Task 7. Algorithms on graphs. Tools for network analysis.

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1)We have downloaded and install Gephi.

2) We have chosen dataset “Bitcoin Alpha web of trust network”, which properties are nodes = 3783 and edges =24186. Also, it is Weighted, Signed, Directed and Temporal graph.

Graph import

Next, we uploaded and process it in Gephi. What we have done can be seen on illustrations below. We have imported graph as edges table.

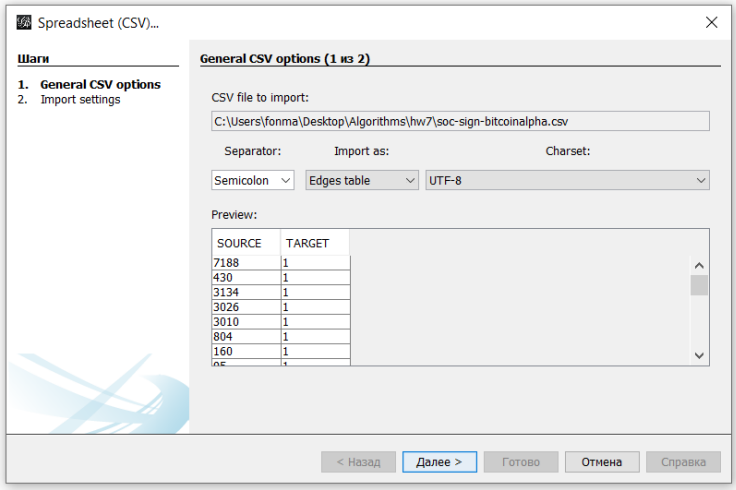
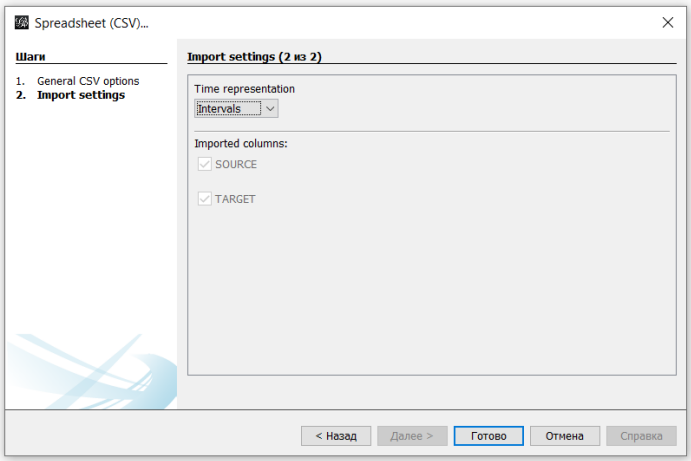
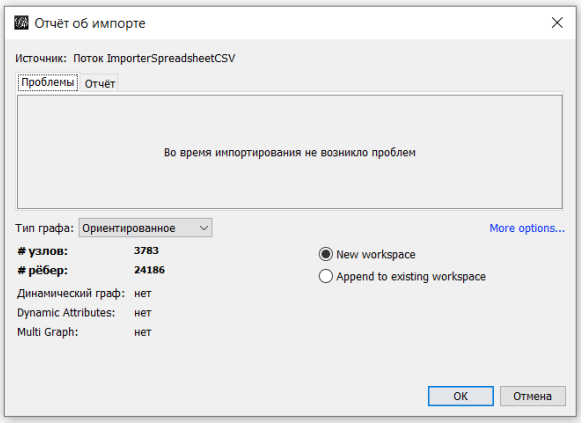


Figure 1. Graph import.





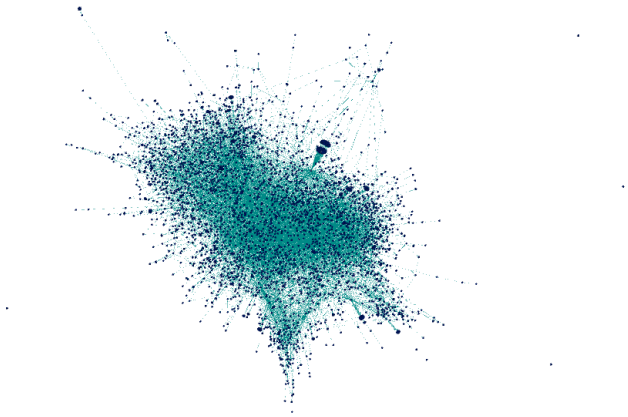
We have imported graph properly, because number of nodes and edges are the same as on SNAP.

Layout

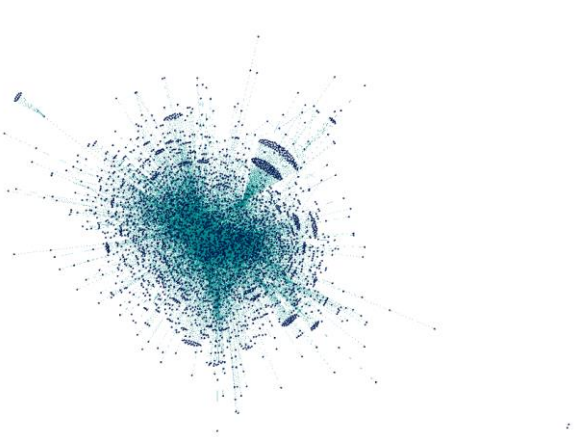
Graph before layout choose:

Then, we have obtained two different graph layouts:

Force Atlas 2



And Yifan Hu's



As can be seen graph illustration change with change of a layout.

