random multigraph models: statistics

statistics for analysing structural features under multigraph models

measures defined using the distribution of edge multiplicities:

☑ number of loops and non-loops: tendency for within and between vertex category edges
   ➡ homophily/heterophily

☑ tendency for isolated vertices ➡ network diffusion

☑ simple occupancy of edges ➡ simple/complex network *

☑ single ties within vertex category ➡ isolation

☑ tendency for strengthening ties and if overlapping for multiple edge types ➡ multiplexity

approx 95% intervals
$$\hat{E} \pm 2\sqrt{\hat{V}}$$

* *"if a graph contains loops and/or any pairs of nodes is adjacent via more than one line a graph is complex"* [Wasserman and Faust, 1994]

random multigraph models: goodness of fit

gof measures between observed and expected edge multiplicity sequence
under simple or composite hypothesis

test statistics:

☑ S of Pearson type

☑ A of information divergence type

summary:

☑ even for very small m, the null distributions of the test statistics under the IEA model are well approximated by their asymptotic distributions

☑ the convergence of the cdf's of test statistics are rapid and depend on parameters in models

☑ approximations can be obtained using adjustments of χ^2-distributions yielding better power

☑ influence of RSM on both test statistics is substantial for small m: a shift of their distributions towards smaller values compared to what holds true for null distributions under IEA