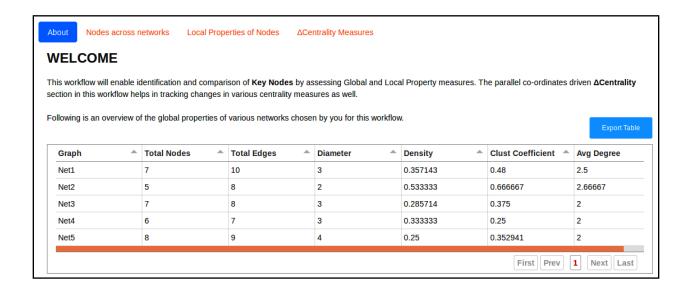# NetConfer Workflow 2

Identify and Compare Key Nodes

Objective: This workflow helps users identify and compare key nodes. There are three basic outputs of this module:

1. Global property of the networks: Allows to asses and compare the global network structure.

2. Table of the local properties of various nodes across different networks: Allow understanding the importance of each node with respect to a network.

3. Delta centrality viewer: Comparison of network properties of each node and visualize its change across the selected networks.
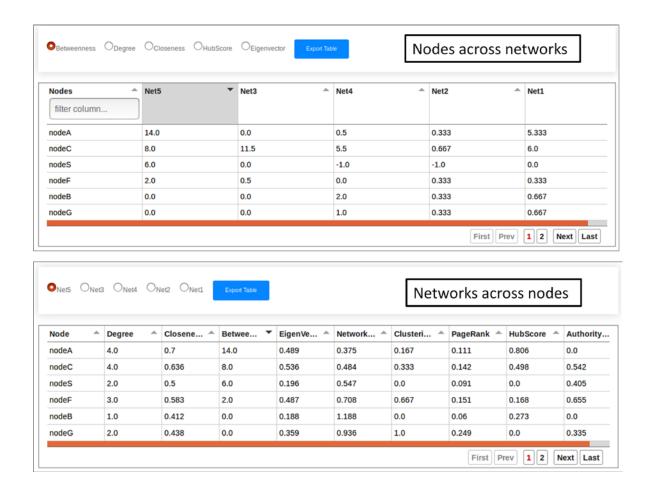
Interpretation:

The global properties viz. average clustering coefficient, average shortest distance, density, diameter, number of edges and number of nodes are presented as sortable tabulated outputs. Users also have the option to download the table as a CSV File.
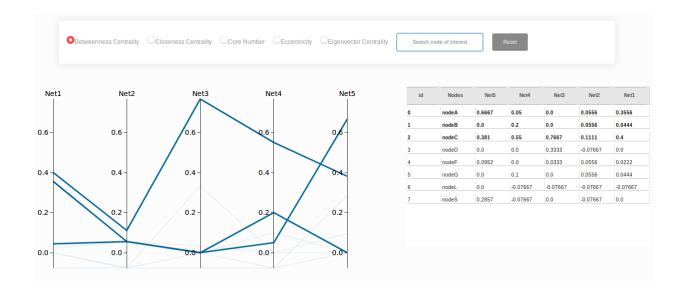

Some of the most useful (local) properties of nodes in a network covered by NetConfer are degree, betweenness centrality, hub and authority score, eccentricity and eigenvector centrality. The workflow allows tabulated and graphical analysis and tracing of various properties across

selected set of networks. These properties can be viewed by sortable and searchable tables for comparing the node properties across different networks. Further the table can be generated by either having the values of one of the properties of a node across different networks or having the different properties of all the nodes in one network. The first option is useful for understanding the changes in centrality measure across different networks.

Nodes across networks

○ Betweenness ○ Degree ○ Closeness ○ HubScore ○ Eigenvector   [Export Table]

Nodes	Net5	Net3	Net4	Net2	Net1
filter column...					
nodeA	14.0	0.0	0.5	0.333	5.333
nodeC	8.0	11.5	5.5	0.667	6.0
nodeS	6.0	0.0	-1.0	-1.0	0.0
nodeF	2.0	0.5	0.0	0.333	0.333
nodeB	0.0	0.0	2.0	0.333	0.667
nodeG	0.0	0.0	1.0	0.333	0.667

First Prev **1** 2 Next Last

Networks across nodes

○ Net5 ○ Net3 ○ Net4 ○ Net2 ○ Net1   [Export Table]

Node	Degree	Closene...	Betwee...	EigenVe...	Network...	Clusteri...	PageRank	HubScore	Authority...
nodeA	4.0	0.7	14.0	0.489	0.375	0.167	0.111	0.806	0.0
nodeC	4.0	0.636	8.0	0.536	0.484	0.333	0.142	0.498	0.542
nodeS	2.0	0.5	6.0	0.196	0.547	0.0	0.091	0.0	0.405
nodeF	3.0	0.583	2.0	0.487	0.708	0.667	0.151	0.168	0.655
nodeB	1.0	0.412	0.0	0.188	1.188	0.0	0.06	0.273	0.0
nodeG	2.0	0.438	0.0	0.359	0.936	1.0	0.249	0.0	0.335

First Prev **1** 2 Next Last

The centrality measures of various nodes in a network allow identifying critical or key nodes in a network. For example, in a microbial association network, degree and betweenness might be useful to identify key nodes ('microbes') that help in microbial communication. Nodes with high betweenness score are essentially key points of information flow and if removed can disrupt the whole network. Similarly, hub and authority scores have been proven to be useful in identification of essential proteins in protein-protein interaction networks.

Delta centrality viewer

id	Nodes	Net5	Net4	Net3	Net2	Net1
0	nodeA	0.6667	0.05	0.0	0.0556	0.3556
1	nodeB	0.0	0.2	0.0	0.0556	0.0444
2	nodeC	0.381	0.55	0.7667	0.1111	0.4
3	nodeD	0.0	0.0	0.3333	-0.07667	0.0
4	nodeF	0.0952	0.0	0.0333	0.0556	0.0222
5	nodeG	0.0	0.1	0.0	0.0556	0.0444
6	nodeL	0.0	-0.07667	-0.07667	-0.07667	-0.07667
7	nodeS	0.2857	-0.07667	0.0	-0.07667	0.0

NetConfer provides an innovative solution to view changes in the various centralities utilizing interactive parallel coordinates. In such plot, user can choose a centrality measure using the radio button and highlight the values for one or more selected node using the tabulated summary by clicking on the desired node name. A node can also be searched using the 'Search node of interest' feature. Each axis of the parallel coordinate are scaled to the global max and global min of the observed centrality values for a meaningful interpretation. The axes can be clicked and dragged to reorder the network arrangements. This feature is useful especially for comparing ordered networks (e.g. networks arising from time series data). **N.B:** In order to enable the implementation of the parallel coordinates (which requires a value for each node in each axes), nodes absent in a particular network (represented by the axes) are assigned negative values (to distinguish them from the ones that are present and having a positive value).