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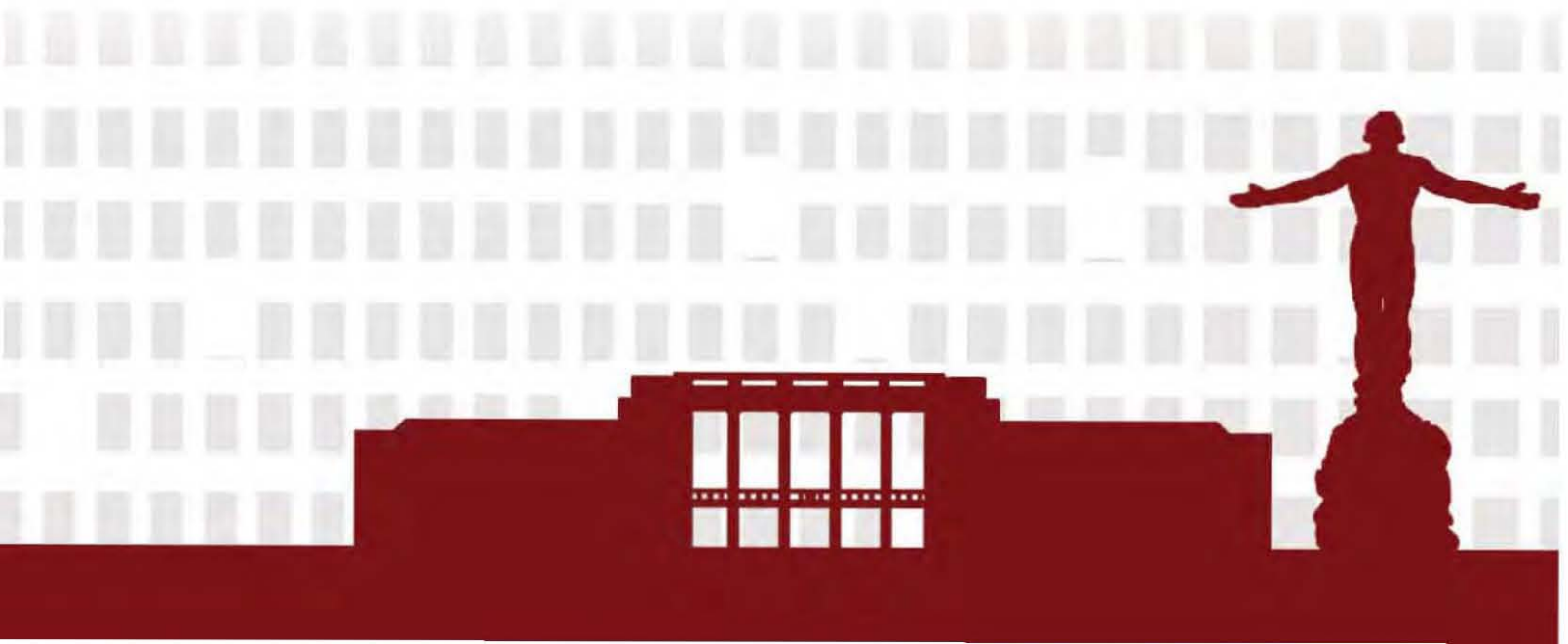

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A COMPARISON STUDY FOR AN OPTIMAL COMMON SPATIAL PATTERN ALGORITHM FOR EEG SIGNAL CLASSIFICATION APPLICABLE TO BCI SYSTEMS

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ABSTRACT

Common spatial pattern (CSP), a well-known algorithm in the field of brain–computer interface (BCI), has contributed much to research in that area. Many methods have been proposed for improving classification performance using CSP. Even though there have been many CSP-based publications, there is still confusion regarding the different approaches to CSP and the important factors of each approach. This paper reviews several approaches to CSP and determines the optimal CSP parameters by analyzing electroencephalography (EEG) signals during the imagination of right-hand and foot movement tasks.

The simulation results show that a longer length of an EEG segment of 3.5–4 s is optimal for achieving the highest classification accuracy. Selecting a discriminant function for the CSP algorithm also depends on using a selection method for good optimization performance. The pair selection method can give acceptable performance with less need to care about which discriminant function is required. The maximum and minimum selection methods require careful selection of the optimal discriminant function.

Keywords: Optimal, Common Spatial Pattern, EEG, BCI, Feature Extraction.

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