Gephi – network analysis and visualization

2019 March 6

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Goals for today

- Learn about network analysis
- Practice using Gephi for network visualization

Schedule

- Overview of network analysis
- Tools for network analysis
- About Gephi
- Installing Gephi
- How to use Gephi
- Practice with Gephi

Networks

Image: https://cdn.pixabay.com/photo/2015/05/24/14/02/spaghetti-781795_960_720.jpg

Networks

Image:
https://assets.epicurious.com/photos/55f72d733c346243461d496e/2:1/w_1260,h_630/09112015_15minute_pastasauce_tomato.jpg

Nodes and Edges

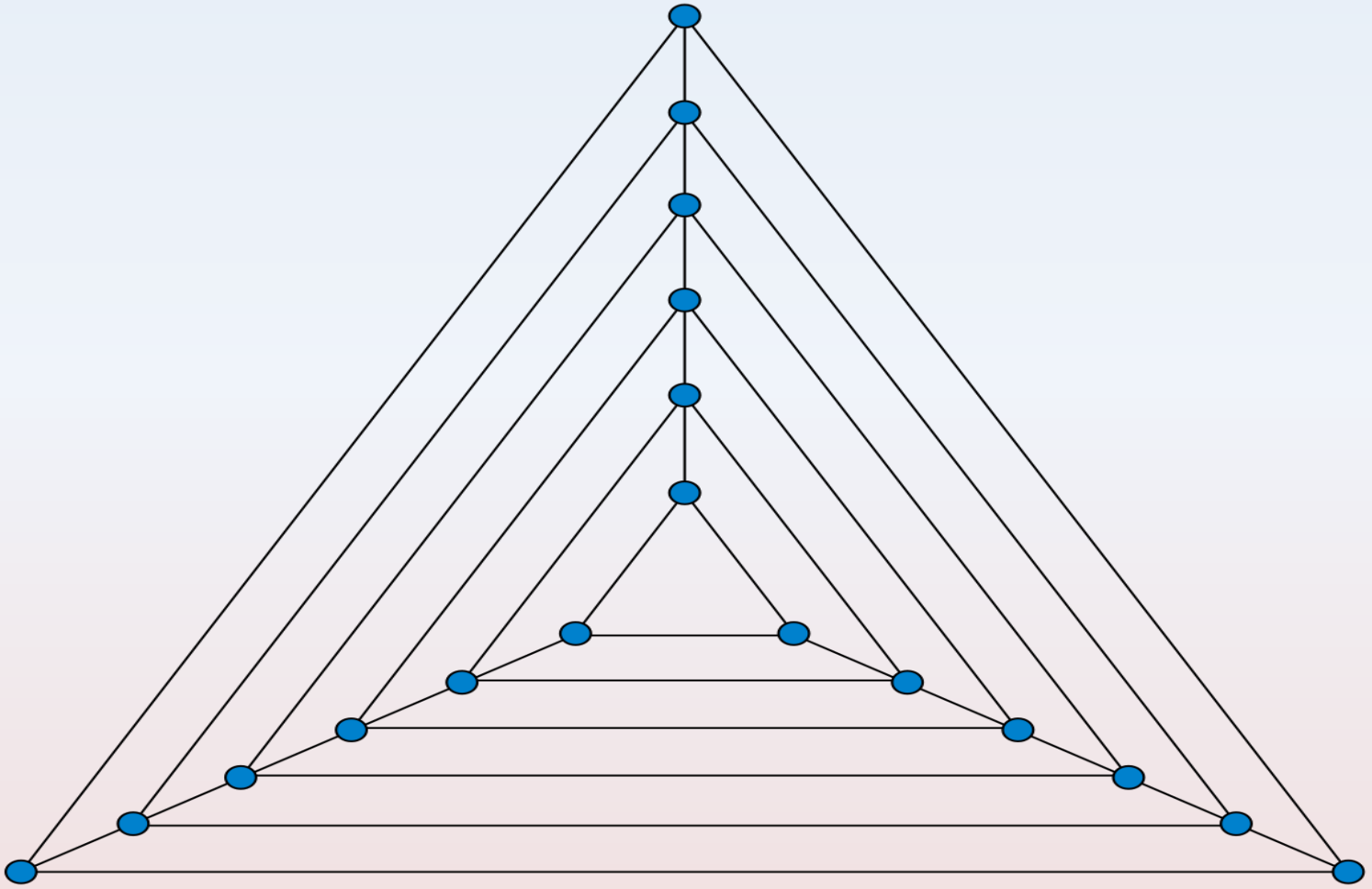


Image: https://upload.wikimedia.org/wikipedia/commons/thumb/2/28/Nested_triangle_graph_18.svg/1200px-Nested_triangle_graph_18.svg.png

Directed network

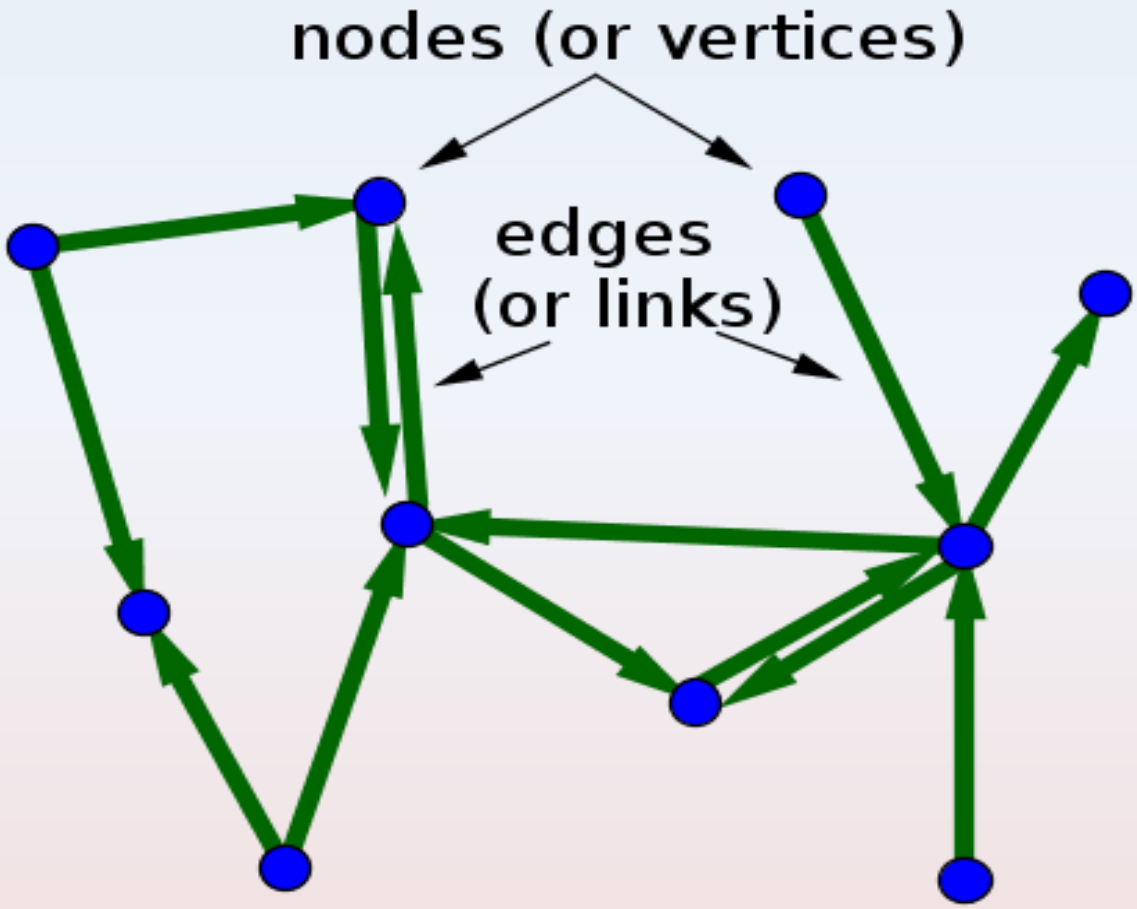


Image: https://mathinsight.org/media/image/image/small_directed_network_labeled.png

Clusters

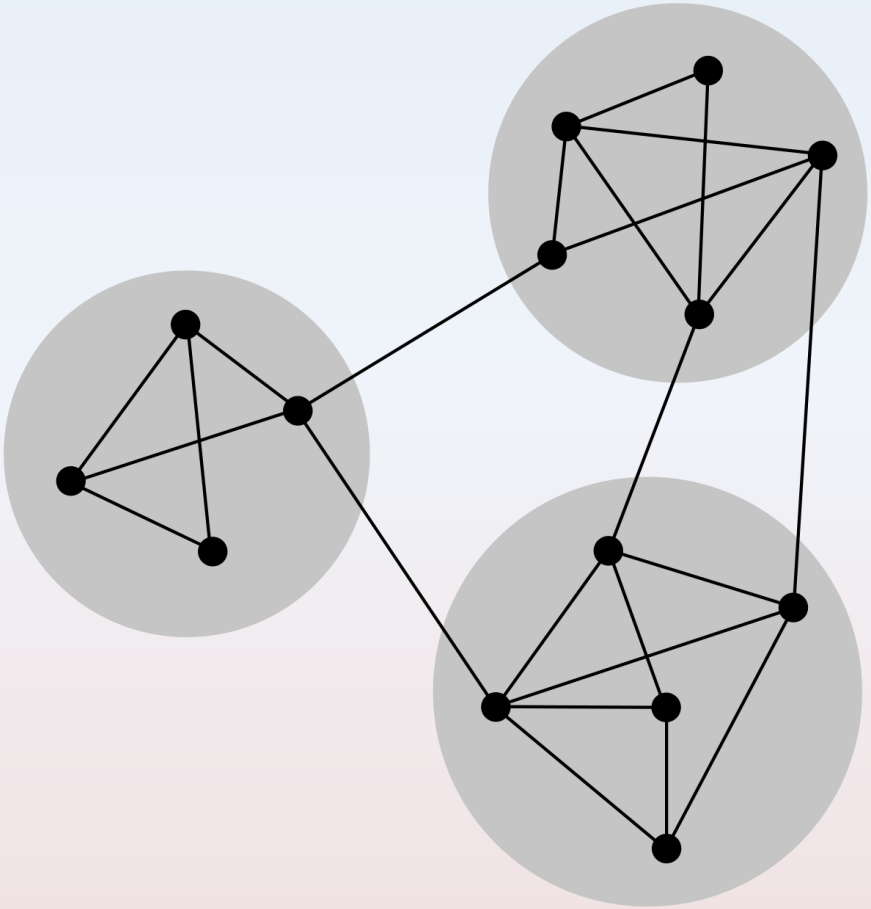
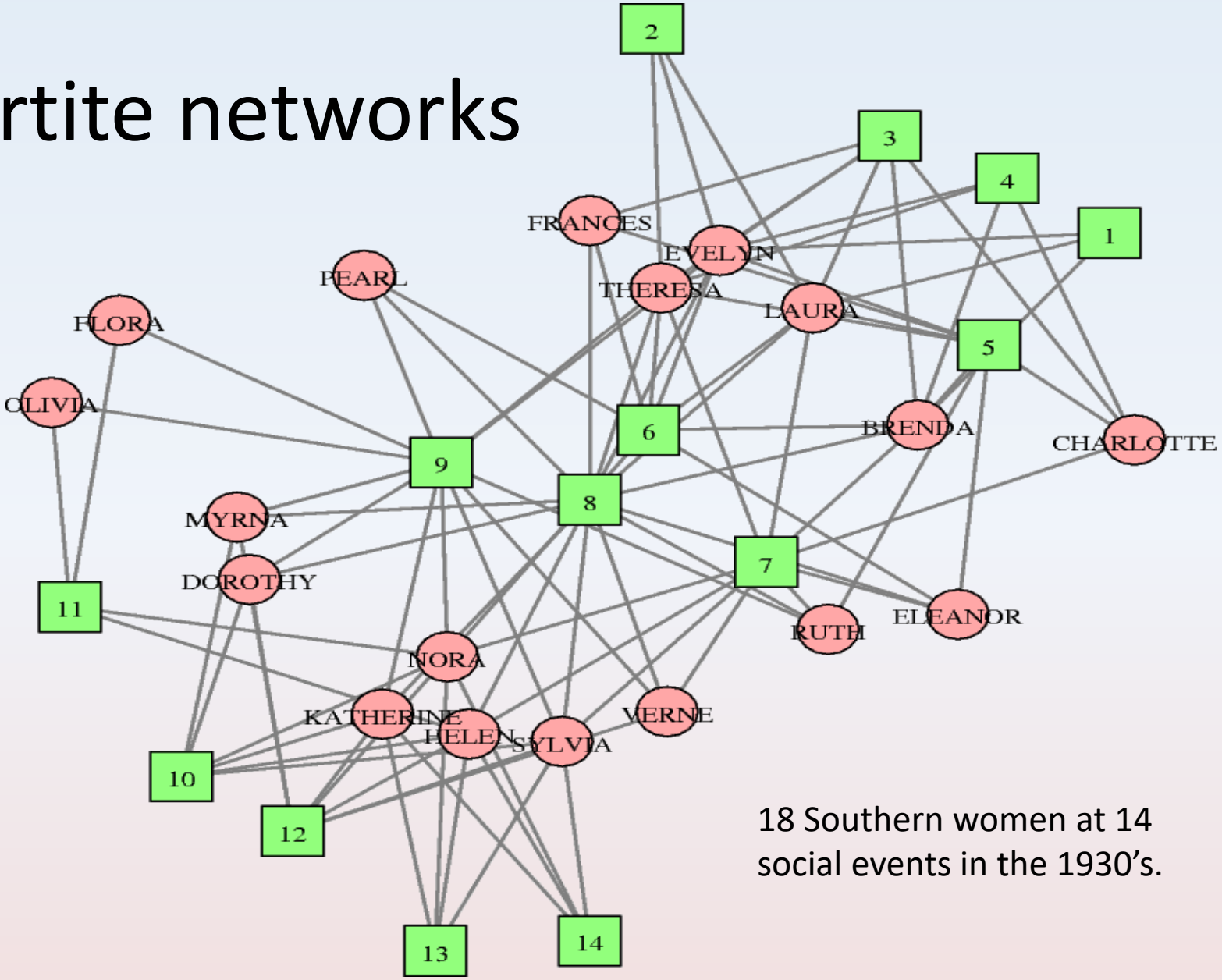


