

Classification enhancement for post-stroke dementia using fuzzy neighborhood preserving analysis with QR-decomposition

ABSTRACT

The aim of the present study was to discriminate the electroencephalogram (EEG) of 5 patients with vascular dementia (VaD), 15 patients with stroke-related mild cognitive impairment (MCI), and 15 control normal subjects during a working memory (WM) task. We used independent component analysis (ICA) and wavelet transform (WT) as a hybrid preprocessing approach for EEG artifact removal. Three different features were extracted from the cleaned EEG signals: spectral entropy (SpecEn), permutation entropy (PerEn) and Tsallis entropy (TsEn). Two classification schemes were applied - support vector machine (SVM) and k-nearest neighbors (kNN) - with fuzzy neighborhood preserving analysis with QR-decomposition (FNPAQR) as a dimensionality reduction technique. The FNPAQR dimensionality reduction technique increased the SVM classification accuracy from 82.22% to 90.37% and from 82.6% to 86.67% for kNN. These results suggest that FNPAQR consistently improves the discrimination of VaD, MCI patients and control normal subjects and it could be a useful feature selection to help the identification of patients with VaD and MCI.

Keyword: Dementia; Fuzzy neighborhood preserving analysis with QR-decomposition; Electroencephalogram