

1,

Case 1:

a) $n-k / n-1$

b) $1/n$

c) $n-k / (n*(n-1))$

Case2:

a) $k-1 / n-1$

b) $1/n$

c) $k-1/(n*(n-1))$

case1+case2:

$$(n-k)/(n*(n-1)) + (k-1) / (n*(n-1)) = 1/n$$

2,

A static-graph sampling is a Scale-down sampling. Suppose the sample graph is S with m nodes and the target graph is G with n nodes. We measure the 9 distributions for these two graphs and compare them using the D-statistics.

3,

A page that is linked to by many pages with high PageRank receives a high rank itself.

- Place more outlinks from V

This will decrease the PageRank value. According to the definition of PageRank.

- Obtain more inlinks to V

This will increase the PageRank value. According to the definition of PageRank.

- Split V to two nodes Va and Vb without any link between Va and Vb. (Copy all links of V to Va and Vb, $pr(V) = \max(pr(Va), pr(Vb))$)

This will decrease the PageRank value. Because using two nodes to replace the original one node, cause the total pageRank value have to split to more nodes. And the pageRank value of all the nodes sums to 1. So the PageRank value of Va, Vb will decrease. $pr(V) = \max(pr(Va), pr(Vb))$ also will decrease.

- Create 10 nodes $V_1 \cdots V_{10}$. Add a bidirectional link between each (V, V_i) (This is called Sybil attack)