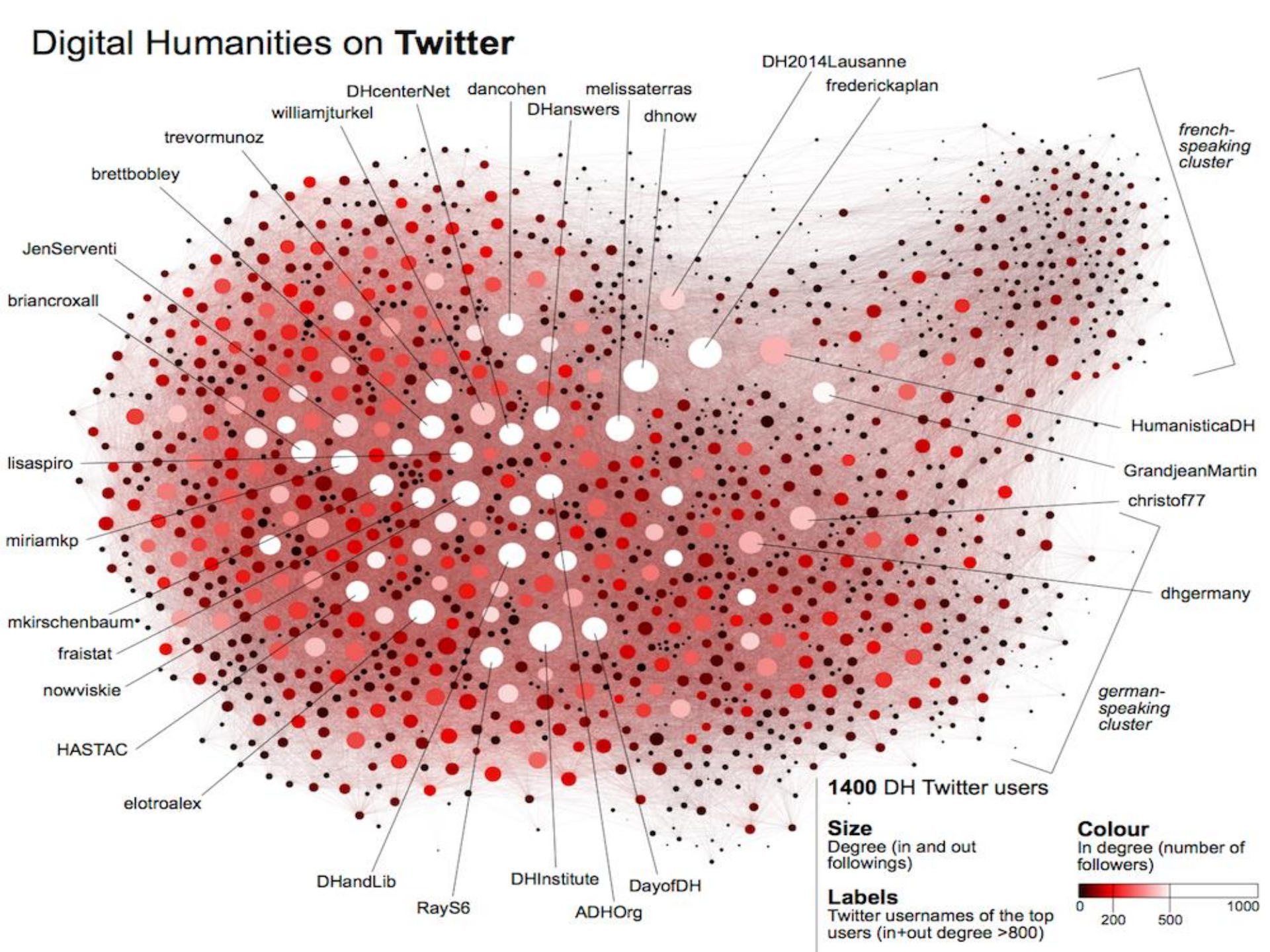
Image: https://upload.wikimedia.org/wikipedia/commons/thumb/f/f4/Network_Community_Structure.svg/1200px-Network_Community_Structure.svg.png

Bipartite networks



18 Southern women at 14 social events in the 1930's.

Sources: http://vlado.fmf.uni-lj.si/pub/networks/data/UciNet/UciData.htm#davis
https://scientificgems.files.wordpress.com/2017/02/davis.png


Digital Humanities on **Twitter**
DH2014Lausanne
fredericka plan
DHcenterNet
dancohen
melissaterras
williamjturkel
DHanswers
dhnow
trevormunoz
brettbobley
JenServenti
briancroxall
lisaspiro
miriamkp
mkirschenbaum
fraistat
nowviskie
HASTAC
elotroalex
DHandLib
RayS6
DHInstitute
ADHOrg
DayofDH
french-speaking cluster
HumanisticaDH
GrandjeanMartin
christof77
dhgermany
german-speaking cluster
1400 DH Twitter users
Size
Degree (in and out followings)
Labels
Twitter usernames of the top users (in+out degree >800)
Colour
In degree (number of followers)
0
200
500
1000

Free Tools for Network Analysis

- Commetrix - http://www.commetrix.de/
- Cuttlefish - https://github.com/dev-cuttlefish/cuttlefish
- Cytoscape - https://cytoscape.org/
- EgoNet - https://sourceforge.net/projects/egonet/
- Gephi - https://gephi.org/
- Graph-tool - https://graph-tool.skewed.de/
- GraphChi - https://github.com/GraphChi/graphchi-cpp
- Graphviz - http://graphviz.org/
- JUNG - http://jung.sourceforge.net/
- Netlytic - https://netlytic.org/home/
- Network Workbench - http://nwb.cns.iu.edu/
- NetworKit - https://networkit.github.io/
- NetworkX - http://networkx.github.io/
- NodeXL - https://archive.codeplex.com/?p=nodexl
- Pajek - http://mrvar.fdv.uni-lj.si/pajek/
- R + visualization libraries - https://www.r-project.org/
- SocNetV - https://socnetv.org/
- Socioviz - http://socioviz.net/SNA/eu/sna/login.jsp
- Statnet - http://statnetproject.org/
- Tulip - http://tulip.labri.fr/TulipDrupal/
- Visone - http://visone.info/html/demo.html

