Parallel Session 5	BIOSIGNALS
11:45 - 13:00	Room MR.07

Exploratory EEG Analysis using Clustering and Phase-locking Factor

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Keywords: Emotions, EEG, ICA, EMD, Phase-locking Factor, Clustering.

Abstract: Emotion recognition is essential for psychological and psychiatric applications and for improving the quality of human-machine interaction. Therefore, a simple and reliable method is needed to automatically assess the emotional state of a subject. This paper presents an application of clustering algorithms to feature spaces obtained from the acquired EEG of subjects performing a stress-inducing task. These features were obtained in three ways: using the EEG directly, using ICA to remove eye movement artifacts, and using EMD to extract data-driven modes present in the signals. From these features, we computed band-power features (BPFs) as well as pairwise phase-locking factors (PLFs), in a total of six different feature spaces. These six feature spaces are used as input to various clustering algorithms. The results of these clustering techniques show interesting phenomena, including prevalence for low numbers of clusters and the fact that clusters tend to be made of consecutive test lines.

Performance Evaluation of Methods for Correcting Ocular Artifacts in Electroencephalographic (EEG) Recordings

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Keywords: Electroencephalography, Ocular Artifact, Wavelet Transform, Adaptive Filtering, Blind Source Separation.

Abstract: The presence of ocular artifacts (OA) due to eye movements and eye blinks is a major problem for the analysis of electroencephalographic (EEG) recordings in most applications. A large variety of methods (algorithms) exist for detecting or/and correcting OA's. We identified the most promising methods, implemented them, and compared their performance for correctly detecting the presence of OA's. These methods are based on signal processing "tools" that can be classified into three categories: wavelet transform, adaptive filtering, and blind source separation. We evaluated the methods using EEG signals recorded from three healthy persons subjected to a driving task in a driving simulator. We performed a thorough comparison of the methods in terms of the usual performances measures (sensitivity, specificity, and ROC curves), using our own manual scoring of the recordings as ground truth. Our results show that methods based on adaptive filtering such as LMS and RLS appear to be the best to successfully identify OA's in EEG recordings.

EEG Discrimination with Artificial Neural Networks

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Keywords: Electroencephalogram, Alzheimer's Disease, Artificial Neural Network.

Abstract: Neurodegenerative disorders associated with aging as Alzheimer's disease (*AD*) have been increasing significantly in the last decades. *AD* affects the cerebral cortex and causes specific changes in brain electrical activity. Therefore, the analysis of signals from the electroencephalogram (*EEG*) may reveal structural and functional deficiencies typically associated with *AD*. This study aimed to develop an Artificial Neural Network (*ANN*) to classify *EEG* signals between cognitively normal control subjects and patients with probable *AD* . The results showed that the EEG can be a very useful tool to obtain an accurate diagnosis of AD. The best results were performed using the Power Spectral Density (*PSD*) determined by Short Time Fourier Transform (*STFT*) with a *ANN* developed using *Levenberg – Marquardt* training algorithm, *Logarithmic Sigmoid* activation function and 9 nodes in the hidden layer (correlation coefficient training: 0.99964, test: 0.95758 and validation: 0.9653 and with a total of: 0.99245).

Parallel Session 5	HEALTHINF
11:45 - 13:00	Room MR.08

Electronic Health Records Research in a Health Sector Environment with Multiple Provider Types

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Keywords: Research Database, Shared Health Records Access, EPR, Patient Record Access, Researchone, Multiple Health Providers, Clinical System, Database Validation.

Abstract: Where healthcare provision is divided into provider types, such as child health and palliative care, it is difficult for researchers to access comprehensive healthcare data. Integrated electronic health records offer an opportunity for cross-provider type care research. In this paper a new model for accessing such data is justified using the critical success factors as determined from an established research data provider. This validates a model that will enhance integrated health research for the benefit of clinical practice across multiple provider types.

On a Formal and User-friendly Linguistic Approach to Access Control of Electronic Health Data

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Keywords: Data Security, Electronic Health Records, Access Control.

Abstract: The importance of the exchange of Electronic Health Records (EHRs) between hospitals has been recognized by governments and institutions. Due to the sensitivity of data exchanged, only mature standards and implementations can be chosen to operate. This exchange process is of course under the control of the patient, who decides who has the rights to access her personal healthcare data and who has not, by giving her personal privacy consent. Patients' privacy consent is regulated by local legislations, which can vary frequently from region to region. The technology implementing such privacy aspects must be highly adaptable, often resulting in complex security scenarios that cannot be easily managed by patients and software designers. To overcome such security problems, we advocate the use of a linguistic approach that relies on languages for expressing policies with solid mathematical foundations. Our approach bases on FACPL, a policy language we have intentionally designed by taking inspiration from OASIS XACML, the de-facto standard used