

Network Science

Hands on: Gephi

Albert-László Barabási

with

Emma K. Towlson, Sebastian Ruf,
Michael Danziger, and Louis Shekhtman



Step 0: Installation and data

Hopefully you already downloaded and successfully installed Gephi... if not please navigate to <https://gephi.org/users/download/> and do so **NOW**.

You have been emailed 2 datasets:

- Les Mis characters
- Network Science co-authorship

...please also download these **now**



Network visualisation tools

- Gephi is one of several pieces of software out there that we use to visualise networks. There is no such thing as “THE Tool” to use. We chose it to focus on in this class as it:
 - (a) is free and open source
 - (b) is capable of performing rudimentary network analyses at the click of a button
- The choice of software, programming language, library, module etc etc, depends on the application, the problem, the field, your personal preference...
- ...As such, see these slides as guidelines. If you are already familiar with another tool, you are free to use it.
- Consider (lecturer's personal preferences...) researching Cytoscape, d3, NetworkX etc for your project / future endeavours... the principles are the same, the implementation is slightly different.



The following tutorial is inspired by Roberta Sinatra's inspiration from <https://gephi.github.io>

Gephi makes graphs handy

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The Open Graph Viz Platform

Gephi is the leading visualization and exploration software for all kinds of graphs and networks. Gephi is open-source and free.

Runs on Windows, Mac OS X and Linux.

Learn More on Gephi Platform »

Download FREE
Gephi 0.9.1

[Release Notes](#) | [System Requirements](#)

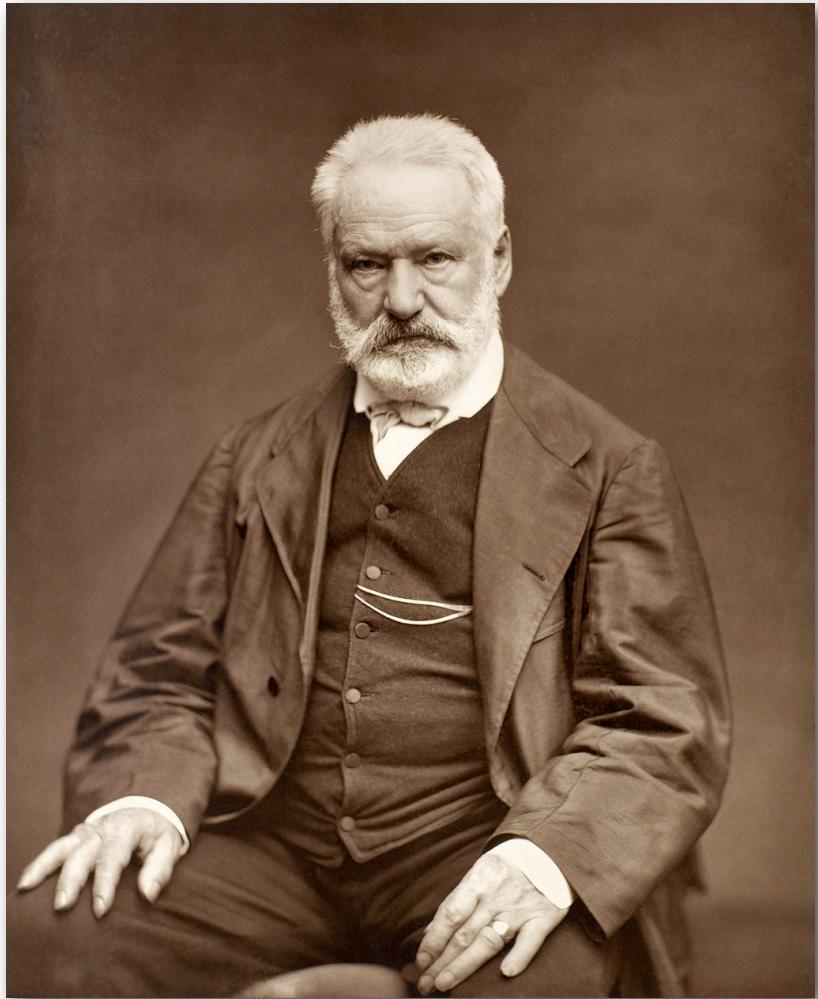
► [Features](#)
► [Quick start](#)

► [Screenshots](#)
► [Videos](#)

A screenshot of the Gephi 0.7 alpha software interface. The main window displays a complex network graph with numerous nodes of different colors (green, orange, blue, red) connected by lines. The left side features a 'Ranking' panel with sliders for 'Degree' and 'Spline'. The right side includes a 'Settings' panel with various metrics like 'Network Overview', 'Node Overview', and 'Edge Overview', each with its own slider. The bottom right corner shows a pie chart representing node distribution across categories.



