Homework 2 - Laboratory

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1 Giant Component

By filtering out the Giant component, applying Force Atlas 2 layout (scaling 2.0 and gravity 10.0) and coloring the nodes following the node-partition the result obtained in Gephy is the following:

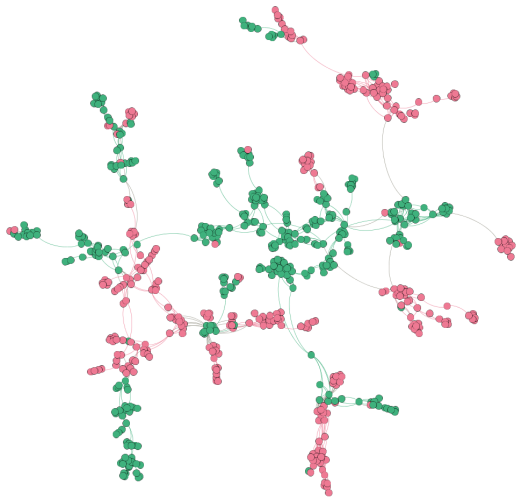

Figure 1: Giant component

Moreover, if we apply also the 'Dissuade Hubs', 'LinLog Mode' and 'Prevent Overlap' options we obtain a more readable graph like the one reported in the 'Figure 2'.

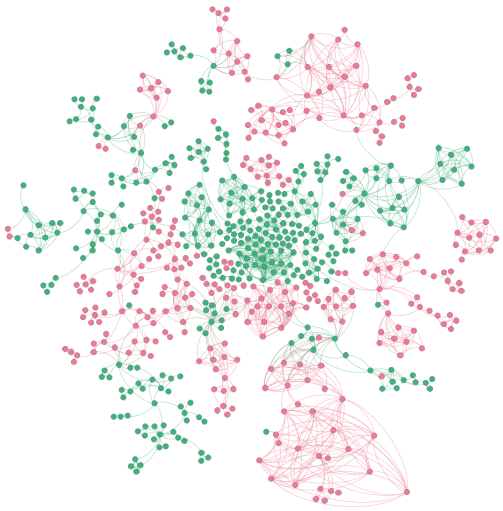

Figure 2: Giant component

In this situation by keeping the Giant-component filter running and creating a new workspace with the given subgraph, we have that:

1. The number of nodes are 680, meanwhile the number of edges are 1887
2. The average degree is 5.55
3. The average path length is 12.005
4. The maximum degree is 30 (ID: 87996)
5. By putting in red color the depth-2 ego network of the node 87996 we obtain the following result:

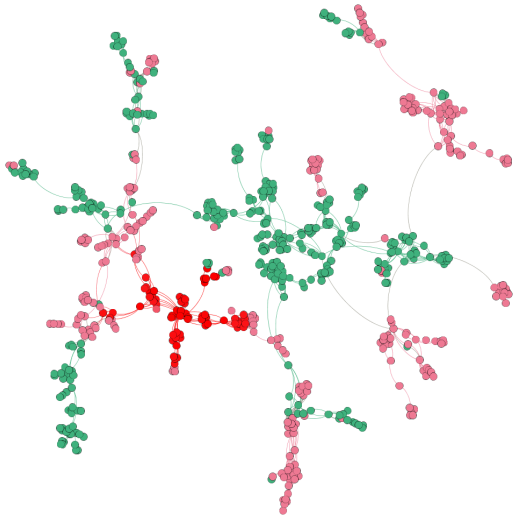

Figure 3: Giant component with red depth-2 ego network of the node 87996

Just for clarity, here's the isolated depth-2 ego network of the node 87996:

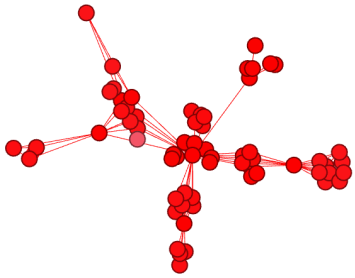

Figure 4: Isolated depth-2 ego network of the node 87996

In this next paragraph you can look at some scatter plots that compares the degree of a node with the eigenvector centrality, closeness centrality and eccentricity.

