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Peer Review

Review of: "STEAM-EEG: Spatiotemporal EEG Analysis with Markov Transfer Fields and Attentive CNNs"

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In this work, the authors propose a framework for EEG classification which involves two different types of representations: Singular Spectrum Analysis (SSA) for trend-seasonal decomposition (1D) and Markov Transfer Field (MTF) imaging (2D), followed by CNN models that take these representations as inputs, followed by a fusion-based classifier. The effectiveness of the method is shown on various tasks, indicating a good general performance of the framework.

While the work is good, it can benefit from some improvements as given below:

1. In section 3.1, in the point on grouping, it would be good to mention more precisely about the “significance and similarity” of eigenvalues and vectors.

2. The statement “These component series capture different temporal patterns and characteristics of the EEG signal, providing a more refined representation for subsequent analysis.” is somewhat vague. Please elaborate more clearly, signifying the effectiveness of the representation.

3. Please provide some insights about the modified attention discussed around equation (5), and compare it conceptually against some standard attention mechanisms such as SE, CBAM, etc.

4. “To generate visual representations of the EEG patterns, we map the inferred marginal probabilities onto a 2D topographic map of the EEG electrode layout. The resulting MTF images highlight the active regions and their spatial relationships, providing an intuitive visualization of the EEG signal dynamics.” This description is too short to understand the 2D representation. As this is an

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important part of the method, it should be clarified better from the point of view of reproducibility.

5. “The residual connections allow the network to learn residual mappings and facilitate the flow of information through the network.” This is a very vague statement. Residual connections are well known, and such loose statements should be avoided.

Declarations

Potential competing interests: No potential competing interests to declare.