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Multiscale Entropy Analysis of Electroencephalogram (EEG) of Alcoholic and Control Subjects

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Abstract : Multiscale entropy analysis (MSE) is a useful technique recently developed to quantify the dynamics of physiological signals at different time scales. This study is aimed at investigating the electroencephalogram (EEG) signals to analyze the background activity of alcoholic and control subjects by inspecting various coarse-grained sequences formed at different time scales. EEG recordings of alcoholic and control subjects were taken from the publically available machine learning repository of University of California (UCI) acquired using 64 electrodes. The MSE analysis was performed on the EEG data acquired from all the electrodes of alcoholic and control subjects. Mann-Whitney rank test was used to find significant differences between the groups and result were considered statistically significant for p-values<0.05. The area under receiver operator curve was computed to find the degree separation between the groups. The mean ranks of MSE values at all the times scales for all electrodes were higher control subject as compared to alcoholic subjects. Higher mean ranks represent higher complexity and vice versa. The finding indicated that EEG signals acquired through electrodes C3, C4, F3, F7, F8, O1, O2, P3, T7 showed significant differences between alcoholic and control subjects at time scales 1 to 5. Moreover, all electrodes exhibit significance level at different time scales. Likewise, the highest accuracy and separation was obtained at the central region (C3 and C4), front polar regions (P3, O1, F3, F7, F8 and T8) while other electrodes such asFp1, Fp2, P4 and F4 shows no significant results.

Keywords : electroencephalogram (EEG), multiscale sample entropy (MSE), Mann-Whitney test (MMT), Receiver Operator Curve (ROC), complexity analysis
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