SVM and Ensemble-SVM in EEG-based Person Identification

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Abstract. Biometric person identification is getting more effective and popular because of Electroencephalography (EEG). EEG signals can be captured from human scalp invasively or non-invasively with the help of electrodes. EEG-based biometric system is more secure and unique for person identification .In this paper, we have used two different state to explore the adaptive and uniqueness of the EEG-based biometric system.We have used eyes open (EO) state as well as eyes closed (EC) state of a EEG motor imagery publicly available dataset of 109 users.The model is trained and test with EO and EC state alternatively to prove the reliability and robustness of the model. The biometric person identification model have been designed using Support Vector machine (SVM) for classification .We achieved a notable person identification rate of 96% (EO) and 91.78% (EC) using SVM with Radial Basis Function (RBF) kernel.We have also used Ensemble Support Vector Machine (ESVM) to enhance the performance of person identification and observed the average performance accuracy of 96.16% with n number of classifier.

Keywords: Electroencephalography (EEG) · Biometrics · Support Vector Machine (SVM) · Ensemble-SVM · Radial Basis Function (RBF).

1 Introduction

Brain-Computer Interface (BCI) is the process of interconnection by capturing different signals like Electroencephalogram (EEG)[14], Electrocardiogram (ECG)[2], Magnetoencephalogram (MEG), functional Magnetic Resonance Imaging (fMRI), etc. However, EEG brain signals are most widely used for BCI and various biometric application because of it's secure, portable, and cost-effective aspects. Capturing EEG signal is mainly based on two methods, invasive EEG and non-invasive EEG. A bunch of electrodes are positioned on the scalp of the