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Finding Brain Functional Modules Aids in Alzheimer's disease Identification

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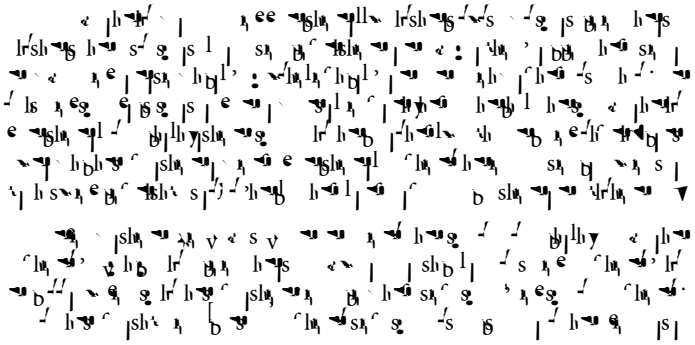
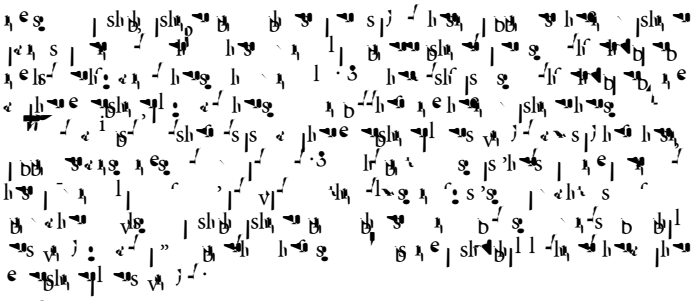
Abstract

Brain hubs serve as focal points for the integration of information, whereas functional modules in the human brain support the brain's drive for specialization. A large number of connections between modules and within modules are found in brain hubs. We argue that brain functional networks mistake brain regions for hubs because of weak connections. We propose a brand-new measure known as ambivert degree, which takes into account both the degree of the node and its connection weights in order to identify hubs that have both high degree and high connection weights. We demonstrate that the Human Connectome Project's resting-state functional MRI scans identify brain hubs that are not only essential but also constant across subjects using the ambivert degree. For diseases that are known to have widespread hub disruption, we hypothesize that nodal measures based on ambivert degree can effectively classify patients from healthy controls. We demonstrate through the use of data from patients with Alzheimer's disease and autism spectrum disorder that the hubs in the diseased and healthy groups differ significantly, and that deep feed forward neural networks trained on nodal hub features achieve significantly higher classification accuracy with significantly fewer trainable weights than functional connectivity features. Therefore, the ambivert level can be used as a di

Introduction





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