Victor Hugo: *Les Misérables*



Network visualisation: telling a story or reading a story?



What does the file look like? -> .csv

Nodes:

ID	label	maincharacter
0	"Myriel"	0
1	"Napoleon"	0
2	"MlleBaptistine"	0
3	"MmeMagloire"	0
4	"CountessDeLo"	0
5	"Geborand"	0
6	"Champtercier"	0
7	"Cravatte"	0
8	"Count"	0
9	"OldMan"	0
10	"Labarre"	0
11	"Valjean"	1
12	"Marguerite"	0
13	"MmeDeR"	0
14	"Isabeau"	0
15	"Gervais"	0
16	"Tholomyes"	0
17	"Listolier"	0
18	"Fameuil"	0
19	"Blacheville"	0
20	"Favourite"	0
21	"Dahlia"	0
22	"Zephine"	0
23	"Fantine"	1
24	"MmeThenardier"	0
25	"Thenardier"	1
26	"Cosette"	1
27	"Javert"	1
28	"Fauchelevent"	0
29	"Bamatabois"	0
30	"Perpetue"	0
31	"Simplice"	0
32	"Scaufflaire"	0
33	"Woman1"	0
34	"Judge"	0

Attributes



What does the file look like? -> .csv

Edges:

Source	Target	Weight
1	0	1
2	0	8
3	0	10
3	2	6
4	0	1
5	0	1
6	0	1
7	0	1
8	0	2
9	0	1
11	10	1
11	3	3
11	2	3
11	0	5
12	11	1
13	11	1
14	11	1
15	11	1
17	16	4
18	16	4
18	17	4
19	16	4
19	17	4
19	18	4
20	16	3
20	17	3
20	18	3
20	19	4
21	16	3
21	17	3
21	18	3
21	19	3
21	20	5
22	16	3
22	17	3



