

# Inter-region Synchronization Analysis based on Heterogeneous Matrix Similarity Measurement

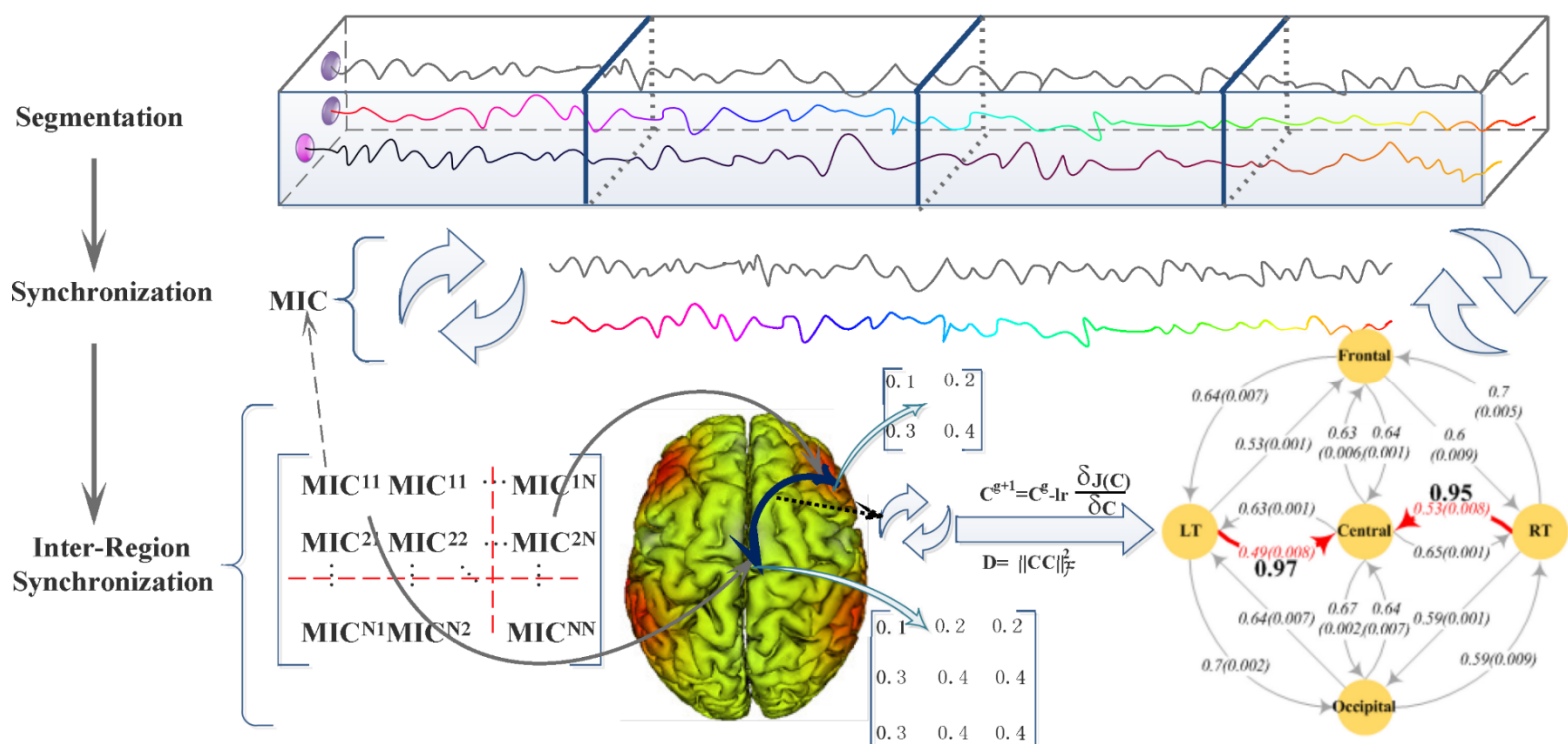
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EEG synchronization is an essential tool to understand mechanisms of communication between brain regions. Despite numerous successes along this direction, grand challenges still remain: (1) to establish the relation between treatment outcome and the synchronization patterns amongst brain regions and (2) to correctly quantify the synchronization amongst brain regions with different electrode placement topologies. As for this problem, we propose an approach to inter-region synchronization analysis based on Heterogeneous Matrix Similarity Measurement to avoid information loss of the results on similarity. It is measured by deriving the bridge matrix that quantifies the distance from the source matrix to the target one both of arbitrary dimensions. The similarity measures are then used to examine the relation between brain region interactions (directional) and treatment outcome. Experiments have been performed on EEG collected from patients received anti-depression treatment with both non-effective and effective outcomes. Experimental results indicate that for the non-effective group, 97% (95%) similarity values from right temporal to central (from left temporal to central) are greater than the average similarity value of all patients; The new correlation measures can quantify the directional synchronization between brain regions and form an indicator for anti-depression treatment outcome with a high-level confidence. The approach also holds potentials in sophisticated applications involving clustering and dimensionality reduction.



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