



Thursday December 05, 2019 at 15:00

Politecnico di Torino, DISMA, Aula Buzano (third floor)

## Costanza CATALANO

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### On a centrality maximization game

Prof. Giacomo Como introduces the seminar.

#### Abstract

The Bonacich centrality is a well-known measure of the relative importance of nodes in a network, which has found applications in many fields as in social networks, opinion dynamics models and production networks among firms. For example, this notion is at the core of Google's PageRank algorithm where webpages that are sorted and presented according to their centrality ranking by the engine; in this context it is reasonable to assume that each webpage wants to increase its centrality ranking in order to increase its external visibility.

Obviously, each webpage can modify just its hyperlinks towards other webpages. Having this in mind, in this talk we present a network formation game when each node in a network decides how to rewire its out-links in order to maximize its Bonacich centrality. More precisely, we consider a game in which each player corresponds to a node in the network to be formed and can decide where to place his  $m$  out-links, having his own centrality as utility function. We assume that the number  $m$  of out-links available for each node is fixed. We study the Nash equilibria and the best response dynamics of this game and we provide a complete classification of the set of Nash equilibria when  $m = 1, 2$ . Our analysis shows that the centrality maximization performed by each node tends to create disconnected or loosely connected networks, namely 2-cliques for  $m=1$  and rings or a special "Butterfly"-shaped graph when  $m = 2$ . Our results build on the proof of the locality property of the best response function in such game.

#### Biography

Since July 2019, Costanza Catalano is a post-doc researcher in the department of mathematical sciences at Politecnico di Torino, under the Excellence project funded by the MIUR grant Dipartimenti di Eccellenza. She received her B.Sc. in 2012 (cum laude) and her M.Sc. in 2015 (cum laude) both in pure Mathematics and from the University of Florence (Italy). She obtained her PhD (cum laude) in Mathematics for Natural, Social and Life Sciences on March 2019 from Gran Sasso Science Institute (L'Aquila, Italy), under the supervision of prof. Raphaël Jungers (Université Catholique de Louvain). She has been a visiting PhD student at the Université Catholique de Louvain (Belgium) from October 2017 to December 2018. Her current research interests include network games, network formation, random graph theory, consensus and synchronization of multi-agent systems, and more generally probability on discrete structures.