Beyond Low-Order Functional Connectivity in Brain-Related Studies

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Brain connectivity has been attracting attentions in a variety of research domains such as cognitive neuroscience and computational modelling because it represents interactions between brain regions. To date, the connectivity derived from strength estimation based on phase, magnitude, or spectral synchronisation/coupling was extensively investigated. It is called low-order functional connectivity (LOFC). However, LOFC only captures interactions between individual brain regions and cannot be used to capture interactions between topographical profiles (i.e., a set of connections from a brain region to all other brain regions). In this talk, I will present other functional connectivity metrics (e.g., high-order functional connectivity) after brief introduction of LOFC. Meanwhile, I will introduce two studies (i.e., driving fatigue [1] and exoskeleton-aided walking [2]) we recently accomplished using these functional connectivity metrics and show the results derived from the studies to demonstrate the feasibility of the metrics. These metrics are universal and can be utilized to other studies.

References

[1] Jonathan Harvy, Nitish Thakor, Anastasios Bezerianos, **Junhua Li***, Between-Frequency Topographical and Dynamic High-Order Functional Connectivity for Driving Drowsiness Assessment, *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 27(3), 358-367, 2019

[2] **Junhua Li***, Nitish Thakor, Anastasios Bezerianos, Brain Functional Connectivity in Unconstrained Walking with and without An Exoskeleton, *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 28(3), 730-739, 2020