# S1 Appendix

For weighted networks, the generalized clustering coefficient $C_{wu}$ [1] and the global efficiency $E_{global}$ [2] are defined as follows

$$C_{wu} = \frac{1}{p}\sum_{i}\frac{1}{D_{ii}(D_{ii}-1)}\sum_{j,k}(W_{ij}W_{ik}W_{jk})^{1/3}, \tag{S1}$$

$$E_{global} = \frac{1}{N(N-1)}\sum_{i\neq j}\frac{1}{l_{ij}}, \tag{S2}$$

where $D_{ii} = \sum_j W_{ij}$ is the degree of vertex $i$; $l_{ij}$ is the shortest weighted path length between vertices $i$ and $j$; $N$ denotes the number of vertices in the network. Notice that the subscript '$wu$' indicates a weighted undirected network.

There are multiple ways of specifying the modularity. One way to define the modularity of a partition of the network into $c$ communities is [3]

$$Q = \sum_{i=1}^{c}(e_{ii} - a_i^2), \tag{S3}$$

where $e_{ii}$ is the fraction of edges with both end vertices in the same community $i$ and $a_i$ is the fraction of ends of edges adjacent to vertices in community $i$. If we define $B_{ij}$ as the difference between $W_{ij}$ and the expected weight between vertices $i$ and $j$ if edge weights are distributed at random, then the modularity can also be viewed as the normalized summation of $B_{ij}$ over all pairs of $i, j$ that are in a same community.

# References

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2. Achard S, Bullmore E. Efficiency and cost of economical brain functional networks. PLoS Computational Biology. 2007;3(2):e17.

3. Newman ME. Modularity and community structure in networks. Proceedings of the National Academy of Sciences. 2006;103(23):8577–8582.