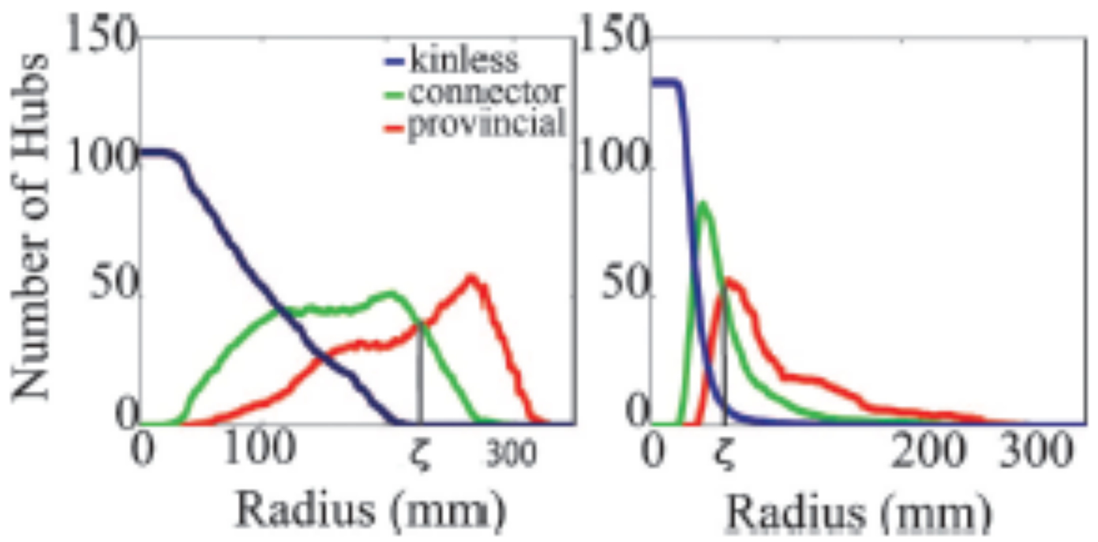
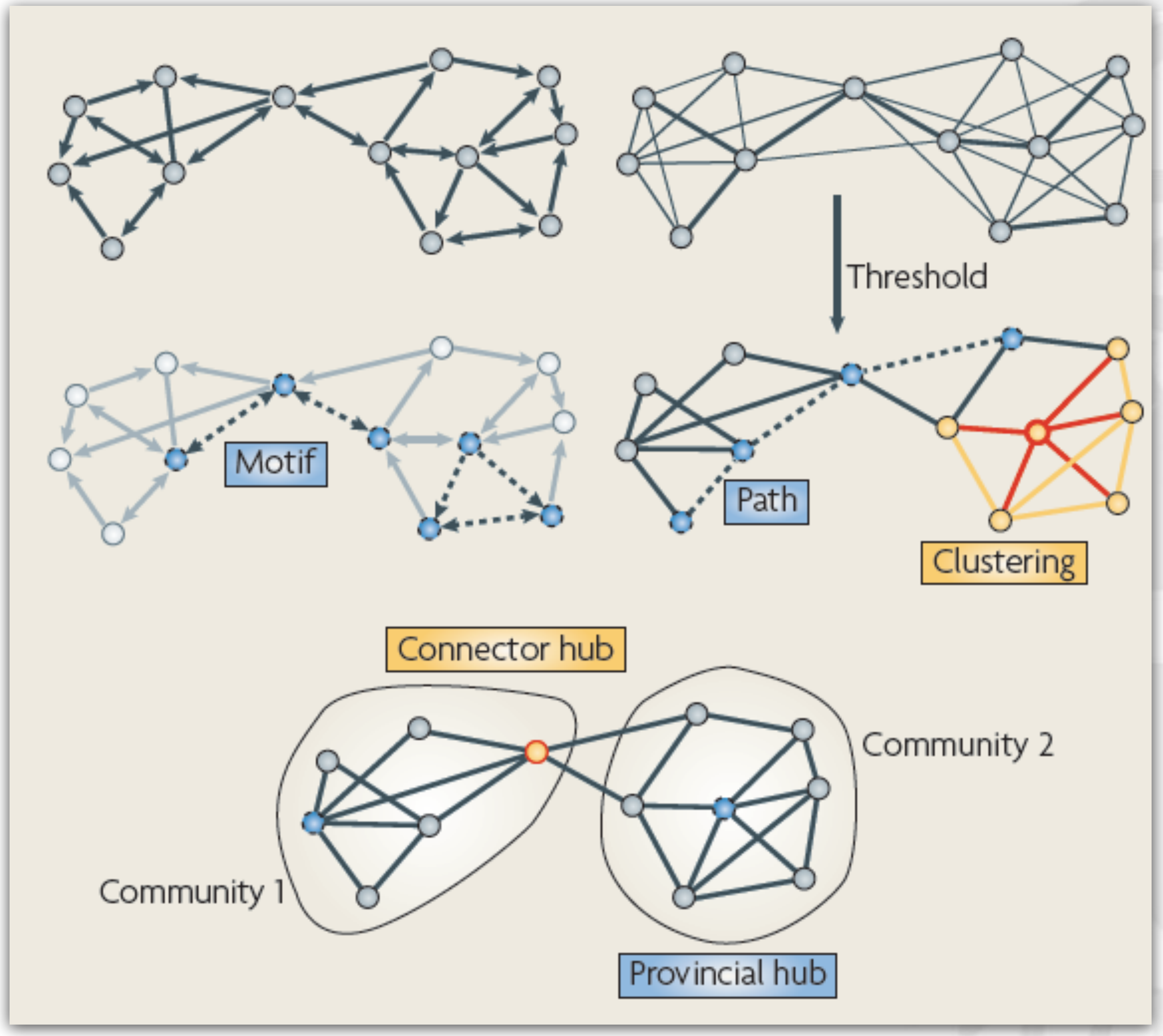
A brand new zoo of complexity measures!

