Classification of Full EEGs (Electroencephelograms) for Biometrics and Medical Applications through Machine Learning and AI

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EEG (electroencephalogram) based identification systems have a myriad of applications ranging anywhere from scalable EEG systems for disease diagnostics, anti-epileptic drug administration, and biometric identification. In this study, we tried to find the most efficient LSTM (Long Short Term Memory) neural network configuration to classify the whole EEG dataset. The LSTM network was chosen for its established usage in sequence classification problems. In this study classification of the whole EEG was the goal, which differs from current research which focuses on classification of evoked potentials (EEG data based on sensory stimulus) and other potentials caused by motor movement. Classification of the whole EEG dataset is important as EEGs are highly variable based on the mental/physical state of the subject, this makes evoked potential based classifiers harder to replicate for biometric applications than a generalization of the signal. Secondly, evoked potential based classifiers may not work for medical applications ,as they only train on the response potential created by the Subject. This may be an issue when classifying for certain potentials caused by diseases, as these disease potentials may be missing in the the response potential from stimulus. The study paves the way to solve this by trying to find the underlying features that describe any EEG. A LSTM based model with different architectures and 100 Subjects' EEGs were used for classification. Standard EEG noise reduction was completed, and PCA (Principal Component Analysis) was used for further reduction. The classification accuracy results show that the classifiers have potential to be used.