Gephi

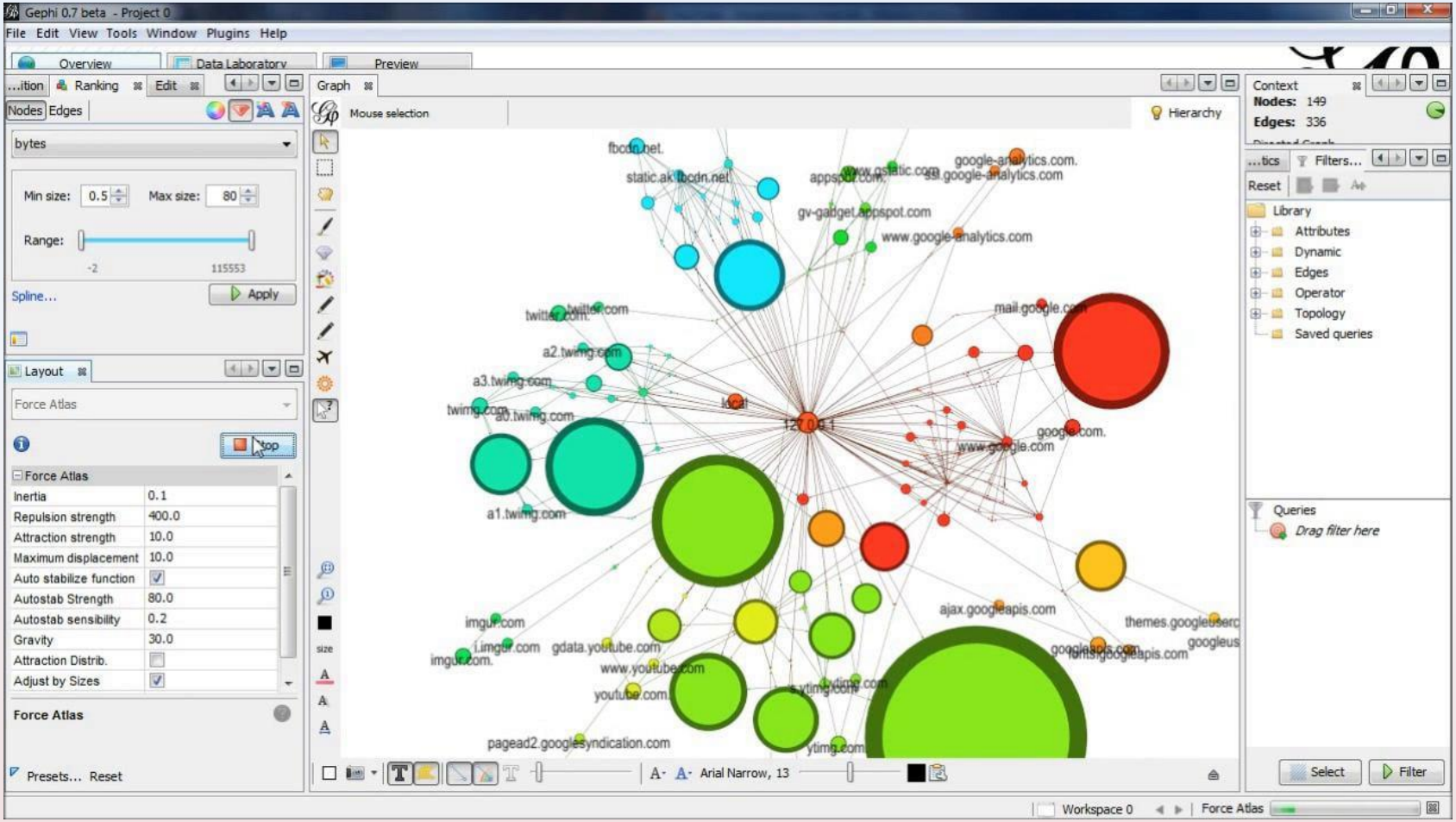


Image: https://vimeo.com/18591468

Gephi

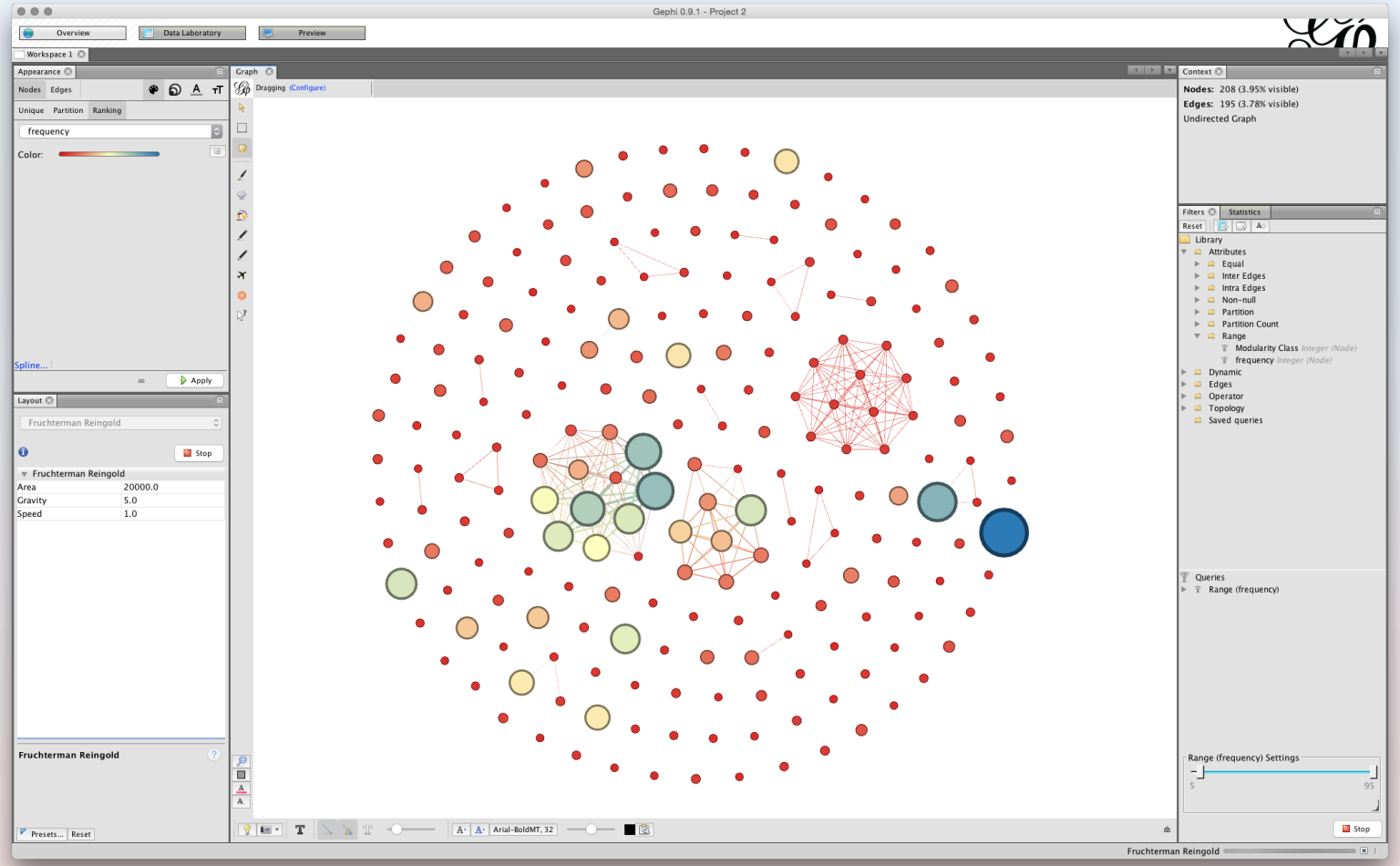


Image: https://www.pauloldham.net/gephi_patent_network/

Gephi

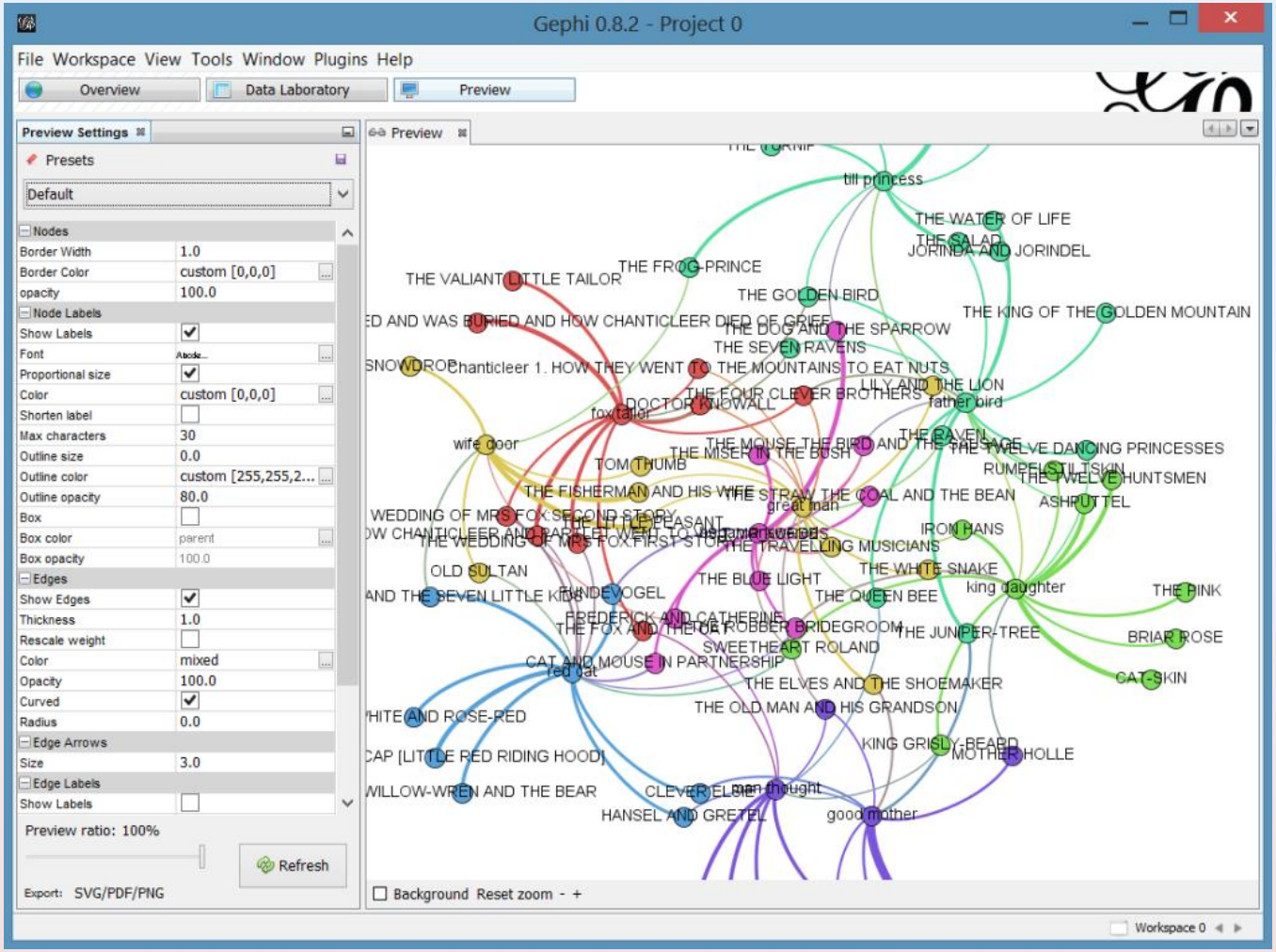


Image: http://altbibl.io/dst4l/topic-modeling-and-gephi/#respond/

Gephi

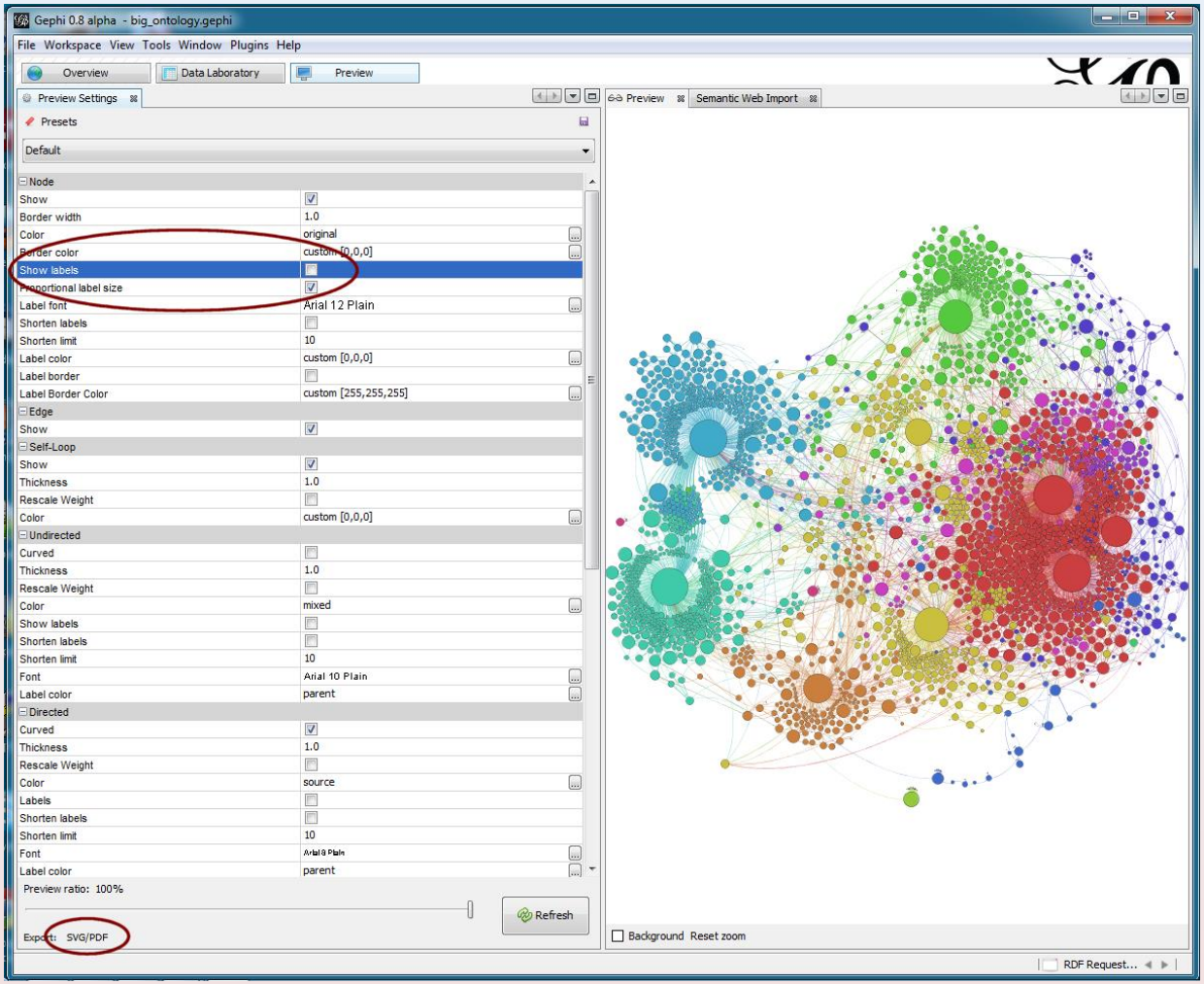


Image: http://www.mkbergman.com/wp-content/themes/ai3v2/images/2011Posts/110808_gephi_preview.png

Questions?

Installing Gephi

- Requires Java JRE version 7 or 8.
  - PC: https://www.java.com/en/download/
  - Mac: Java is preinstalled
  - Linux: Update your distribution with JRE

https://gephi.org/users/install/

Installing Gephi

- Gephi installer https://gephi.org/users/download/
  - Windows:
    - run installer and follow prompts
  - Mac:
    - click the downloaded .dmg file
    - Drag the gephi app into the application folder
  - Linux:
    - Untar/unzip then execute ./bin/gephi script file

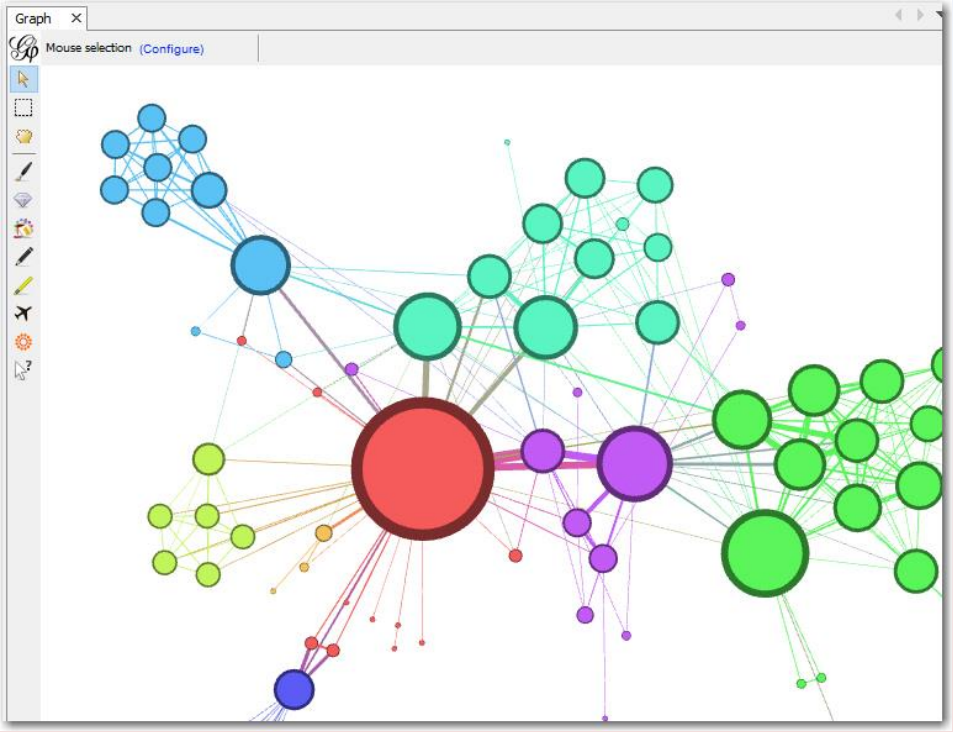
https://gephi.org/users/install/

Install Gephi now

Mark and I will walk around to help if needed.

Run Gephi

- Welcome window
  - Select Les Miserables.gexf sample
    - (Window > Welcome will show that window)
  - This is our goal.



