Hamilton Institute

Classification of Time-Embedded EEG Using Short-Time Principal Component Analysis

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Abstract

Principal Components Analysis (PCA) is often used to project high-dimensional signals to lower dimensional subspaces defined by basis vectors that maximize the variance of the projected signals. The projected values can be used as features for classification problems. However, data containing variations of relatively short duration and small magnitude, such as those seen in EEG signals, may not be captured by PCA when applied to time series of long duration. Instead, PCA can be applied independently to short segments of data and the basis vectors themselves can be used as features for classification.

In addition, the time-embedding of EEG samples is investigated, resulting in a representation that captures EEG variations in space and time. The resulting features of the analysis are then classified via standard linear and quadratic discriminant analysis. Results are shown for two data sets of EEG, one recorded from subjects performing five mental tasks, and one from the third brain-computer interface competition recorded from subjects performing one mental task and two imagined movement tasks. Related approaches are used in an EU project directed by J. del R. Millan, (IDIAP, Martigny, Switzerland) for mentally guiding a wheel chair, as demonstrated in a video.

Venue: Seminar Room, Hamilton Institute, Rye Hall, NUI Maynooth

Time: 1.30 - 2.30pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie

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