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**Xiaoran Yan\***, 1001 E SR 45/46 Bypass, Bloomington, IN 47408, and **Shanghua Teng** and **Kristina Lerman**. *Z-Laplacian: a dynamical framework for community structures and centralities on networks*. Preliminary report.

In this work, we highlight the interplay between a dynamical process and the structure of the network on which it is defined. We start by examining the connections between random walks on graphs and node ranking and community detection algorithms. We introduce the Z-Laplacian framework for defining and characterizing an ensemble of dynamical processes which spans the space of all possible Z-matrices. We show that some traditional node centrality and clustering criterion are special cases under this framework.

Based on the Z-Laplacian framework, we will demonstrate how graph transformations can represent the flow of different dynamic processes on networks. We will show some empirical examples of how such transformations can be applied in real world problems, including modelling information diffusion over communication networks, brain connectome and scholarly collaboration networks. (Received February 06, 2017)