Gephi datasets

https://github.com/gephi/gephi/wiki/Datasets

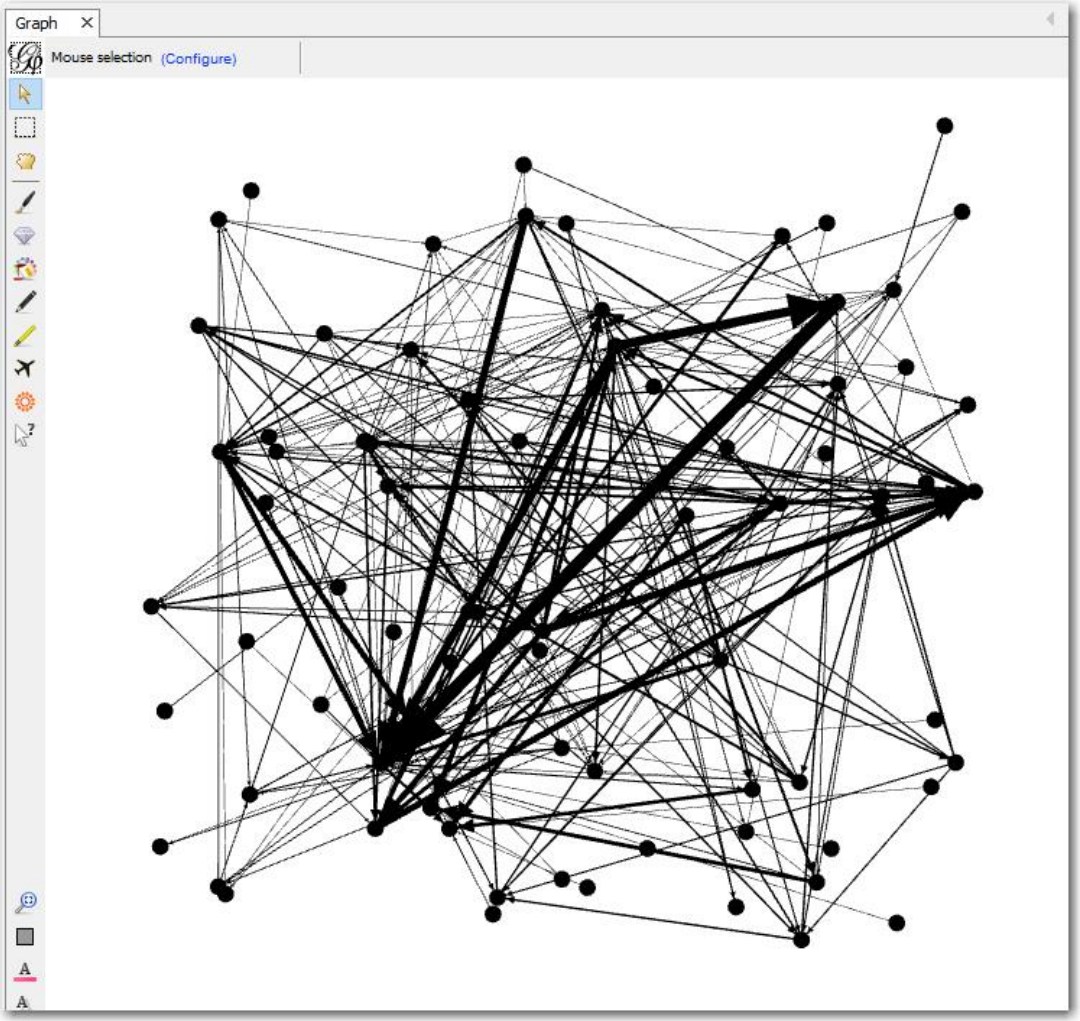
- Download the "GML file. **Les Miserables**: …"
- Unzip and save the file

```
Creator "Mark Newman on Fri Jul 21 12:44:53 2006“
Graph
[
  node  [    id 0    label "Myriel"  ]
  node  [    id 1    label "Napoleon"  ]
….
   edge  [    source 1    target 0    value 1  ]
   edge  [    source 2    target 0    value 8  ]
 ….
]
```

Open lesmiserables.gml file in Gephi

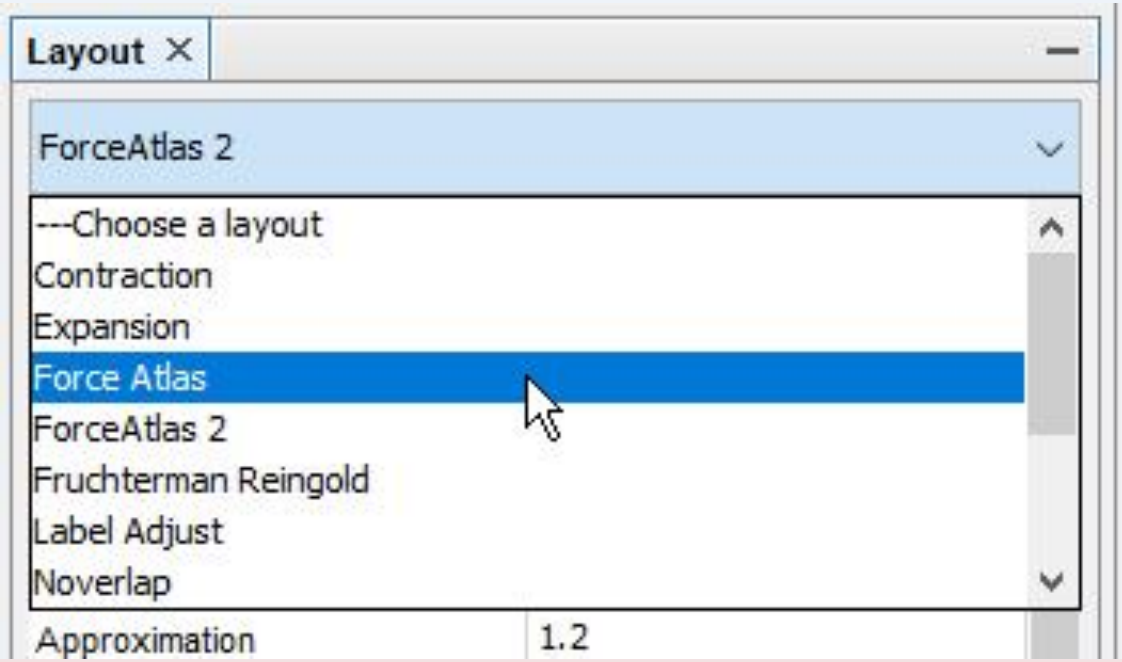
Zoom with mouse wheel or two-finger up-down stroke on the touch pad.

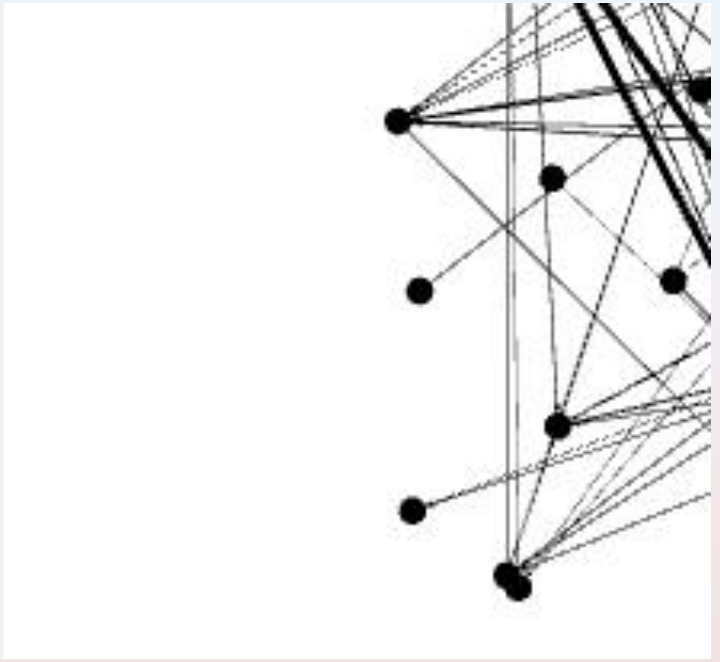
Right mouse button will move the visualization.



Layout

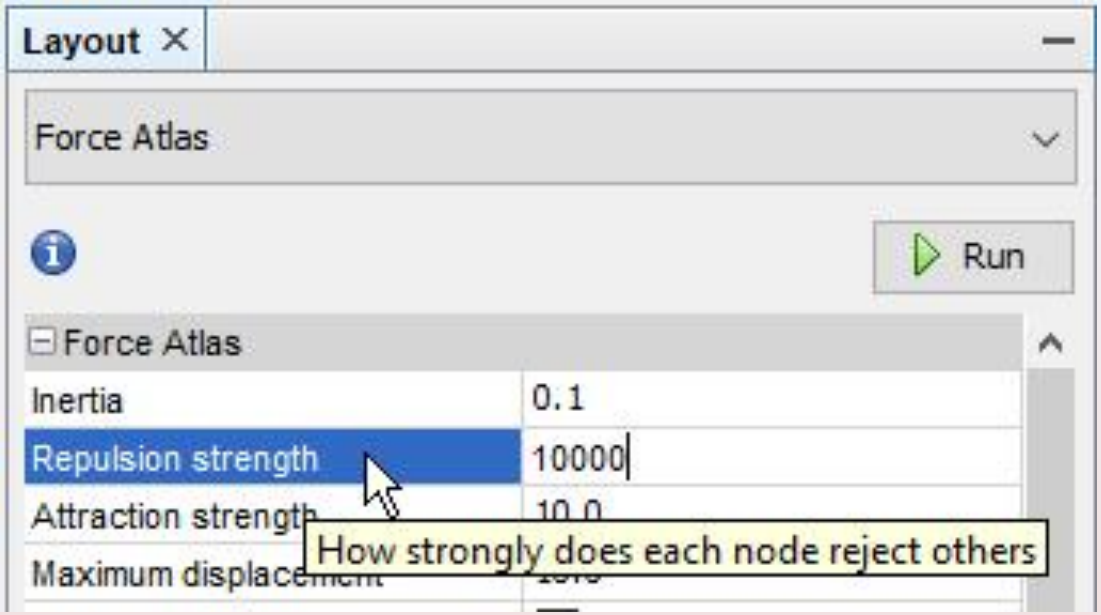
Gephi has many different options for how to distribute the nodes



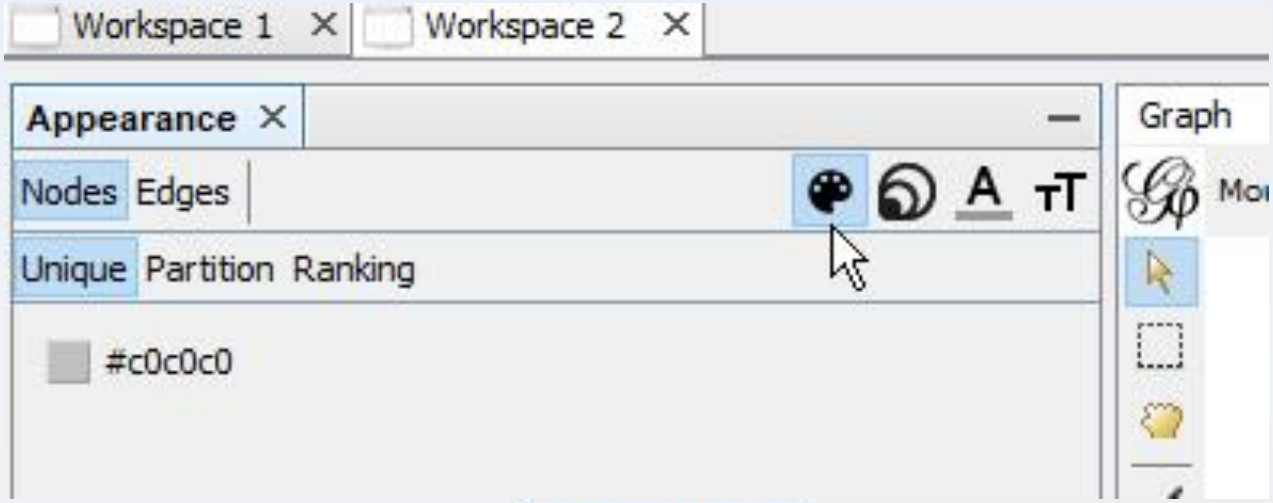


Stretch out the graph

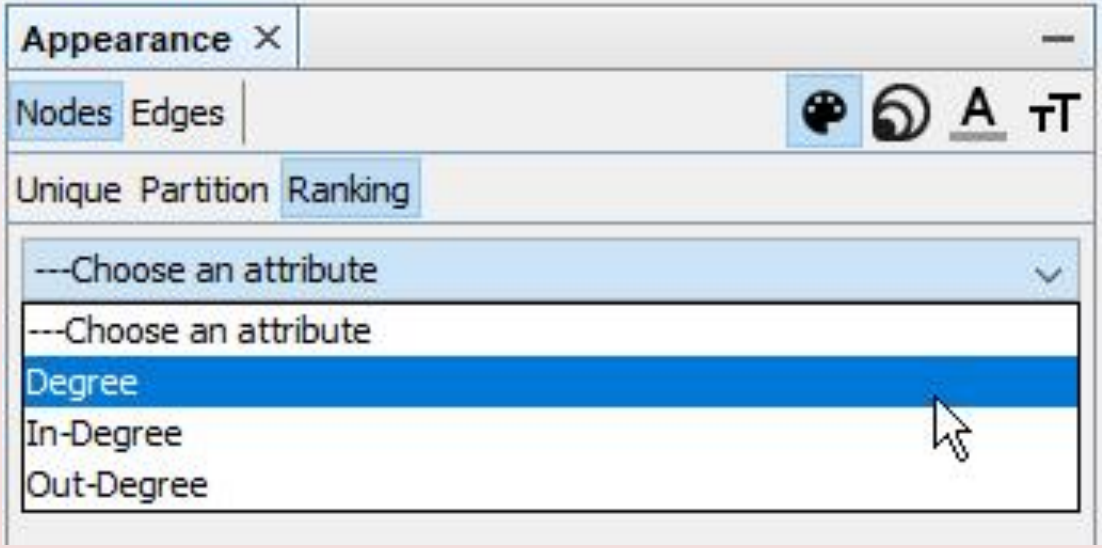
Change the “Repulsion strength” to 10,000 and click “Run”