Also, we can’t see any big clusters on this graph nor for Force Atlas 2 nor for Yifan Hu layouts.

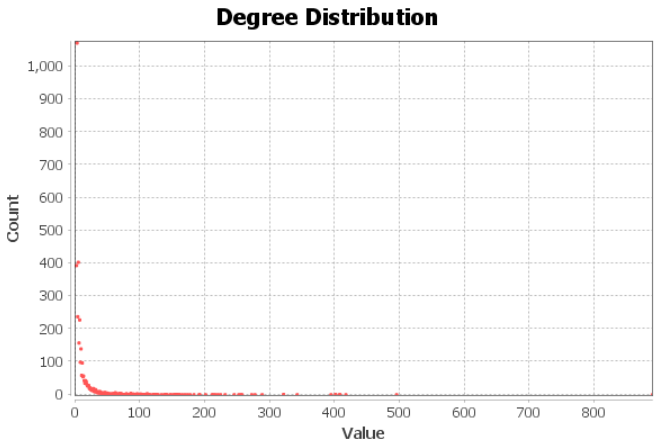
Statistics.

The graph has 3783 vertices and 24186 edges

Next, we calculate statistics for our graph. Firstly, we measured Average Degree of a graph. Avg.Degree = 6.363. Below you can see degree distribution of a graph.

Results:

Average Degree: 6.393



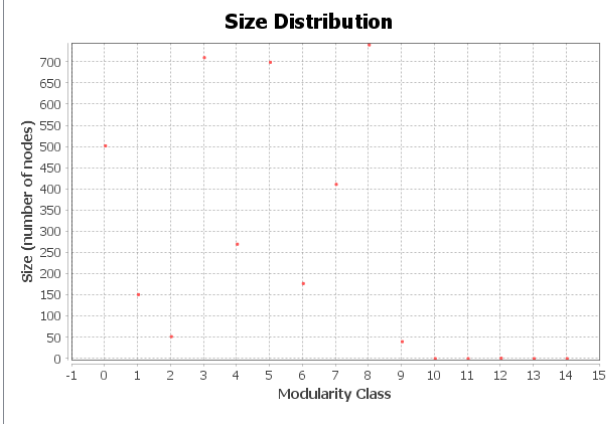
Full statistics of our graph:

Network Overview		
Average Degree	6.393	Run
Avg. Weighted Degree	6.393	Run
Network Diameter	10	Run
Graph Density	0.002	Run
HITS		Run
Modularity	0.461	Run
PageRank		Run
Connected Components		Run
Node Overview		
Avg. Clustering Coefficient	0.156	Run
Eigenvector Centrality		Run
Edge Overview		
Avg. Path Length	3.679	Run
Dynamic		
# Nodes		Run
# Edges		Run
Degree		Run
Clustering Coefficient		Run

Modularity is 0.461 and number of communities is 15. However, it can't be clearly seen from graph layout.

Results:

Modularity: 0.461
Modularity with resolution: 0.461
Number of Communities: 15



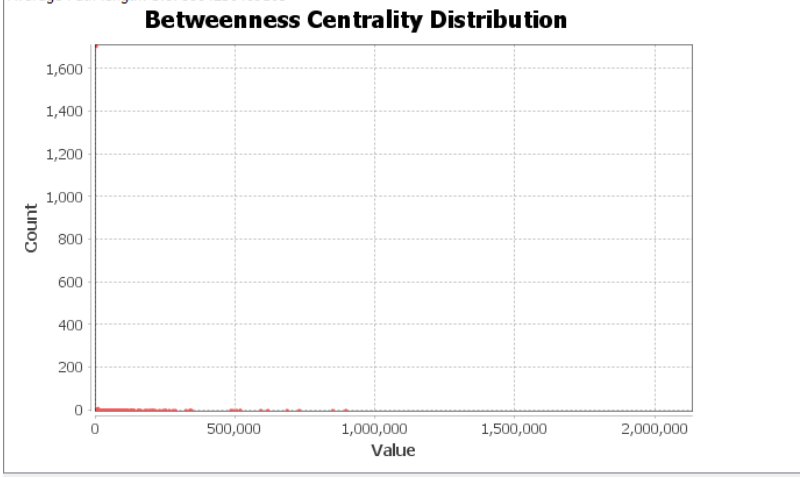
Graph density is 0.002. So, our graph is sparse.

Average clustering coefficient is 0.156, which is quite small.

Average path length is 3.6789, which means that average it needs to pass nodes to get from any node to other.

Results:

Diameter: 10
Radius: 0
Average Path length: 3.678864236409105



Network diameter is 10. In other words, shortest distance between the two most distant nodes for our graph is 10.

Conclusion

For our graph of Bitcoin Alpha web of trust network statistics said that graph has 15 communities/clusters. However, from our graph layout it cannot be clearly seen. Moreover, each node has in average 6 neighbors. For our case, that means that in average user trusts 6 other people with whom can trade Bitcoin.