# Correlation of top-k rankings in centrality measures

**Keywords:** centrality measures, ranking correlations.

- Alonso Silva (alonso.silva@nokia-bell-labs.com)
  `https://www.bell-labs.com/usr/alonso.silva`

## Laboratory

- Nokia Bell Labs France,
  Nokia Paris-Saclay, Route de Villejust, 91620 Nozay
  Department of Mathematics of Complex Dynamic Networks

## 1 Context

The centrality of a vertex in a graph is a measure that determines its relative importance in the graph. The centrality is not an intrinsic characteristic of the vertices, it's an structural characteristic, i.e., it's a value that depends exclusively of its location in the graph.

The centrality measures according to a certain criteria measures the importance of a vertex according to its location in the graph. Since there are different possible criteria, there are different possible centrality measures.

In the proposed project, we consider the following centrality measures:

- degree
- closeness
- harmonic centrality
- betweenness

Each centrality measure defines a ranking of importance of the vertices in the graph.

The objective of this project consists in finding the correlation between the previously mentioned centrality measures. In particular, to find the correlation between the top-K vertices according to the rankings defined by the centrality measures. The usual measures to compute the correlation between rankings are Kendall or Spearman.

We have already the coefficient of correlations of Kendall for a total ranking ($k$ = number of vertices) under the centrality measures already mentioned.

The objective is to find the correlation coefficients for the top-k vertices as well as the correlation coefficients of Spearman.

# References


[1] R. Fagin, R. Kumar, and D. Sivakumar, "Comparing top k lists," in *Proceedings of the Fourteenth Annual ACM-SIAM Symposium on Discrete Algorithms*, SODA '03, (Philadelphia, PA, USA), pp. 28–36, Society for Industrial and Applied Mathematics, 2003.

[2] J. Bar-Ilan, M. Mat-Hassan, and M. Levene, "Methods for comparing rankings of search engine results," *Computer Networks*, vol. 50, no. 10, pp. 1448 – 1463, 2006. I. Web DynamicsII. Algorithms for Distributed Systems.

[3] M. G. Kendall, "A new measure of rank correlation," *Biometrika*, vol. 30, no. 1/2, pp. 81–93, 1938.