Appearance > Nodes > Color palette icon > Ranking > Degree

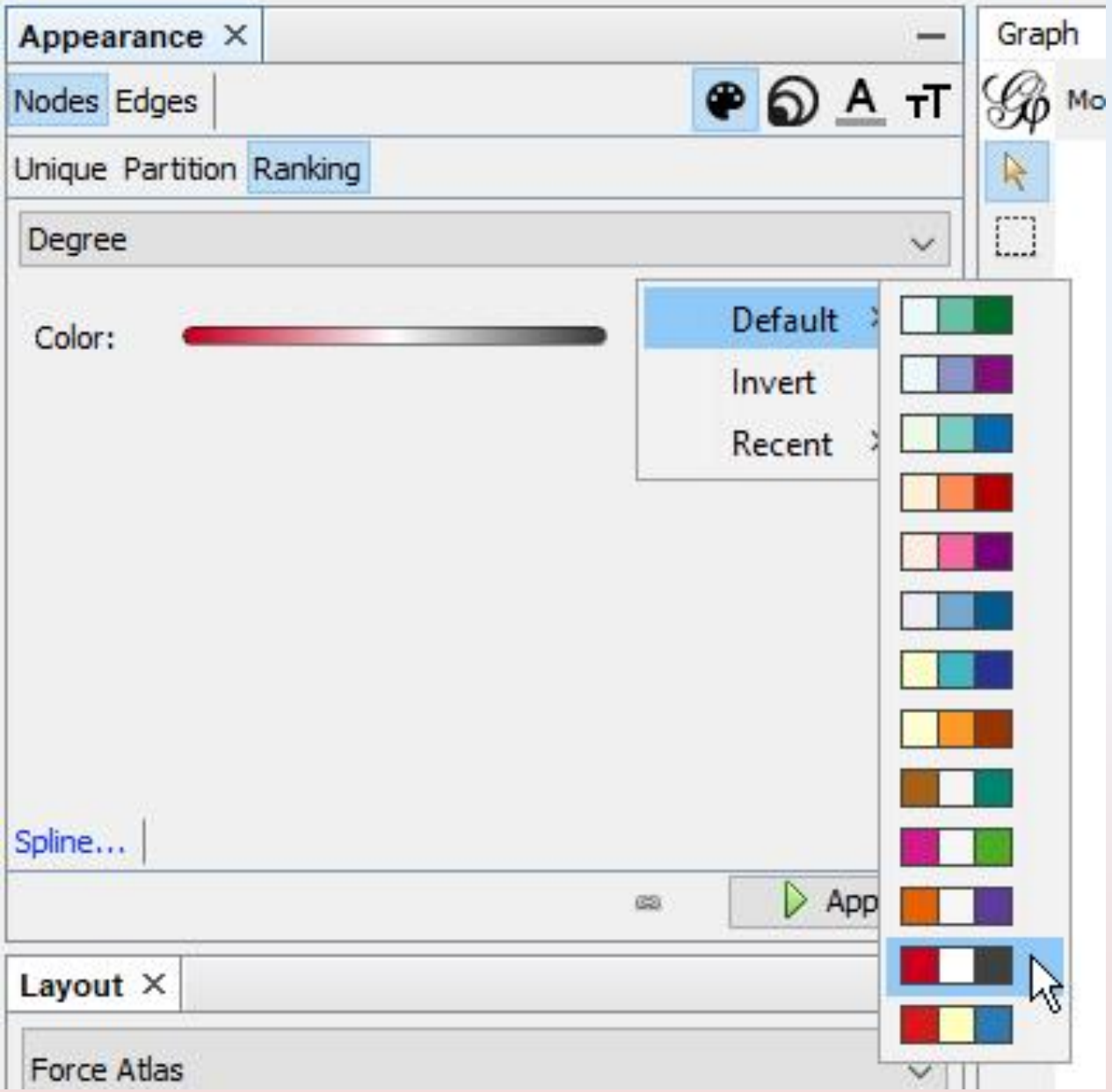


Highly connected nodes become darker



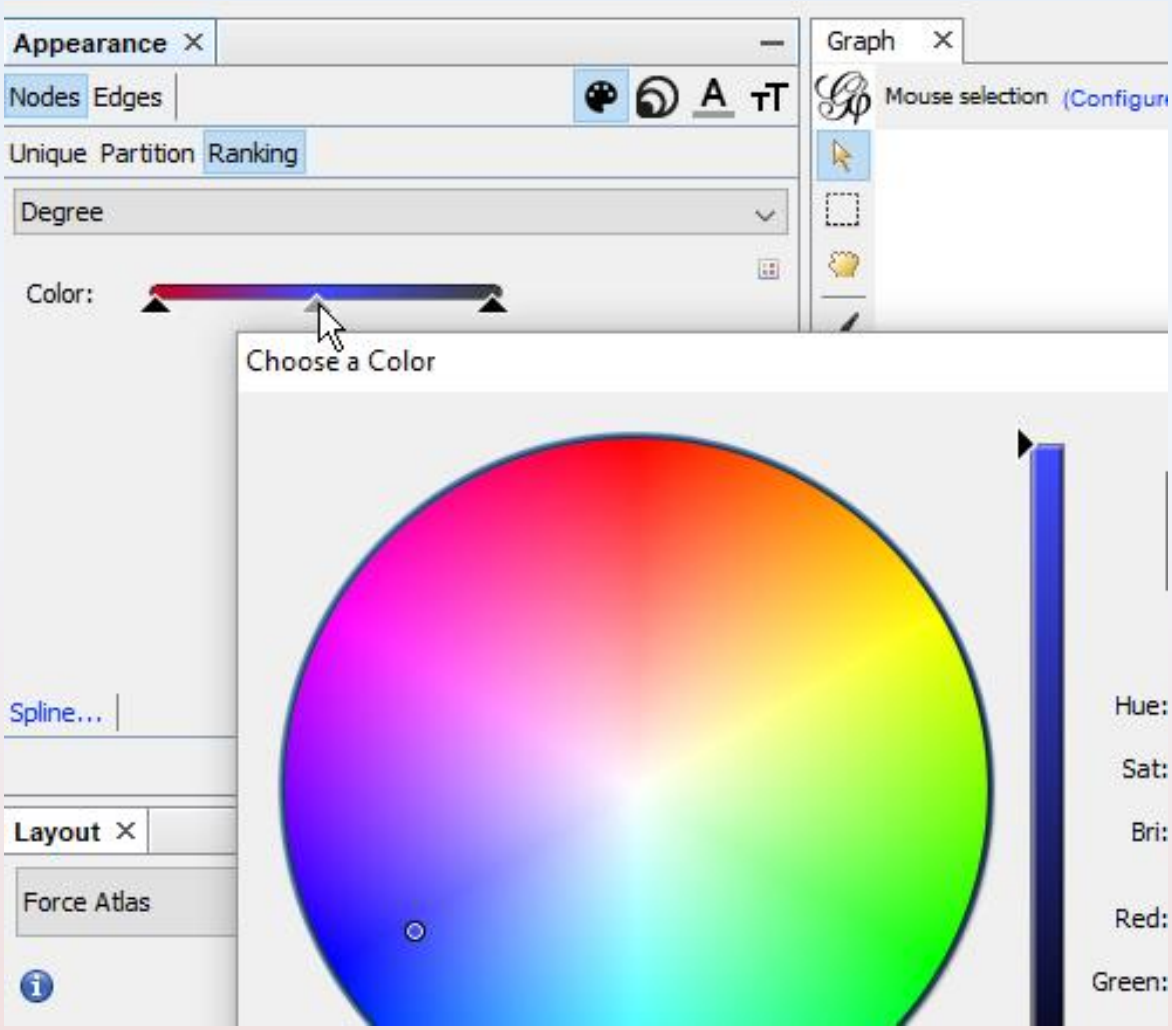
Set colors

To the right of the color bar, click and select your desired colors then click Apply



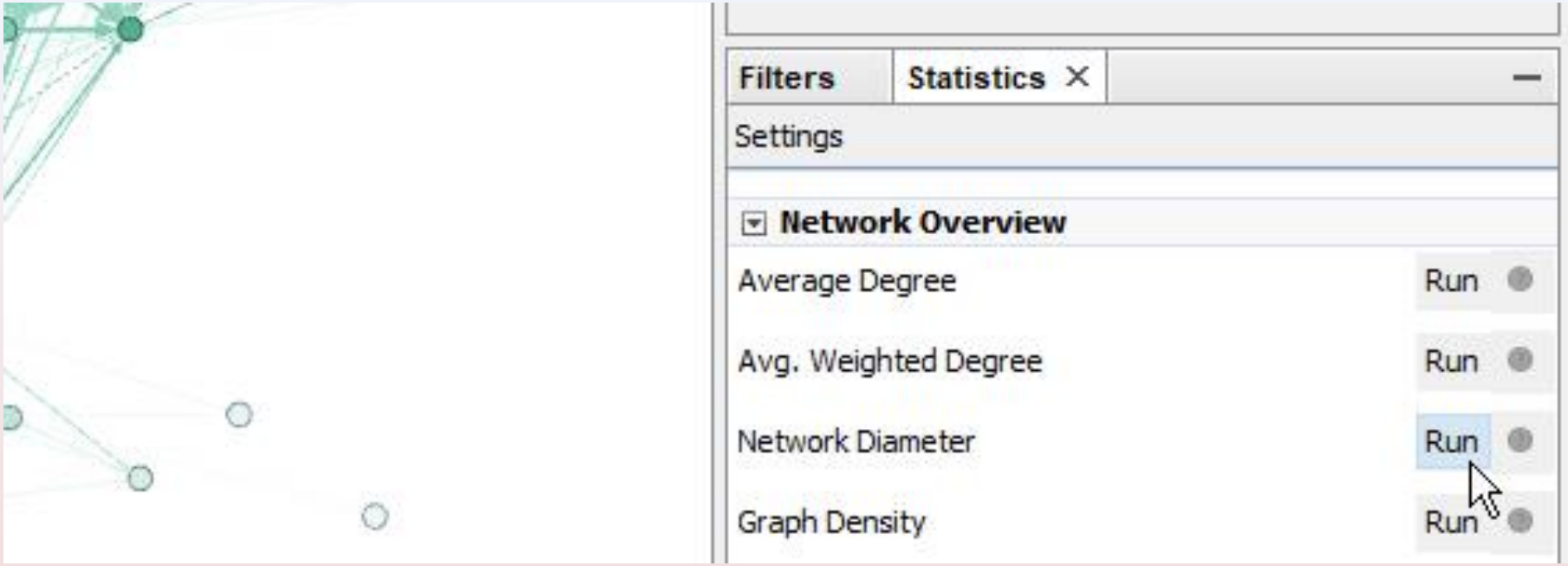
Set color gradient

Click on a triangle in the color bar to chose a color



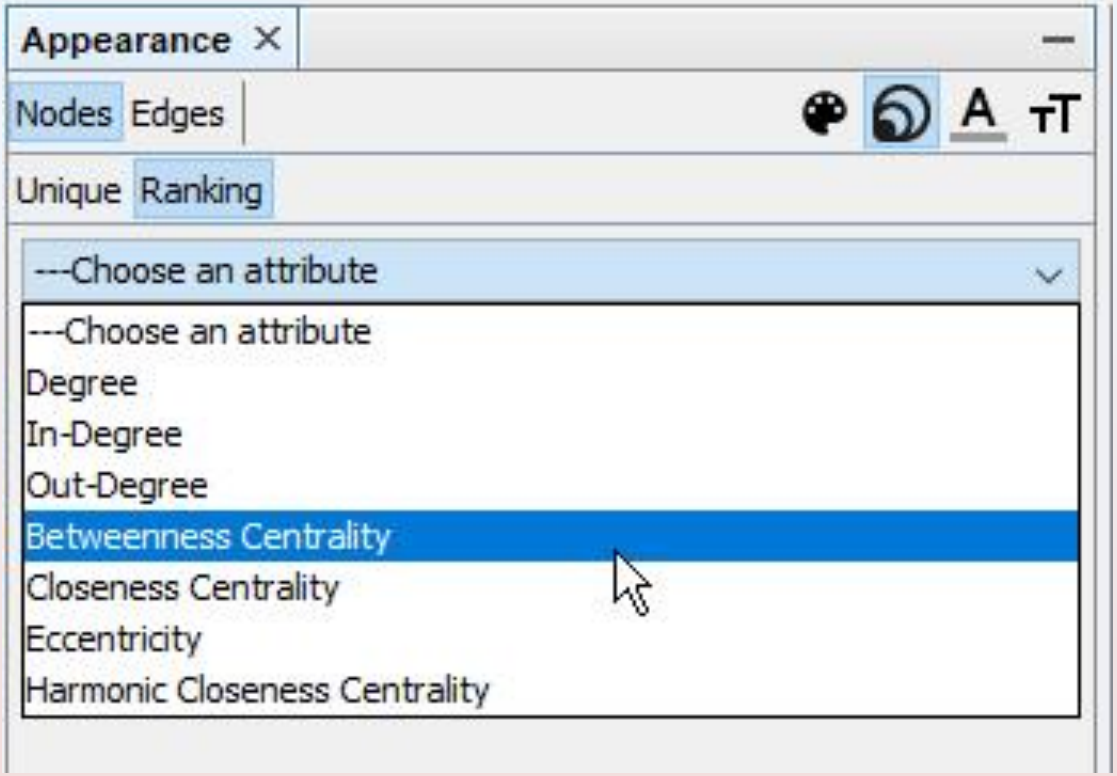
Statistics

- On the right, click
  - Statistics > Network Diameter > Run
  - Select Undirected