- Node degree
- Degree distribution
- Assortativity
- Clustering coefficient
- Motifs
- Path length
- Path efficiency
- Connection density or cost
- Hubs
- Centrality
- Robustness
- Modularity





Bullmore, E., & Sporns, O. (2009). Complex brain networks: graph theoretical analysis of structural and functional systems. Nature reviews. Neuroscience, 10(3), 186-98. doi: 10.1038/nrn2575.

Table A1 (*continued*)

Measure	Binary and undirected definitions	Weighted and directed definitions
Modularity	Modularity of the network (Newman, 2004b), $$Q = \sum_{u \in M} \left[e_{uu} - \left(\sum_{v \in M} e_{uv} \right)^2 \right],$$ where the network is fully subdivided into a set of nonoverlapping modules M, and e_{uv} is the proportion of all links that connect nodes in module u with nodes in module v. An equivalent alternative formulation of the modularity (Newman, 2006) is given by $Q = \frac{1}{l}\sum_{i,j \in N}\left(a_{ij} - \frac{k_i k_j}{l}\right)\delta_{m_i,m_j}$, where m_i is the module containing node i, and $\delta_{m_i,m_j} = 1$ if $m_i = m_j$, and 0 otherwise.	Weighted modularity (Newman, 2004), $Q^w = \frac{1}{l^w}\sum_{i,j \in N}\left[w_{ij} - \frac{k_i^w k_j^w}{l^w}\right]\delta_{m_i,m_j}$. Directed modularity (Leicht and Newman, 2008), $Q^{\rightarrow} = \frac{1}{l}\sum_{i,j \in N}\left[a_{ij} - \frac{k_i^{out} k_j^{in}}{l}\right]\delta_{m_i,m_j}$.
Measures of centrality		
Closeness centrality	Closeness centrality of node i (e.g. Freeman, 1978), $$L_i^{-1} = \frac{n-1}{\sum_{j \in N, j \neq i} d_{ij}}.$$	Weighted closeness centrality, $(L_i^w)^{-1} = \frac{n-1}{\sum_{j \in N, j \neq i} d_{ij}^w}$. Directed closeness centrality, $(L_i^{\rightarrow})^{-1} = \frac{n-1}{\sum_{j \in N, j \neq i} d_{ij}^{\rightarrow}}$.
Betweenness centrality	Betweenness centrality of node i (e.g., Freeman, 1978), $$b_i = \frac{1}{(n-1)(n-2)} \sum_{\substack{h,j \in N \\ h \neq j, h \neq i, j \neq i}} \frac{\rho_{hj}(i)}{\rho_{hj}},$$ where ρ_{hj} is the number of shortest paths between h and j, and $\rho_{hj}(i)$ is the number of shortest paths between h and j that pass through i.	Betweenness centrality is computed equivalently on weighted and directed networks, provided that path lengths are computed on respective weighted or directed paths.
Within-module degree z-score	Within-module degree z-score of node i (Guimera and Amaral, 2005), $$z_i = \frac{k_i(m_i) - \bar{k}(m_i)}{\sigma^{k(m_i)}},$$ where m_i is the module containing node i, $k_i(m_i)$ is the within-module degree of i (the number of links between i and all other nodes in m_i), and $\bar{k}(m_i)$ and $\sigma^{k(m_i)}$ are the respective mean and standard deviation of the within-module m_i degree distribution.	Weighted within-module degree z-score, $z_i^w = \frac{k_i^w(m_i) - \bar{k}^w(m_i)}{\sigma^{k^w(m_i)}}$. Within-module out-degree z-score, $z_i^{out} = \frac{k_i^{out}(m_i) - \bar{k}^{out}(m_i)}{\sigma^{k^{out}(m_i)}}$. Within-module in-degree z-score, $z_i^{in} = \frac{k_i^{in}(m_i) - \bar{k}^{in}(m_i)}{\sigma^{k^{in}(m_i)}}$.

Rubinov, M., & Sporns, O. (2010). Complex network measures of brain connectivity: uses and interpretations. *NeuroImage*, *52*(3), 1059-69. Elsevier Inc. doi:10.1016/j.neuroimage.2009.10.003