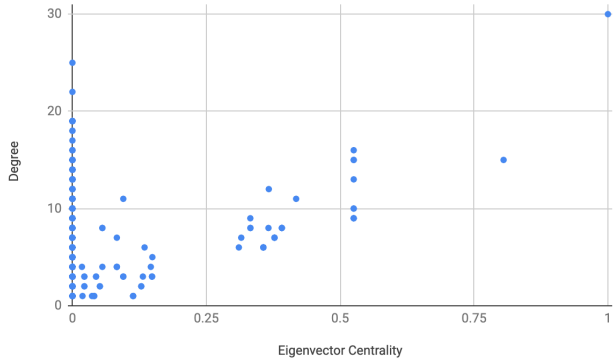

Figure 5: Degree versus eigenvector centrality

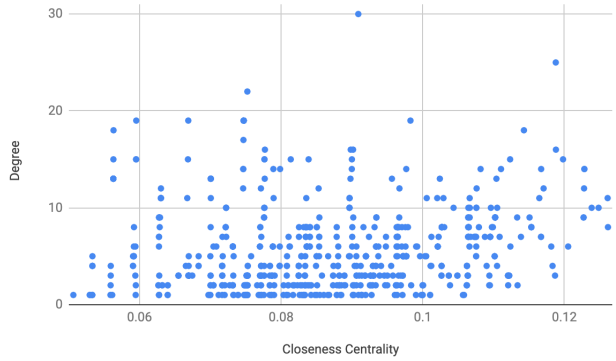

Figure 6: Degree versus closeness centrality

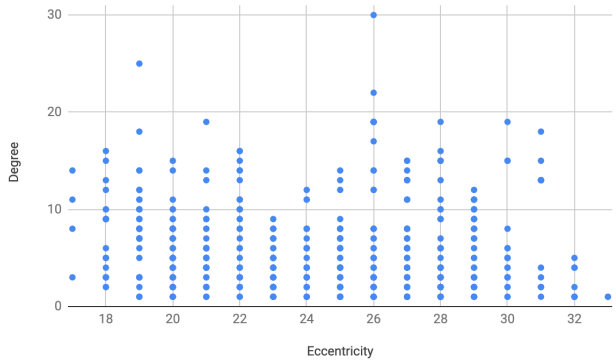

Figure 7: Degree versus eccentricity

The next graphs are multiple representation of the Giant component with node size between 1 and 10 regarding different variables.