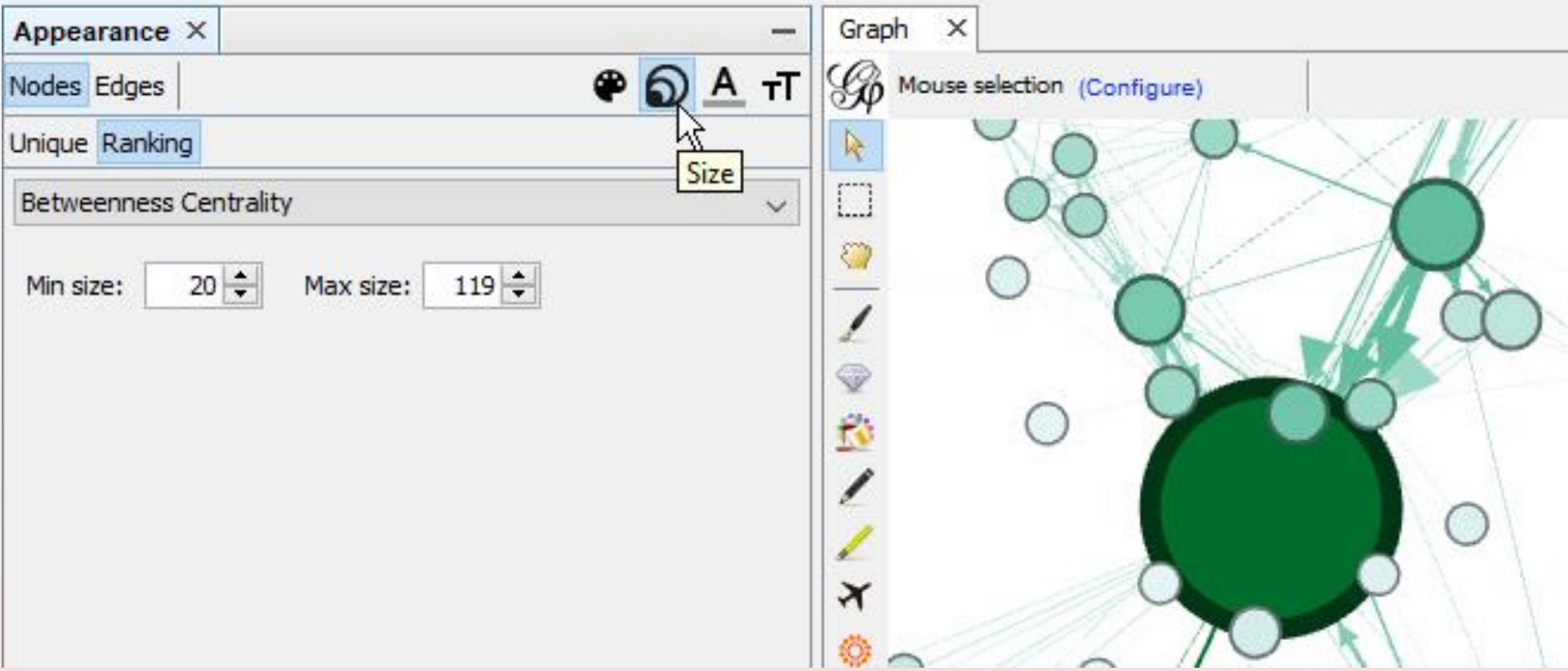
Size

- More options are now available
- Size > Ranking > Betweenness Centrality



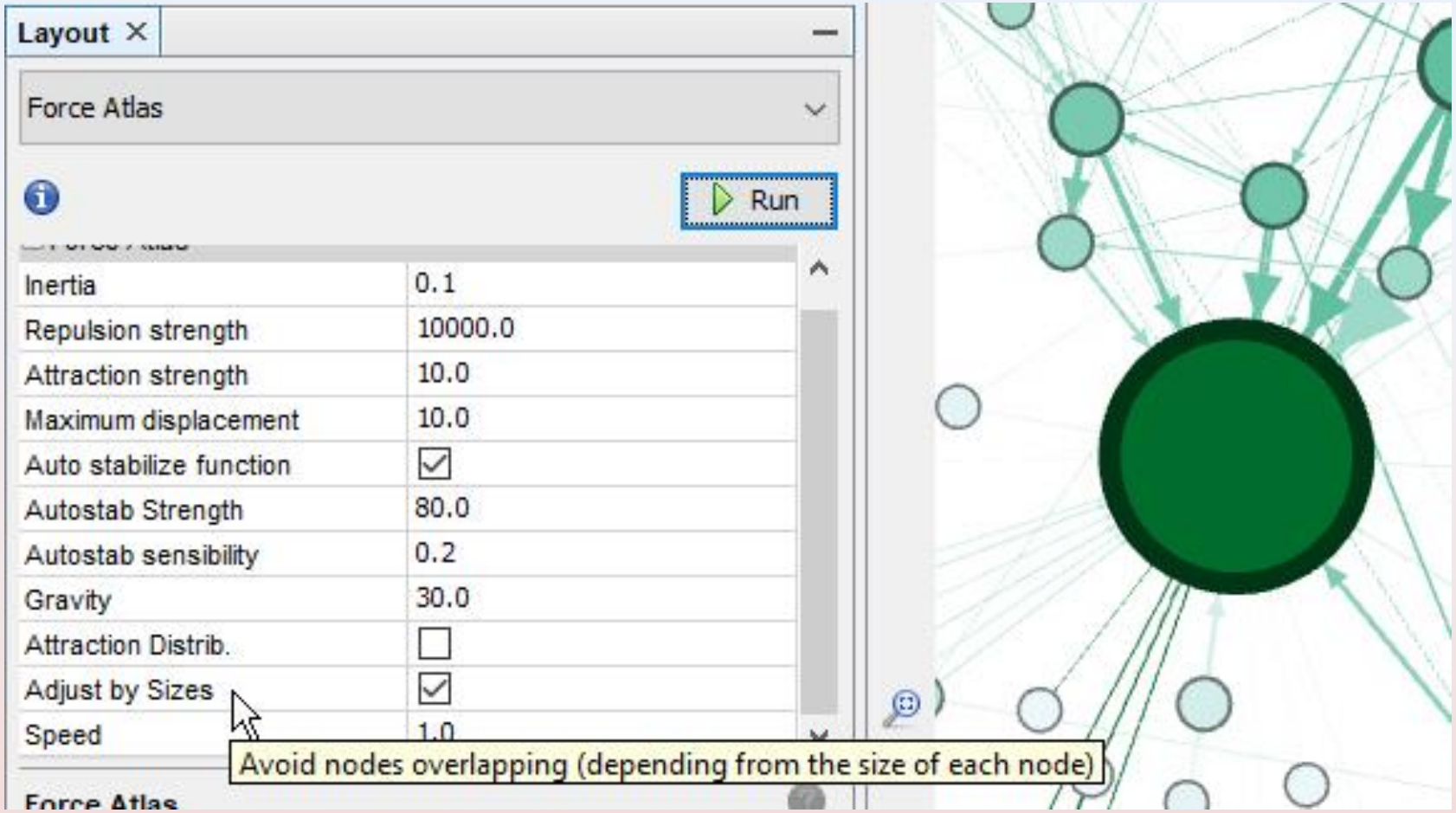
Ranking > Size

Set size to range from 20 to 119



Layout by size

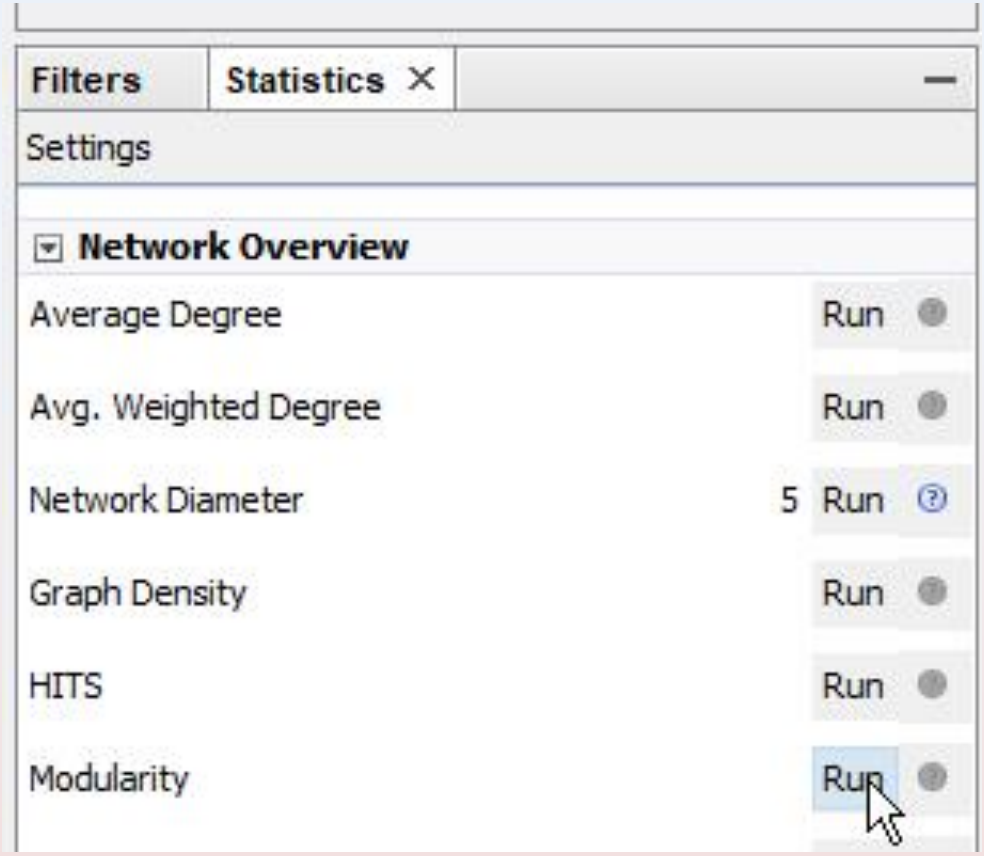
In Layout, click Adjust by Sizes



Community Detection

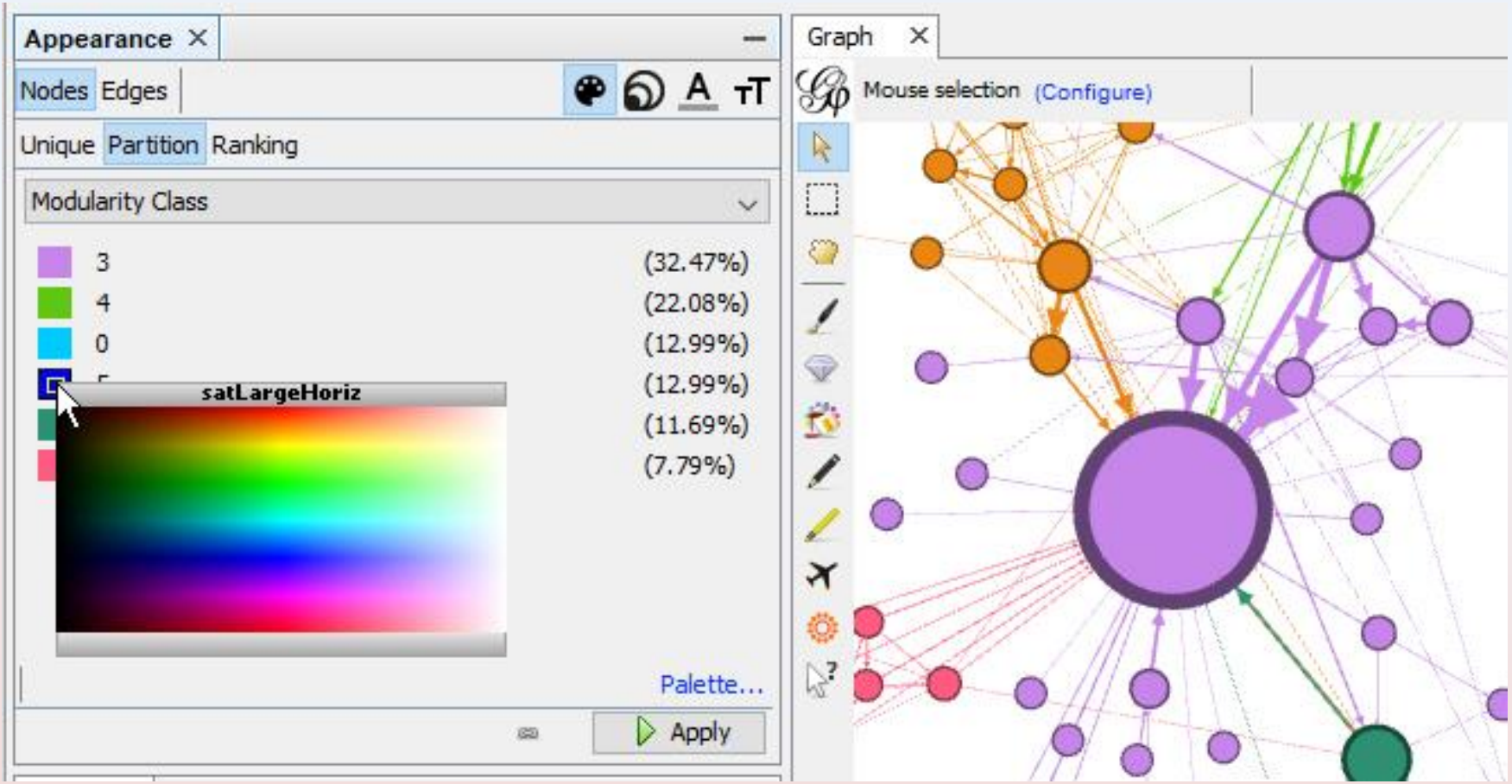
What clusters of nodes belong together?