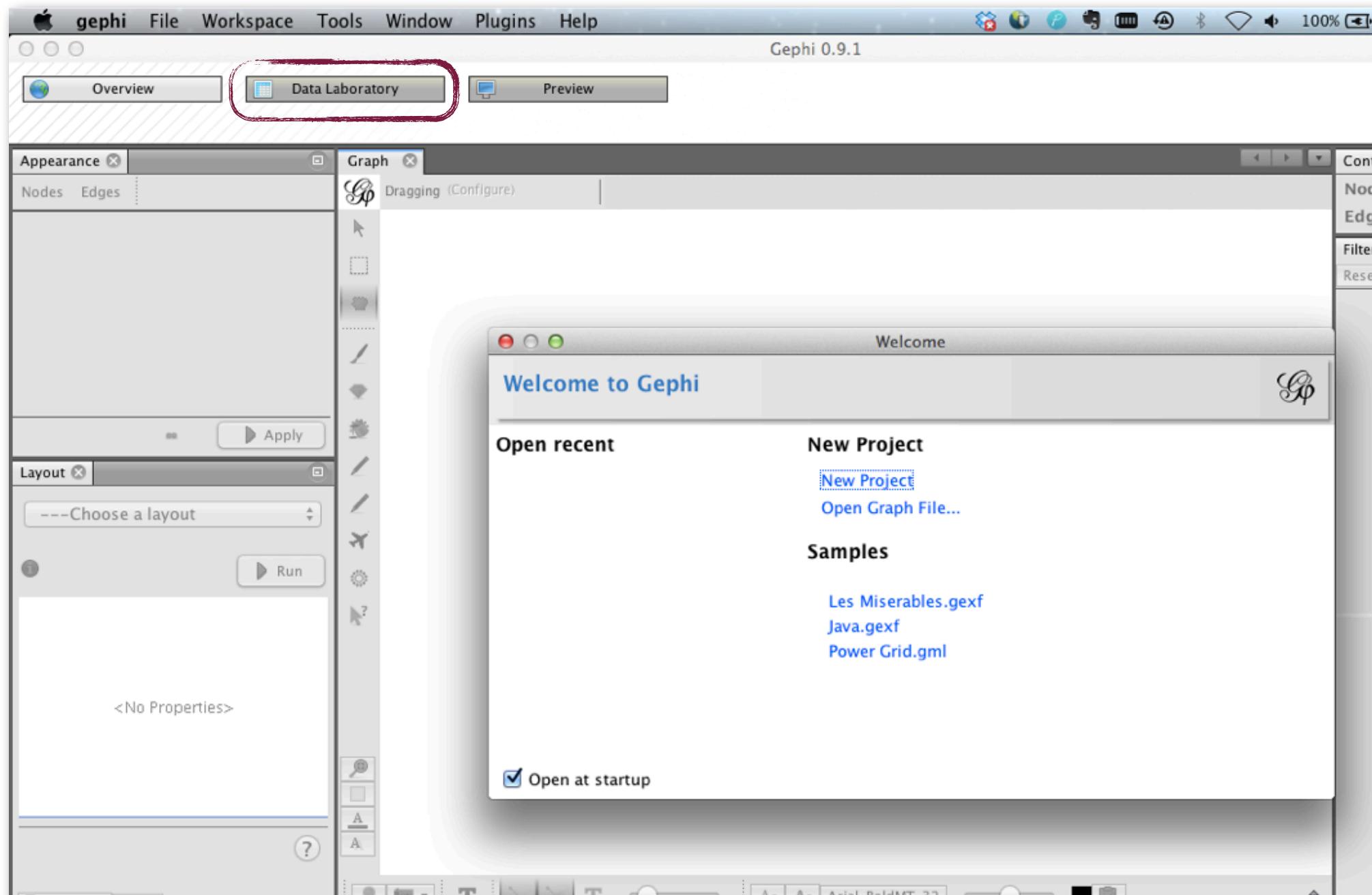
What does the file look like? -> .gml

A screenshot of a text editor window titled "lesmiserables.gml". The window displays a GML (Graph Markup Language) code snippet. The code starts with "Creator "Mark Newman on Fri Jul 21 12:44:53 2006"" followed by "graph [[node [id 0 label "Myriel" maincharacter 0] node [id 1 label "Napoleon" maincharacter 0] node [id 2 label "MlleBaptistine" maincharacter 0] node [id 3 label "MmeMagloire" maincharacter 0] node [id 4 label "CountessDeLo" maincharacter 0] node [id 5

```
Creator "Mark Newman on Fri Jul 21 12:44:53 2006"
graph [
  [ node [
    id 0
    label "Myriel"
    maincharacter 0
  ]
  [ node [
    id 1
    label "Napoleon"
    maincharacter 0
  ]
  [ node [
    id 2
    label "MlleBaptistine"
    maincharacter 0
  ]
  [ node [
    id 3
    label "MmeMagloire"
    maincharacter 0
  ]
  [ node [
    id 4
    label "CountessDeLo"
    maincharacter 0
  ]
  [ node [
    id 5 
```

