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

nodes (or vertices)

edges (or links)

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

1400 DH Twitter users

Size
Degree (in and out followings)

Colour
In degree (number of followers)

Labels
Twitter usernames of the top users (in+out degree >800)
Free Tools for Network Analysis

- Commetrix - [http://www.commetrix.de/](http://www.commetrix.de/)
- Cuttlefish - [https://github.com/dev-cuttlefish/cuttlefish](https://github.com/dev-cuttlefish/cuttlefish)
- Cytoscape - [https://cytoscape.org/](https://cytoscape.org/)
- EgoNet - [https://sourceforge.net/projects/egonet/](https://sourceforge.net/projects/egonet/)
- Gephi - [https://gephi.org/](https://gephi.org/)
- Graph-tool - [https://graph-tool.skewed.de/](https://graph-tool.skewed.de/)
- GraphChi - [https://github.com/GraphChi/graphchi-cpp](https://github.com/GraphChi/graphchi-cpp)
- Graphviz - [http://graphviz.org/](http://graphviz.org/)
- Netlytic - [https://netlytic.org/home/](https://netlytic.org/home/)
- NetworKit - [https://networkit.github.io/](https://networkit.github.io/)
- NetworkX - [http://networkx.github.io/](http://networkx.github.io/)
- Pajek - [http://mrvar.fdv.uni-lj.si/pajek/](http://mrvar.fdv.uni-lj.si/pajek/)
- R + visualization libraries - [https://www.r-project.org/](https://www.r-project.org/)
- SocNetV - [https://socnetv.org/](https://socnetv.org/)
- Socioviz - [http://socioviz.net/SNA/eu/sna/login.jsp](http://socioviz.net/SNA/eu/sna/login.jsp)
- Statnet - [http://statnetproject.org/](http://statnetproject.org/)
- Tulip - [http://tulip.labri.fr/TulipDrupal/](http://tulip.labri.fr/TulipDrupal/)
Gephi

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

Gephi

Questions?
Installing Gephi

• Requires Java JRE version 7 or 8.
  – 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 choose 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

- [https://video.search.yahoo.com/search/video?fr=crmas&p=gephi+tutorial&id=2&vid=597f4e60a1ba9270030a1c6b3be6cc9e&action=click](https://video.search.yahoo.com/search/video?fr=crmas&p=gephi+tutorial&id=2&vid=597f4e60a1ba9270030a1c6b3be6cc9e&action=click)
- [https://youtu.be/371n3Ye9vVo](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