> *Since there are some problems about mathjax, I also upload the pdf version [/Network / 4 Network Distance](#).*

Structural Distance

Structural distance captures local changes. It suites to data where local changes can induce radical changes.

Hamming Distance

$$d_H(G,\tilde{G}) = \sum_{i,j} \frac{\left|A_{ij} - \tilde{A}_{ij}\right|}{N(N-1)} = \frac{1}{N(N-1)} \|A - \tilde{A}\|_1$$

Jaccard Distance

Jaccard Distance includes a normalization with respect to the volume of the union graph.

$$\begin{aligned} d_{\text{Jaccard}}\ (G,\tilde{G}) &= \frac{|G \cup \tilde{G}| - |G \cap \tilde{G}|}{|G \cup \tilde{G}|} \\ &= \frac{\sum_{i,j} \left|A_{ij} - \tilde{A}_{ij}\right|}{\sum_{i,j} \max\left(A_{i,j}, \tilde{A}_{ij}\right)} \\ &= \frac{\|A - \tilde{A}\|_1}{\|A + \tilde{A}\|_*}, \end{aligned}$$

It is the metric induced by Steinhaus transformation $\delta(x,y) = \frac{2d(x,y)}{d(x,c)+d(y,c)+d(x,y)}$ with empty graph c.

Four Aspects of Dissimilarity Scores

- **Edge-Importance**: modifications of the graph structure yielding disconnected components should be penalized more.
- **Edge-submodularity**: a specific change is more important in a graph with a few edges than in a denser graph on the same nodes.
- **Weight awareness**: the impact on the similarity measure increases with the weight of the modified edge

- **Focus awareness**: random changes in graphs are less important than targeted changes of the same extent

Reference

- Tracking network dynamics: A survey using graph distances