Synergy and Redundancy: a Network Perspective

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Synergy and redundancy are ubiquitous yet elusive concepts. Frameworks rooted in information theory allow to quantitatively define them, in particular quantifying the joint information shared by two drivers on a target. In this contribution, we will add networks to the picture in two aspects:

1. Synergy and redundancy **as** networks: defining a pairwise synergy index we can define a networks in which the nodes are pairs of drivers, and the links determine whether they share joint information on a given target. The resulting network has a hierarchical structure, and we can see shared information mapped on graph theory quantities.

2. Synergy and redundancy **between** networks: we address the information transferred between networks, in a directed way, or mediated by another network. We will present a simple theory and two simple applications, to social media, and neural data.
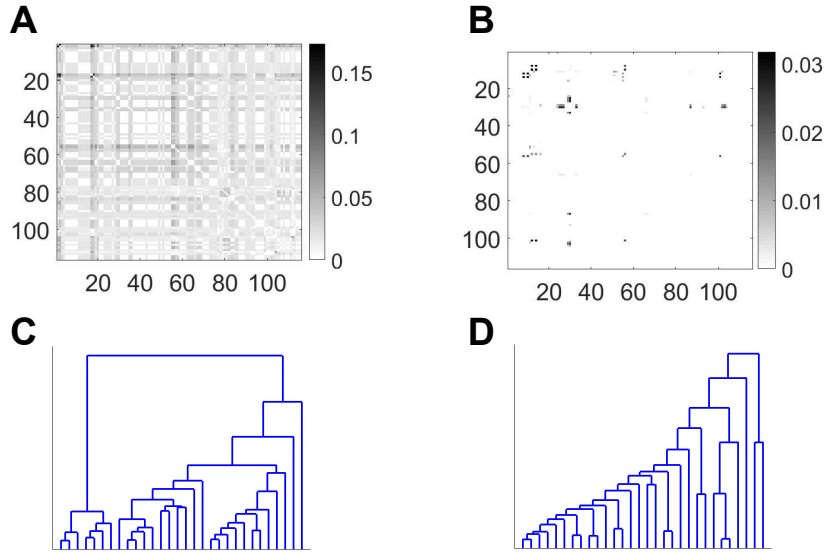
Synergetic and redundant influences between 116 brain regions, averaged over 90 subjects from the HCP dataset. Left: matrix of synergetic/redundant contributions (a/b) and dendrograms (c/d).