

First steps to the classification of ERPs using quantum computation

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Event-related potentials (ERPs) are small potentials produced by the brain in response to a stimulation and can be observed by non-invasive electroencephalography (EEG). Low transfer rate is a major bottleneck for ERP-based brain-computer interfaces (BCIs) for clinical applications. This led to the development of more robust and accurate classifiers. In this study, we investigate the performance of a quantum-enhanced support vector classifier (QSVC) [1]. We used the data from *Brain Invaders*, a public dataset containing data of participants playing a version of the famous vintage game *Space Invaders* with a BCI [2]. Data were prepared using Riemannian Geometry following the guidelines presented in [3]–[5]. Performance of QSVC was assessed with 5-folds cross validation, and the resulting balanced accuracy was 83.17, hence comparing with the classical approach. In fact, it is possible that the encoding of the data into a quantum state or the amount and quality of the data, were too simple. This suggests that QSVC might only offer advantages over classical SVC in only in situations where the classification task is complex, such as in BCI illiteracy.

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