

A Study on Multiple Signal Classification

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Abstract

Multiple signal classification (MUSIC) has attracted much attention and has been implemented in the fields of medicine, industry, and sports science. This study proposes a hybrid method for MUSIC based on the techniques of wavelet, functional principal component analysis (FPCA), common spatial pattern (CSP), and some machine learning algorithms. Wavelet offers various resolutions in both time and frequency domains which provide useful features for classification. FPCA is employed to keep the most variation of data by projecting the multiple signals into a suitable eigenspace. CSP separates a multivariate signal into subcomponents which have maximum differences in variance between two categories. We consider logistic regression, support vector machine, random forest, naïve bayes, and eXtreme Gradient Boosting to construct classifiers. A multi-channel EEG dataset collected from a Brain Computer Interface competition is adopted for our empirical investigation. The numerical results reveal that the proposed hybrid method is capable of improving the classification performances for MUSIC.

Keywords : common spatial pattern, discrete wavelet transform, functional principal component analysis, multiple signal classification