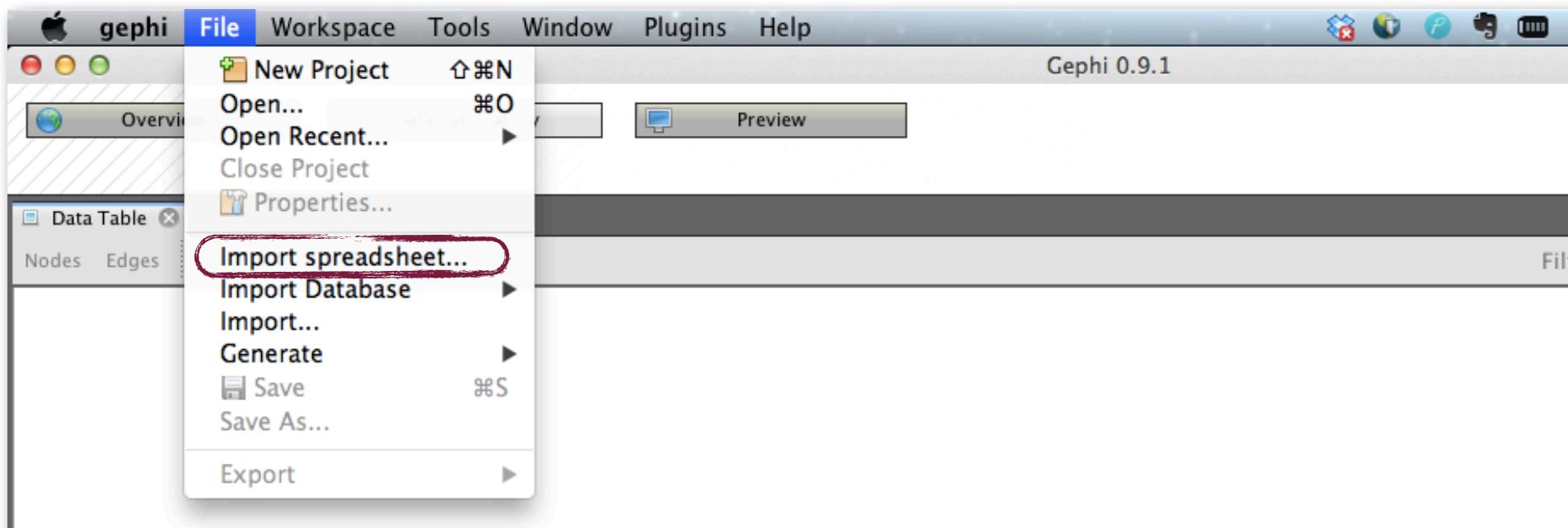


Let's open Gephi now





Importing the file -> .csv





Importing the file -> .csv

Gephi 0.9.1 – Project 1

Overview Data Laboratory Preview

Workspace 1

Data Table

Nodes Edges Configuration Add node

Import spreadsheet

Steps

1. General options
2. Import settings

General options

Choose a CSV file to import:
uff/data_gephi/lesmiserables/node_list.csv

Separator: Tab As table: Nodes ta... Charset: UTF-8

Preview:

ID	label	maincharacter
0	Myriel	0
1	Napoleon	0
2	MlleBaptistine	0
3	MmeMagloire	0
4	CountessDeLo	0
5	Geborand	0
6	Champtercier	0
7	Cravatte	0

Help < Back Next > Finish Cancel



Importing the file -> .csv

Gephi 0.9.1 – Project 1

Overview Data Laboratory Preview

Workspace 1

Data Table Configuration Add node

Id

Steps

1. General options
2. Import settings

Import spreadsheet

Import settings

New columns are created with the specified type.
A generated id is assigned if missing.
Unless the option 'Force nodes to be created as new or

Imported columns:

ID
String

label
String

maincharacter
Integer

Force nodes to be created as new ones

Help < Back Next > Finish Cancel

The screenshot shows the Gephi interface with a 'Data Table' tab selected. A modal dialog titled 'Import spreadsheet' is open, divided into 'Steps' (with '2. Import settings' selected) and 'Import settings'. The 'Import settings' section contains instructions about column creation and includes sections for 'Imported columns'. Under 'Imported columns', there are three entries: 'ID' (checked, String type), 'label' (checked, String type), and 'maincharacter' (checked, Integer type). The 'maincharacter' entry is highlighted with a red oval. At the bottom of the dialog are 'Finish' and 'Cancel' buttons.



Importing the file -> .csv

Screenshot of Gephi 0.9.1 - Project 1 showing the Data Laboratory tab with a CSV-imported dataset.

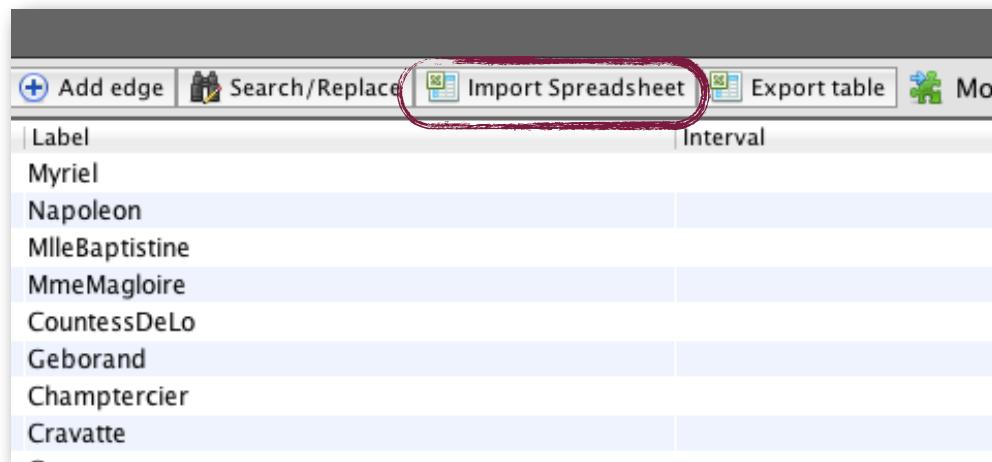
The screenshot shows the Gephi interface with the following details:

- Toolbar:** Apple icon, followed by "gephi", "File", "Workspace", "Tools", "Window", "Plugins", "Help".
- Top Bar:** "Gephi 0.9.1 - Project 1" and various system icons.
- Navigation:** "Overview", "Data Laboratory" (selected), "Preview".
- Project Structure:** "Workspace 1" and "Data Table".
- Data Table:** A table with columns "Id", "Label", "Interval", and "mainc".
- Data Rows:** 25 rows of data, starting with Id 0 and Label Myriel, ending with Id 24 and Label MmeThenardier.
- Table Headers:** "Nodes", "Edges", "Configuration", "Add node", "Add edge", "Search/Replace", "Import Spreadsheet", "Export table", "More actions", "Filter".

