|  |  |  |  |
| --- | --- | --- | --- |
| **Title:** | Common Spatial Pattern in Frequency Domain for Feature Extraction and Classification of Multichannel EEG Signals | | |
| **Author(s) Name:** | Pritom Kumar Saha · Md. Asadur Rahman · Mohammad Khurshed Alam · Asma Ferdowsi ·  Md. Nurunnabi Mollah | | |
| **Contact Email(s):** | Khurshed709@aiub.edu | | |
| **Published Journal Name:** | SN Computer Science (2021) 2:149 | | |
| **Type of Publication:** | Journal | | |
| **Volume:** | 2:149 | Issue |  |
| **Publisher:** | The Author(s), under exclusive licence to Springer Nature Singapore Pte Ltd 2021 | | |
| **Publication Date:** | 19 March, 2021 | | |
| **ISSN:** | Online | | |
| **DOI:** | https://doi.org/10.1007/s42979-021-00586-9 | | |
| **URL:** | https://link.springer.com/article/10.1007/s42979-021-00586-9 | | |
| **Other Related Info.:** | online | | |
|  | | | |

|  |  |
| --- | --- |
| **Abstract:** |  |
| The extraction methodology of the significant features from the signals is one of the most important pre-requisite steps for EEG signal classification. Common spatial pattern (CSP) is a widely used feature extraction method for EEG signal but with a lacking of failing to maintain discriminative features between classes in the time domain, and further as a consequence, ends up in inconvenience with erroneous output. To overcome the limitations of the convention CSP, this research work proposes a novel frequency domain CSP (FCSP) method for feature extraction. This method proposes to convert the time domain EEG  signal to its power spectral density (PSD) so that the event-related variation can be found in the frequency domain. After that,the CSP method is applied to the PSD values of the selected channels to extract the variation based on the spatial pattern of the channels for the events. The output of this method helps to extract simple features from the FCSP-PSD data for the classification. The proposed method is applied to motor imagery data from BCI competition IV. To check the applicability of the proposed method, a complex environment was created considering the same lobe events such as combined left and right feet (Class#1) versus right-hand (Class#2) imagery movement. To compare the performance of the proposed work, the  method is also applied to the conventional classification problem (left-hand vs right-hand imagery movement) and found very promising results of 91% accuracy on average. | |