

An Exploratory Study for the Discrimination of Two Types of Pain Based on Chebyshev's Coefficients of EEG Signal

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Abstract : Our proposal aims for developing an objective pain discrimination system, i.e., to discriminate between two neuronal conditions affecting the same neurophysiological signal. In this study, we present an approach to identify, in the first instance, two types of pain based on the analysis of the EEG signal decomposition coefficients. Each EEG segment of one-second duration is analyzed using the Chebyshev and linear prediction transform to extract a set of non-linear features, namely the Chebyshev and linear prediction coefficients. These features are used as the input vector of the Gaussian mixture model (GMM) for classification to differentiate two types of pain. To evaluate the performance of the proposed approach, we used an EEG dataset recorded in the left temporal (T7) and left frontocentral (FC5) regions. The experimental results demonstrate the effectiveness of Chebyshev coefficients for accurate differentiation of chronic fibromyalgia-like pain and experimental pain in the resting gamma band, with an accuracy of 93.9%. These results suggest a potential for discrimination of clinical pain according to its mechanism.

Keywords : chronic fibromyalgia pain, Chebyshev coefficients, healthy with induced pain, electroencephalogram, Gaussian mixture model

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