Id	Label	Interval	mainc
0	Myriel		0
1	Napoleon		0
2	MlleBaptistine		0
3	MmeMagloire		0
4	CountessDeLo		0
5	Geborand		0
6	Champtercier		0
7	Cravatte		0
8	Count		0
9	OldMan		0
10	Labarre		0
11	Valjean		1
12	Marguerite		0
13	MmeDeR		0
14	Isabeau		0
15	Gervais		0
16	Tholomyes		0
17	Listolier		0
18	Fameuil		0
19	Blacheville		0
20	Favourite		0
21	Dahlia		0
22	Zephine		0
23	Fantine		1
24	MmeThenardier		0



Importing the file -> .csv





Importing the file -> .csv

Gephi 0.9.1 – Project 1

Overview Data Laboratory Preview

Workspace 1

Data Table

Nodes Edges Configuration Add node

Steps

1. General options
2. Import settings

Import spreadsheet

General options

Choose a CSV file to import:
uff/data_gephi/lesmiserables/edge_list.csv

Separator: Tab As table: Edges table Charset: UTF-8

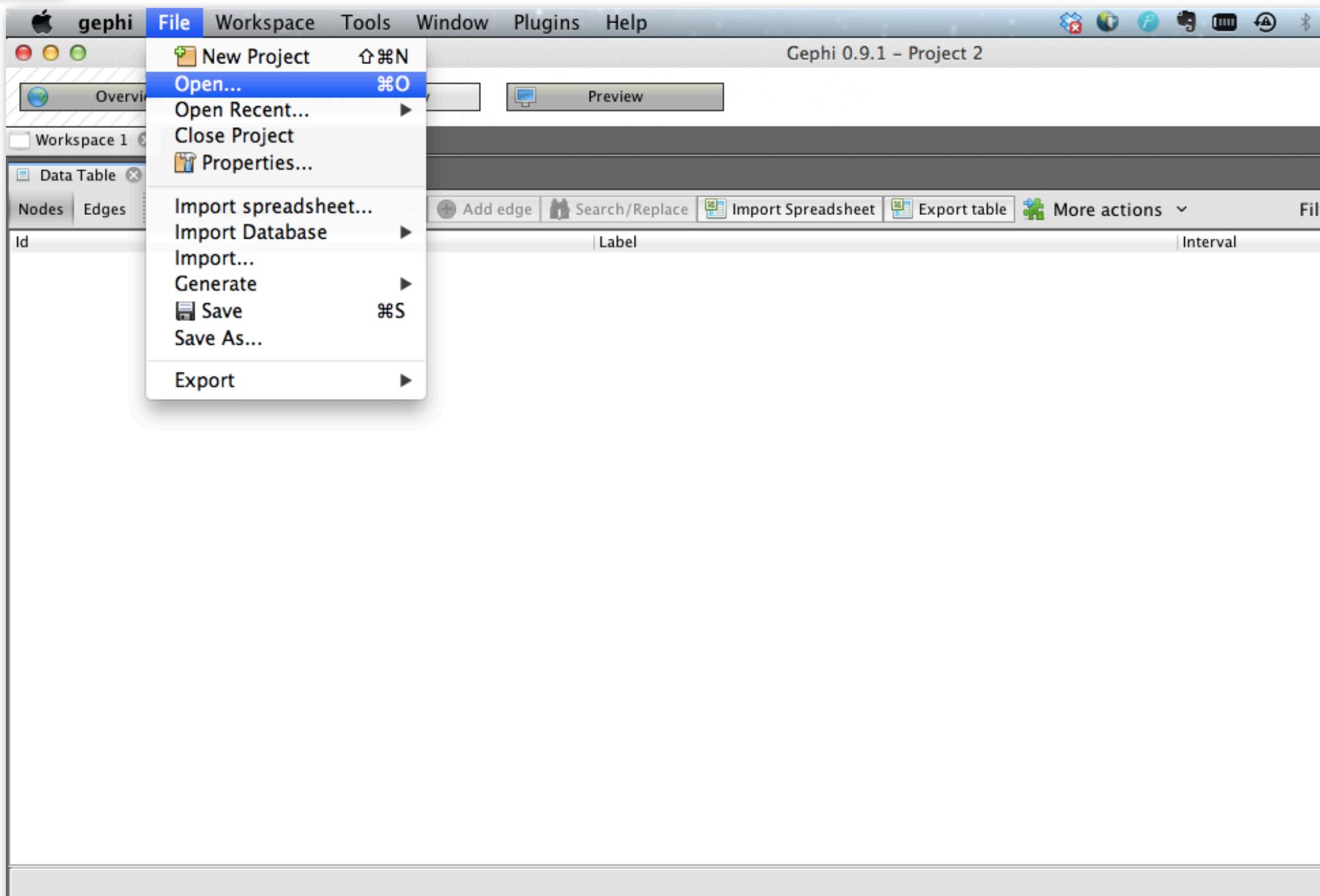
Preview:

