



ABSTRACTS

13th Seminar D² Seminar Series

Florence Center for Data Science 'Double' Seminar Series

Daniela Bubboloni - Department of Mathematics and Computer Science "Ulisse Dini", University of Florence

Title: Paths and flows for centrality measures in networks

Abstract: Consider the number of paths that must pass through a subset X of vertices of a capacitated network N in a maximum sequence of arc-disjoint paths connecting two vertices y and z . Consider then the difference between the maximum flow value from y to z in N and the maximum flow value from y to z in the network obtained by N by setting to zero the capacities of all the arcs incident to X . When X is a singleton, those quantities are involved in defining and computing the flow betweenness centrality and are commonly identified without any rigorous proof justifying the identification. That surprising gap in the literature is the starting point of our research. On the basis of a deep analysis of the interplay between paths and flows, we prove that, when X is a singleton, those quantities coincide. On the other hand, when X has at least two elements, those quantities may be different from each other. By means of the considered quantities, two conceptually different group centrality measures, respectively based on paths and flows, can be naturally defined. Such group centrality measures both extend the flow betweenness centrality to groups of vertices and satisfy a desirable form of monotonicity.

You can download the full paper here <https://onlinelibrary.wiley.com/doi/10.1002/net.22088>