Title: Permutation tests for labeled network analysis

Authors: Nathalie Villa-Vialaneix (1,2) and Thibault Laurent (3)
(1) Université de Perpignan Via Domitia, IUT, Département STID, 11000 Carcassonne - France
(2) SAMM, EA 4543, Université Paris 1, 75634 Paris - France
(3) Toulouse School of Economics, 31000 Toulouse - France

Abstract:
Graphs (also called networks) are widely used to model data in many application fields to model interaction data (e.g., social network, regulation network in biology, Internet network...). In a number of real world situations, additional information is available, that describes each node of the network. For instance, the nodes in a social network can be labeled by the individual's memberships to a given social group ; the node of protein interaction networks can be labeled with the protein family... In this context, it is important to understand if the labels of the nodes are somehow related to the network topology (which can give an insight on the reason why two nodes are connected). The present presentation addresses this issue and presents exploratory tools, widely used in spatial statistics, that can be used to answer this question. More precisely, we will focus on permutation tests and explains how these tests should be performed depending on the nature of the labels (numeric labels, factors, spatial labels...). The methods are illustrated on a real world dataset which is a social network extracted from a large corpus of medieval notarial acts.