Source	Target	Weight
1	0	1
2	0	8
3	0	10
3	2	6
4	0	1
5	0	1
6	0	1
7	0	1

Help < Back Next > Finish Cancel

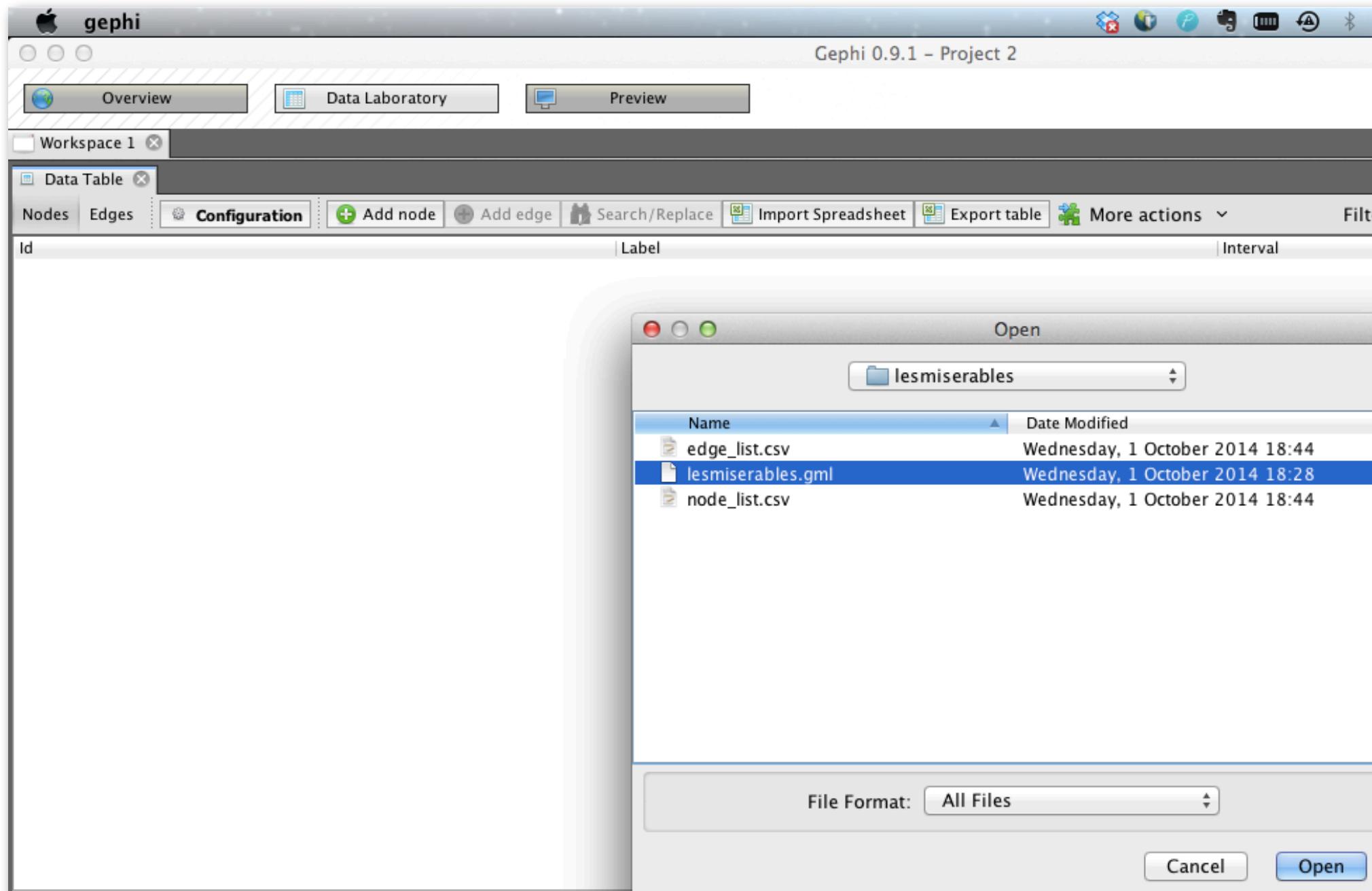


Importing the file -> other formats





Importing the file -> other formats





Importing the file -> other formats

Screenshot of Gephi 0.9.1 interface showing the import process for a file named "lesmiserables.gml".

