBIF). Dimensional reduction was applied using PCA with a variance preservation threshold of 95%. Performance evaluation was conducted using a 10-fold cross-validation scheme with test parameters including accuracy, Cohen's Kappa, and T-Test significance. The results of the experiment show that in the PCA scenario, the MLR algorithm reached an average accuracy of 74.61% and SVM OVR of 74.57%. T-test proved that there was no significant difference between the two methods, indicating that their generalization capabilities were equivalent. However, MLR showed superiority in model stability with a lower standard deviation. The Kappa value of both SVM OVR and MLR indicates that both algorithms fall into the Substantial Agreement category. Based on the T-test, the application of PCA on SVM OVR and MLR did not show a significant increase in accuracy. However, PCA successfully improved the quality of feature information through its transformation.

Keywords : *Brain Computer Interface*, *Motor Imagery*, *Support Vector Machine*, *Multinomial Logistic Regression*, *Principal Component Analysis*