-In Statistics,
run Modularity



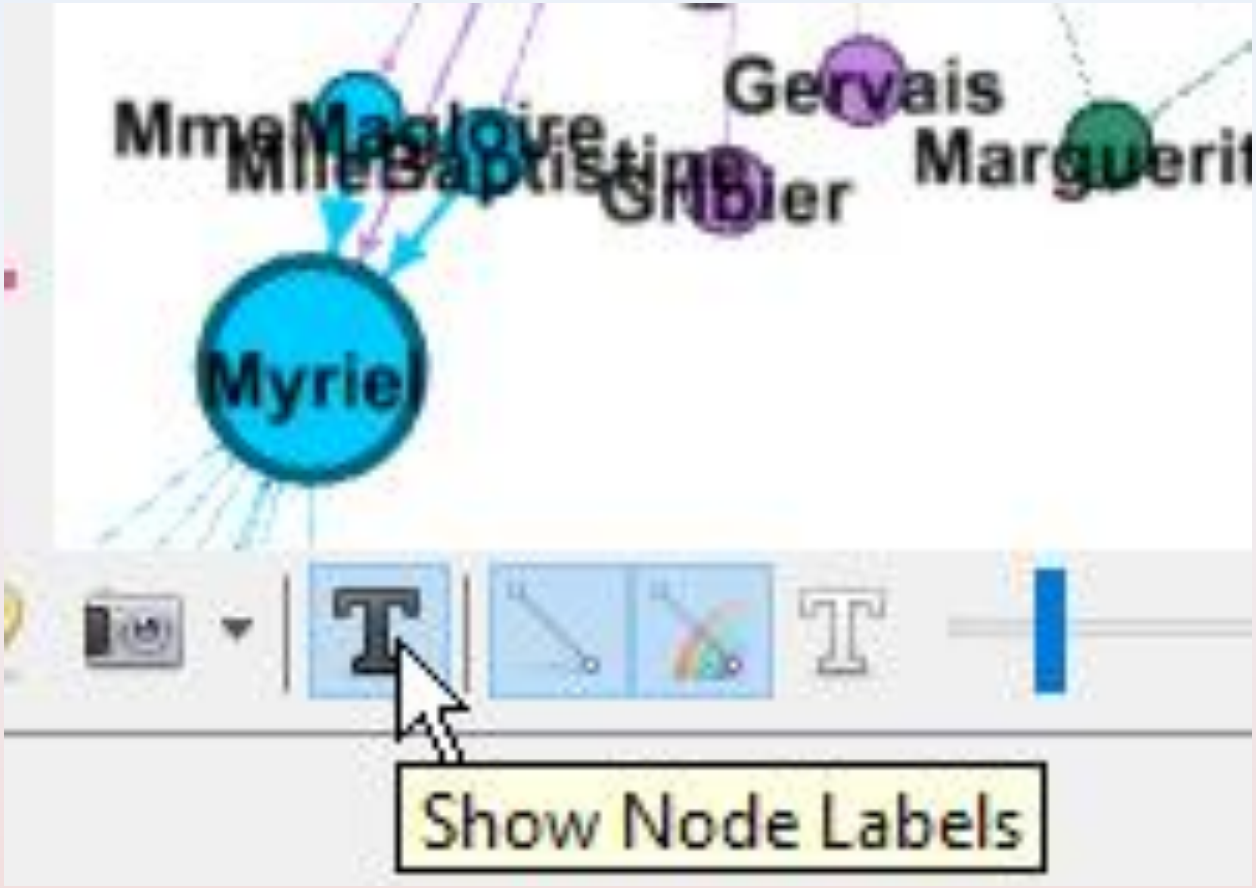
Display modularity

Nodes > Colors > Partition > Modularity Class



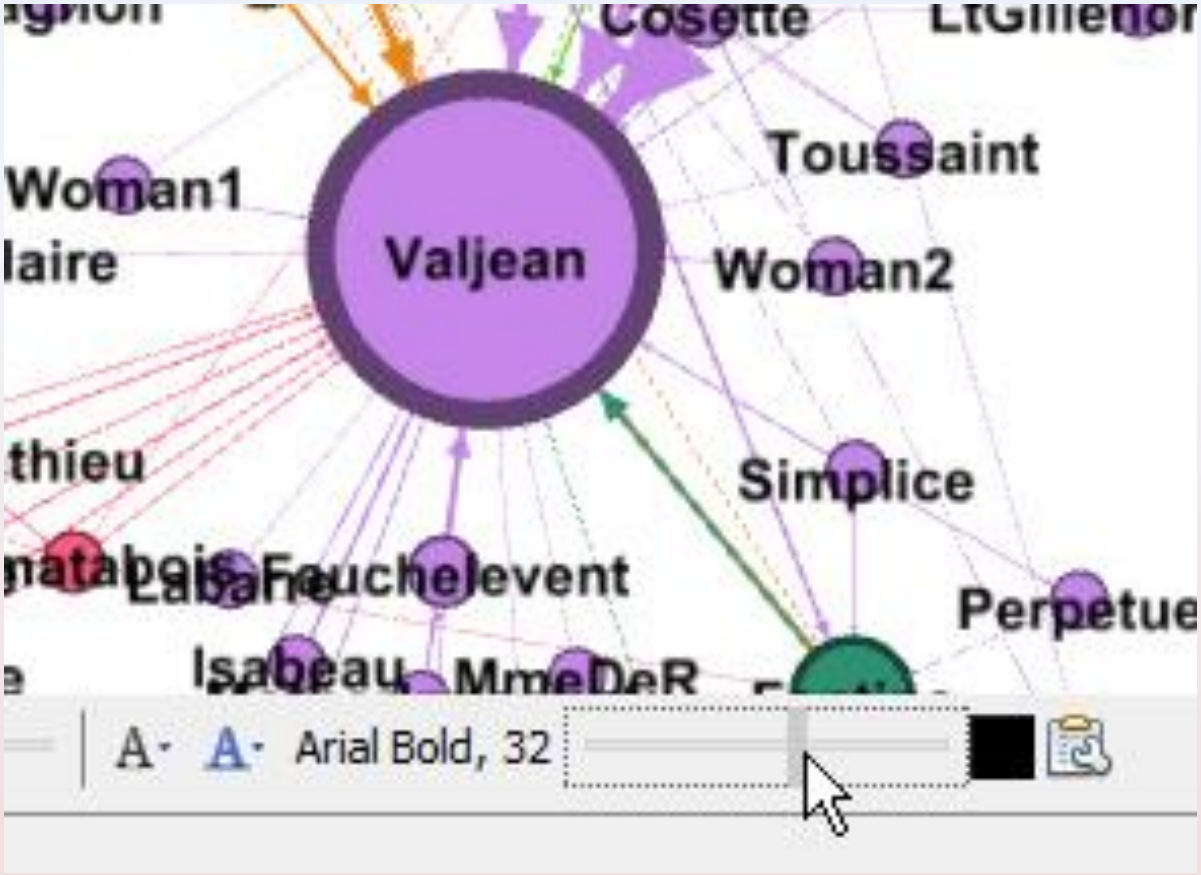
Node labels

Click the solid “T” to show node labels



Node Label Size

The slider can change the size of node labels

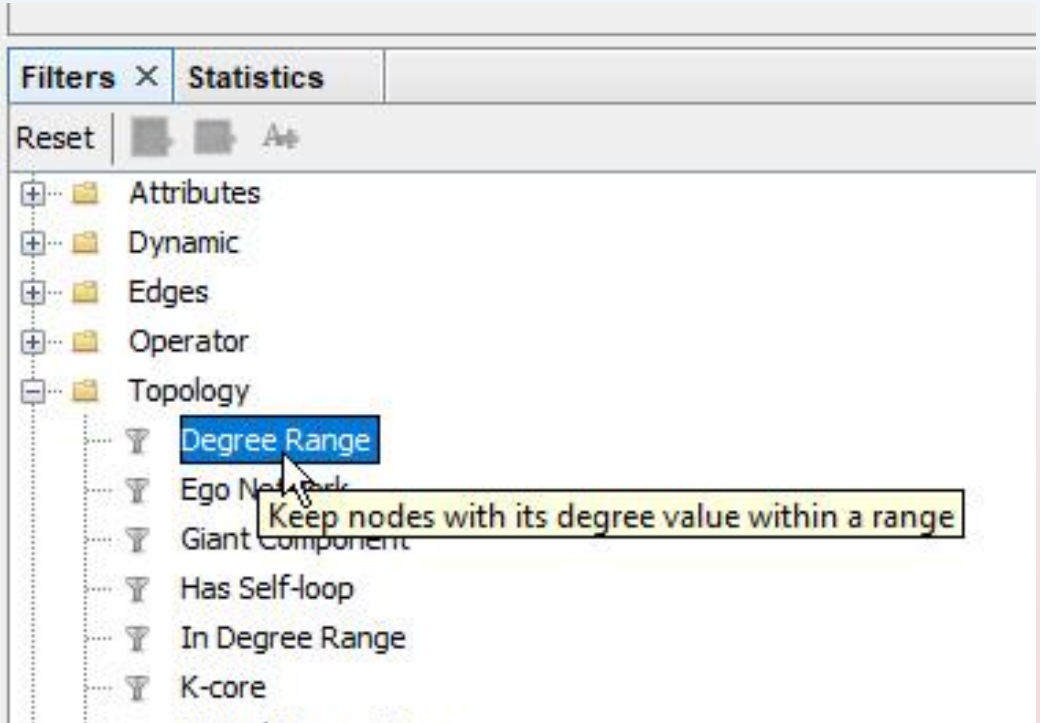


Filters

Beside Statistics is Filters

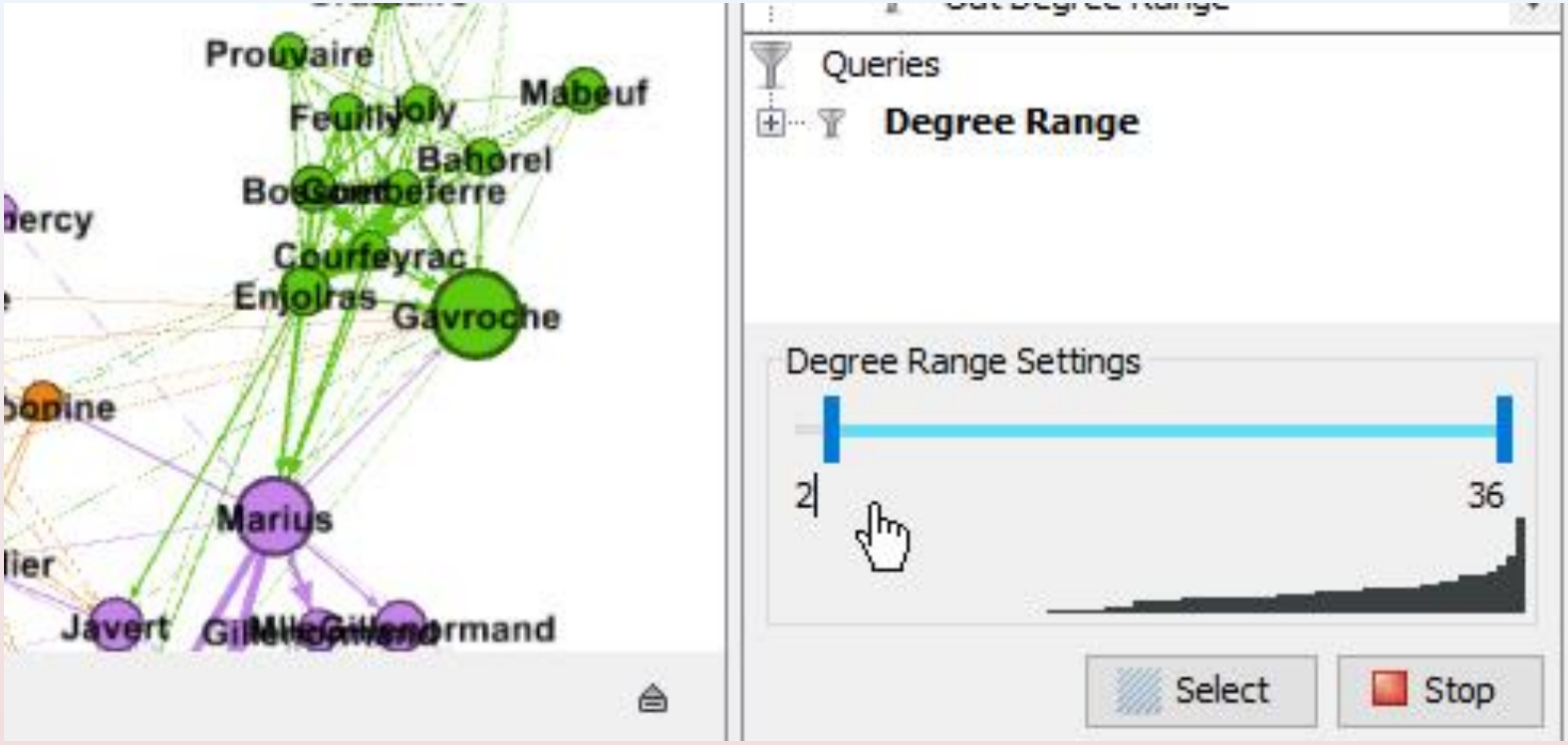
Select Filters > Topology > Degree Range

And drag it down to the queries section



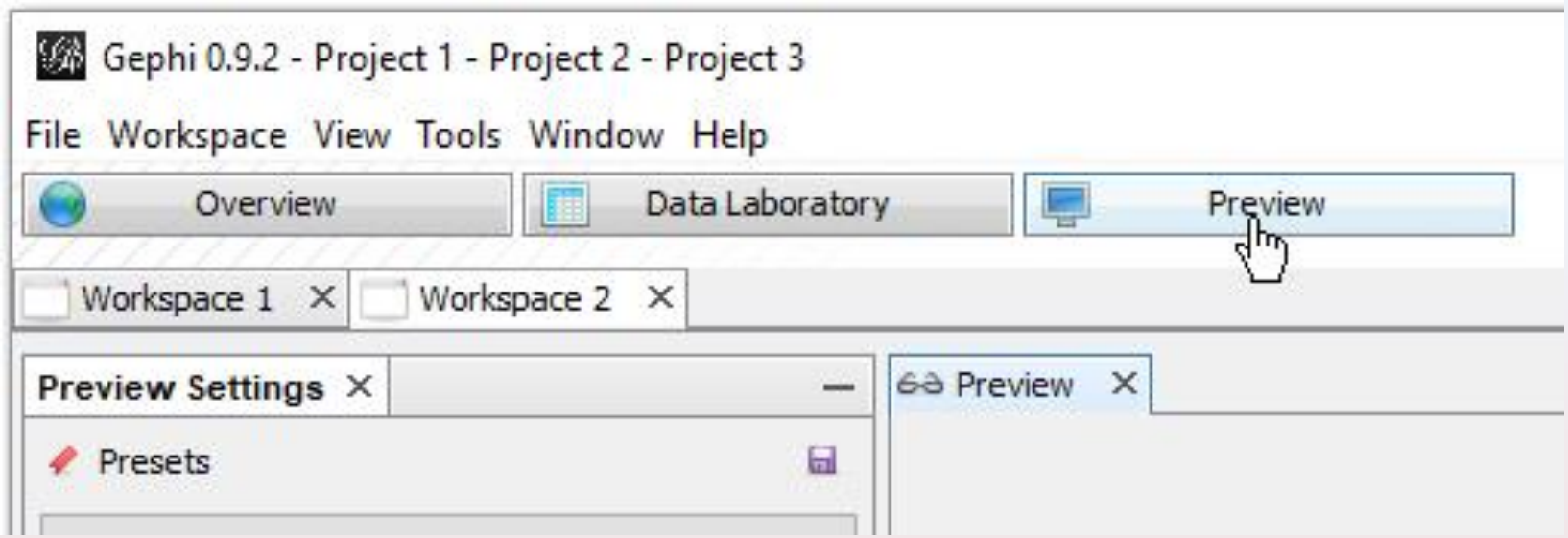
Filters

Adjust the degree range slider
to show significant items.



