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Alzheimer's Early Prediction with Electroencephalogram

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Abstract

Alzheimer's disease (AD) is currently an incurable illness that causes dementia and patient's condition is progressively worse and it represents one of the greatest public health challenges worldwide. The main objective of this work was to develop a classification methodology for EEG signals to improve discrimination amongst patients at varying stages of the illness, Mild Cognitive Impairment (MCI) patients and non-patients either in order to obtain a more reliable methodology to identify AD in early stages. For this purpose, a surrogate decision tree classifier was used with 2 different ways of cross-validation (leave-one-out-cross-validation and 10-fold-cross validation). The EEG studied features were the values of maxima (NMax) and minima (NMin), the zero-crossing (Zcr) rate, the mean derivative value at a point (Mdif), the Relative Power (RP) in each of the conventional bands and finally the spectral ratios (r). The best classification was obtained with vectors of 10 features as classifier entries in a leave-one-out-cross validation process, reaching 0.934 AUC, a sensitivity of 86.19%, a specificity of 99.35%, an accuracy of 94.88%, with a low out-of-sample classification error of 6.98% which indicates that the classifier generalizes fairly well.

Keywords: Alzheimer's diasease; Early stages; Electroencephalogram signal; surrogate decision tree classifier; features.

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