The main window shows the "Data Table" tab selected. A modal dialog titled "Import report" is open, indicating "No issue found during import".

The "Graph Type" dropdown is set to "Undirected".

Import statistics:

- # of Nodes: 77
- # of Edges: 254
- Dynamic Graph: no
- Dynamic Attributes: no
- Multi Graph: no

Graph creation options:

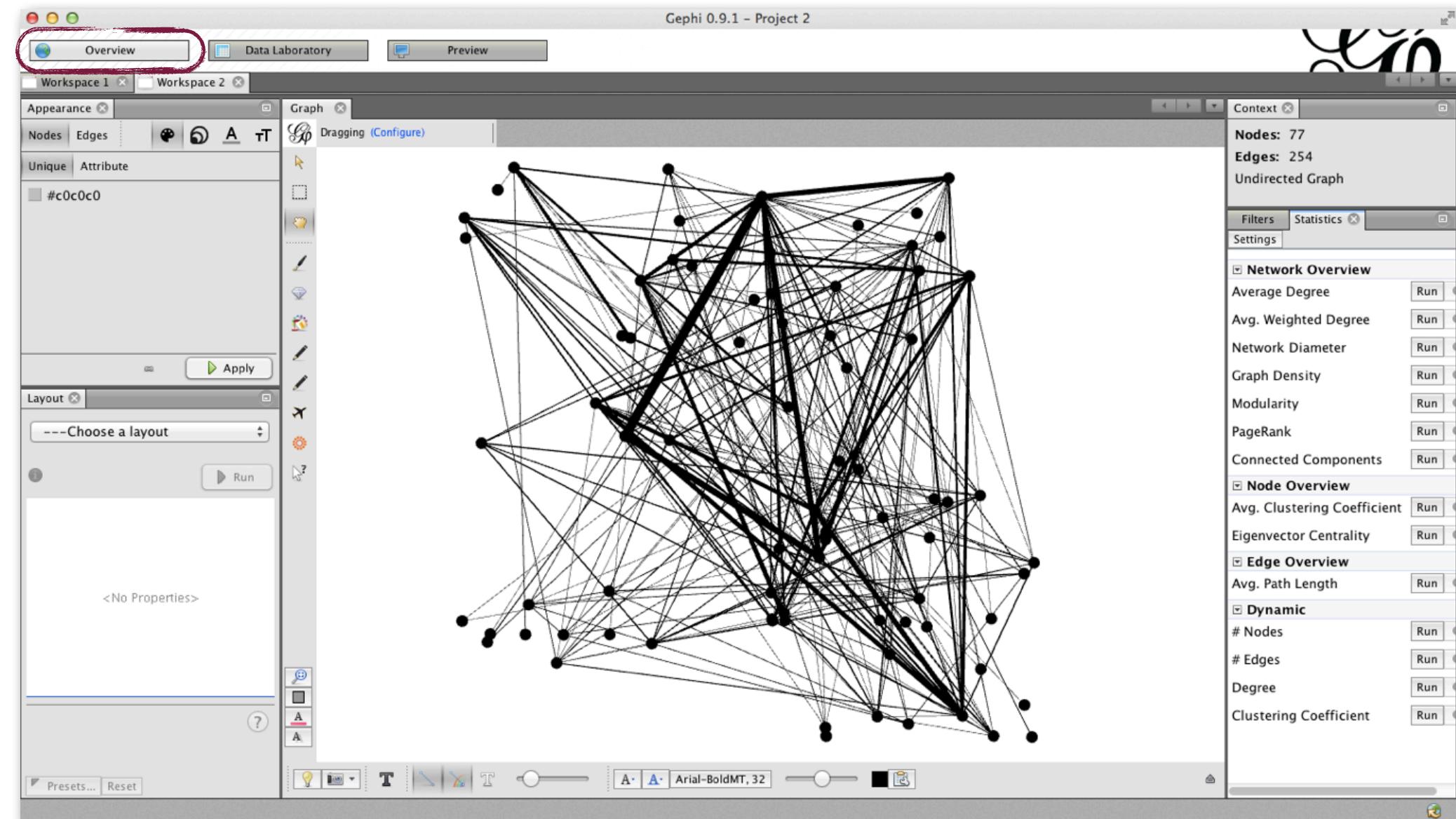
- New graph
- Append Graph

Buttons at the bottom right of the dialog: Cancel and OK.



