In regards to *“Characterization of topological keystone species Local, global and ‘meso-scale’ centralities in food webs“* by Ernesto Estrada; this paper adds some interesting notes and conclusions that can be considered in this research. The researcher wished to study the impact of removing a keystone species (a species whose impact on the community are large) and used centrality measures to determine the impact. The researcher included centralities that fit into three different categories. Local centrality measures included degree and betweenness centrality. Global centrality measures included closeness, eigenvector, and information centrality. Finally, meso-scale measures included closed walk and subgraph centrality. The results of this research were quite interesting but more importantly it had insights into the research highlighted in this research. An important note is that all of the centrality measures generally have high correlation values with each other however, based on the centralities used, the rankings produced by the different ranks were quite different. Removing different nodes in a network can have a variety of effects and differ for each centrality measure.

The paper, “*Robustness envelopes of networks”* by Stojan Trajanovski, Javier Martίn-Hernández, Wynand Winterbach, and Piet Van Mieghem discusses how targeted attacks on networks which highlights the worst-case attacks on networks. The researchers utilized the computational technique called envelopes which calculates that change in energy before and after a node removal. For targeted attacks, the researchers determined that removing nodes based on centrality values is sufficient for maximizing damage to a network. The researchers developed a technique to compare centrality metrics by coming up with a metric where a and b are different centrality measures and k is the percent of nodes to include. The more overlap of ranks there are for the two centralities after k ranks, the more similar the centrality measures are. The results were quite interesting because the researchers found that using degree and eigenvector centrality were the most efficient for simulating the worst-case scenario for targeted attacks which indicated that the had little overlap.

Resources:

Estrada, Ernesto. "Characterization of topological keystone species: local, global and “meso-scale” centralities in food webs." *Ecological Complexity* 4.1-2 (2007): 48-57.

Trajanovski, Stojan, et al. "Robustness envelopes of networks." *Journal of Complex Networks* 1.1 (2013): 44-62.