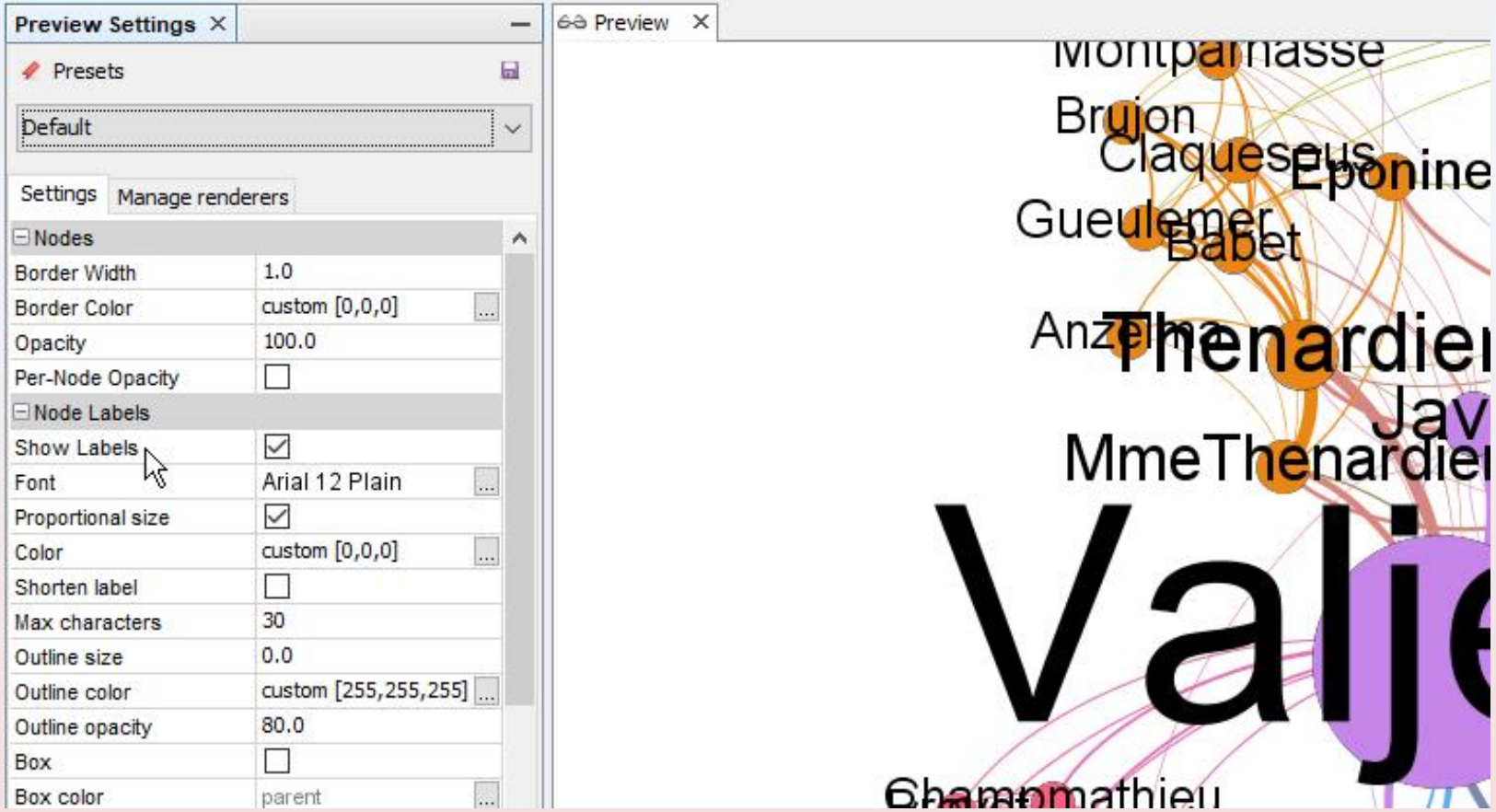
Exporting the graph

Click the preview tab at the very top



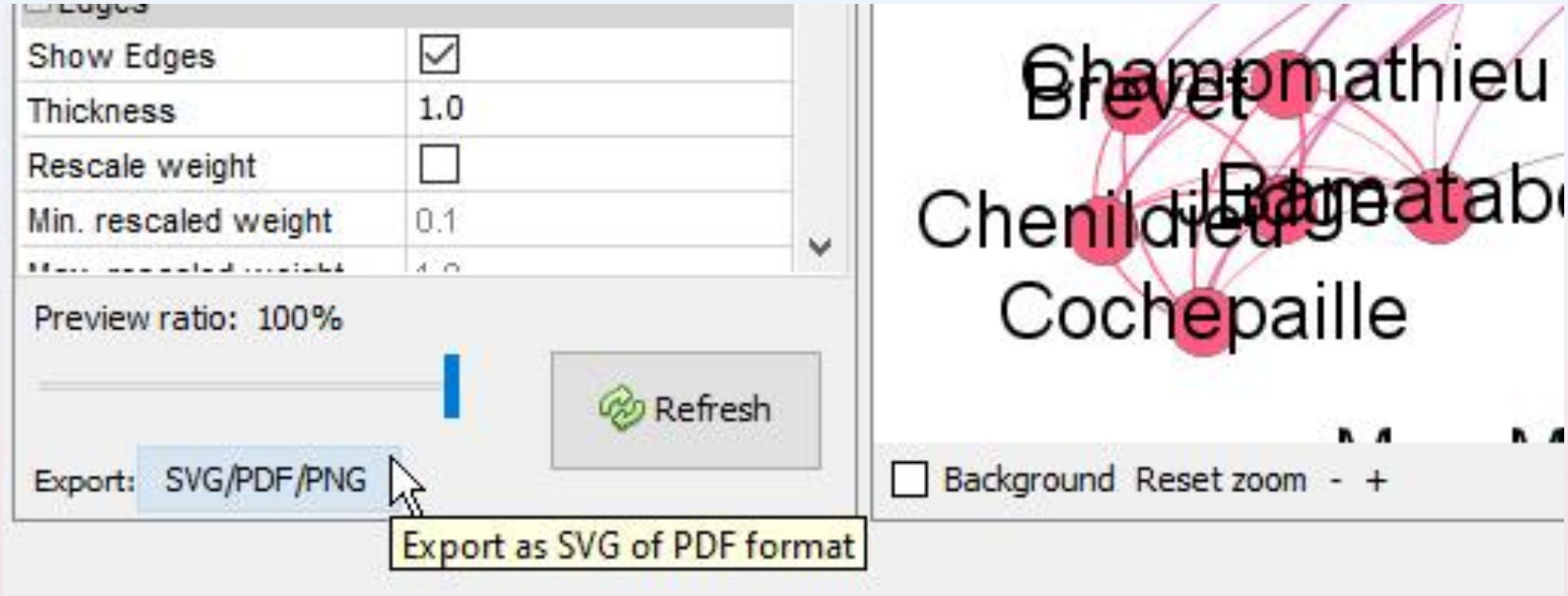
Preview settings

Click Show Labels and any other changes, then click Refresh



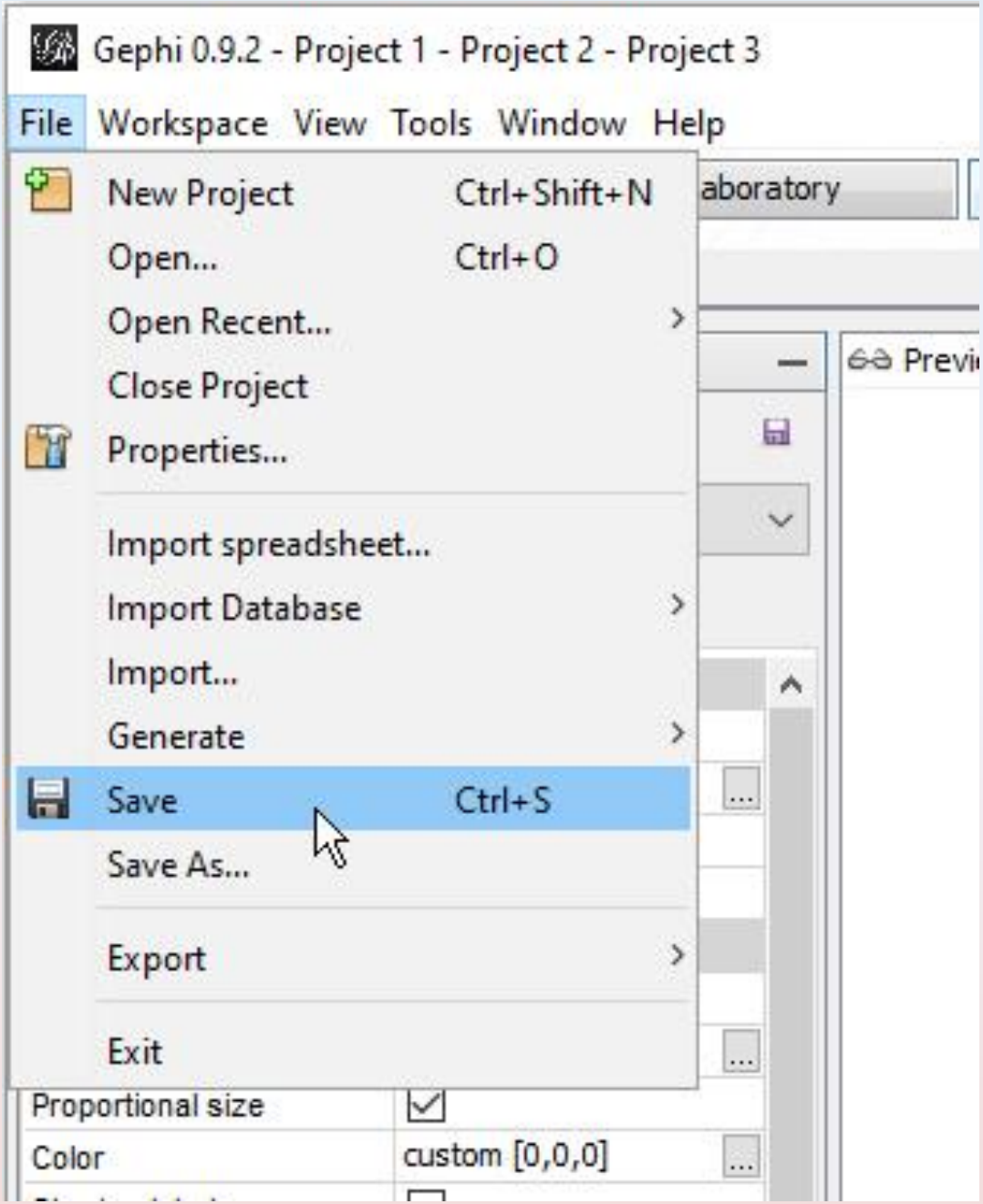
Export

Select PNG or other format at the lower left.



Save Project from the File menu

This saves your project settings



Questions?

Practice Time

More Information

- http://www.martingrandjean.ch/gephi-introduction/
- https://www.kdnuggets.com/2015/06/top-30-social-network-analysis-visualization-tools.html/3
- https://video.search.yahoo.com/search/video?fr=crmas&p=gephi+tutorial#id=2&vid=597f4e60a1ba9270030a1c6b3be6cc9e&action=click
- https://github.com/gephi/gephi/wiki/Datasets
- https://youtu.be/371n3Ye9vVo

Image sources

- https://cdn.pixabay.com/photo/2015/05/24/14/02/spaghetti-781795_960_720.jpg
- https://assets.epicurious.com/photos/55f72d733c346243461d496e/2:1/w_1260,h_630/09112015_15minute_pastasauce_tomato.jpg