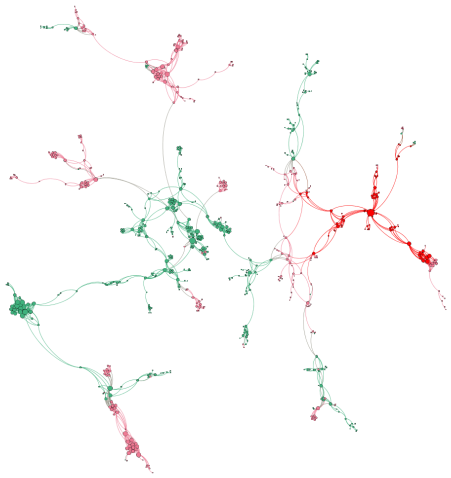

Figure 8: Node size depending on the degree

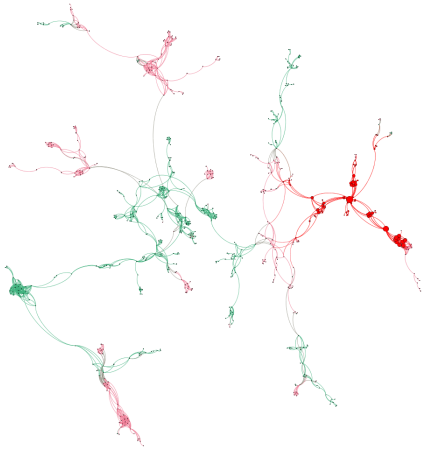

Figure 9: Node size depending on the eigenvector centrality

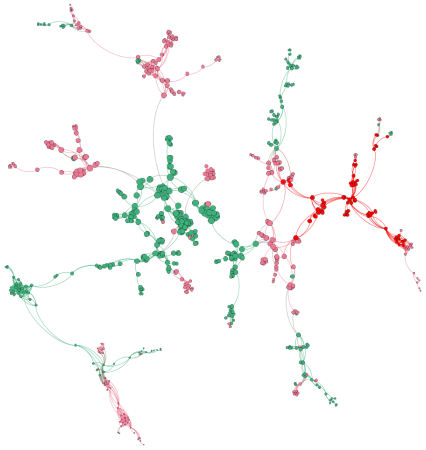

Figure 10: Node size depending on the closeness centrality

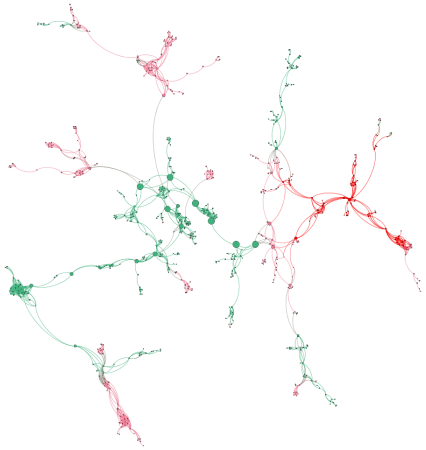

Figure 11: Node size depending on the betweenness centrality

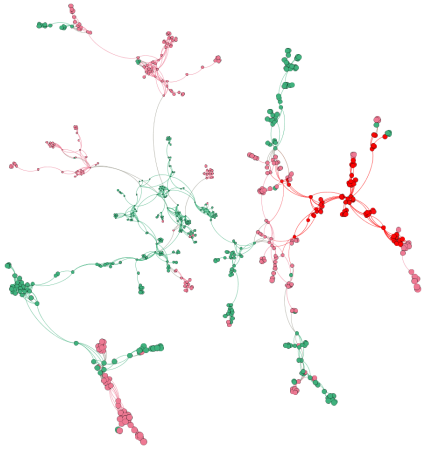

Figure 12: Node size depending on the eccentricity

2 Bipartite Graph

By considering the original network and removing both the nodes with null degree (done by applying the *degree range* filter with parameter 1 to the maximum) and the edges between companies of the same province (done by applying the *intra-edge* filter as a sub-filter), we obtain the following bipartite graph:

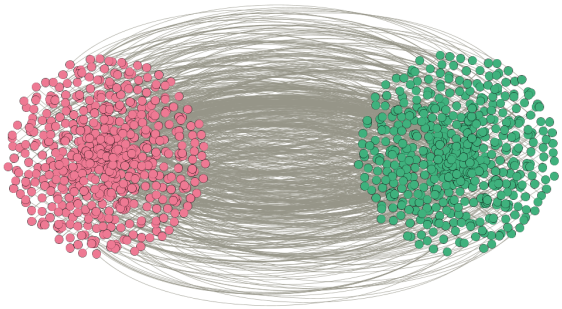

Figure 13: Bipartite graph

3 Betweenness Centrality

By considering the original network and removing both the nodes with null degree (done by applying the *degree range* filter with parameter 1 to the maximum) and the edges with edge-partition value equal to 1 (done by applying properly the *edge-partition* filter as a sub-filter), we obtain a sub-graph with 1993 nodes and 1471 edges.
A graphical representation of the obtained bipartite sub-graph can be seen in the 'Figure 14'.

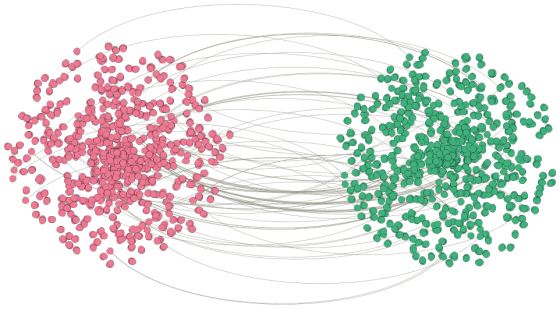

Figure 14: Bipartite graph

Moreover the node with the largest betweenness centrality is the one that has its ID equals to 55610 (betweenness centrality = 17.5) and its relative max-depth ego network is:

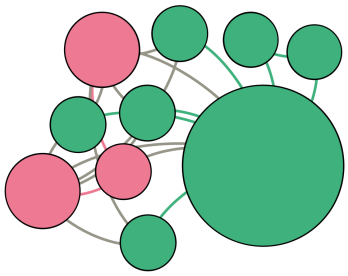

Figure 15: Max-depth ego network with nodes sizes proportional to their betweenness centrality

4 Additional Notes

All the data reported in this documentation has been developed using Gephy v0.9.2.
A problem discovered during the tests is that the software didn't recognise properly the imported spreadsheets in such a way that it gave a total of 33340 nodes and 15694 edges (instead of 16896 edges).