Implementation of welch pre-processing in SVM algorithm for improved accuracy on EEG data

ABSTRACT

The utilization of electroencephalogram (EEG) signals for emotion recognition has attracted considerable attention owing to its non-invasive characteristics and precise evaluation of cerebral electrical activity. This study proposes a methodology for enhancing the precision of emotion prediction in EEG data through the utilization of support vector machine (SVM) classification in conjunction with Welch pre-processing. The Welch method is employed for the purpose of extracting spectral power from the theta, alpha, beta, and gamma frequency sections of EEG signals, hence improving the representation of features. The SVM classifier is trained using the limited feature set acquired from Welch pre-processing. This study employs the DEAP dataset, comprising EEG recordings obtained from a sample of 32 participants who were exposed to a range of stimuli. The pre-processing procedures encompass the elimination of EEG artifacts, the use of band-pass filtering, and the extraction of spectral power via Welch's approach. SVM classification is subsequently utilized to forecast arousal and valence labels. The findings exhibit encouraging levels of accuracy, with the valence prediction task achieving the greatest accuracy rate of 61.45%. The utilization of gamma-central characteristics resulted in the attainment of the highest level of accuracy in predicting arousal, reaching 53.63%. The results of this study highlight the effectiveness of SVM with Welch pre-processing in enhancing the accuracy of emotion recognition based on EEG data. These findings provide significant contributions to the field of emotion research and have practical implications in affective computing and human-computer interaction.