A Misérables visualisation

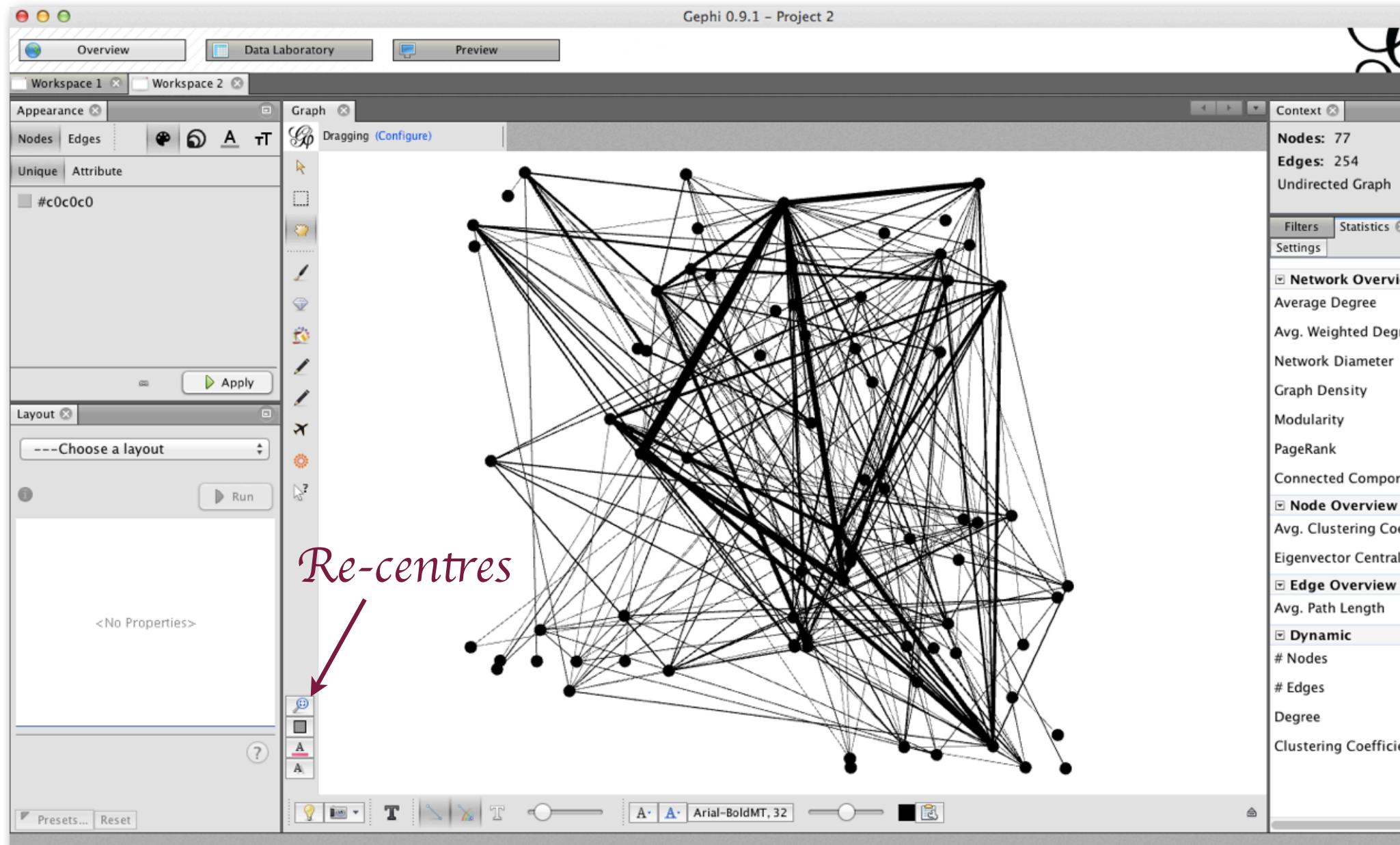
Click the “Overview” button - opens with a random layout





Pan/zoom with your mouse

...and try dragging some nodes around.





Edge thickness

Gephi 0.9.1 – Project 3

Overview Data Laboratory Preview

Workspace 1 Workspace 2

Appearance Graph

Nodes Edges Unique Attribute #c0c0c0

Apply

Layout ---Choose a layout Run

<No Properties>

Presets... Reset

Dragging (Configure)

Nodes: Edges: Undirected Filters Settings

Netw Average Avg. We Network Graph D Modula PageRank Conn Node Avg. Cl Eigene Edge Avg. Par Dyna # Nodes # Edges Degree Clusteri

Adjusts edge thickness

Arial-BoldMT, 32



Force-directed layouts

Gephi 0.9.1 – Project 3

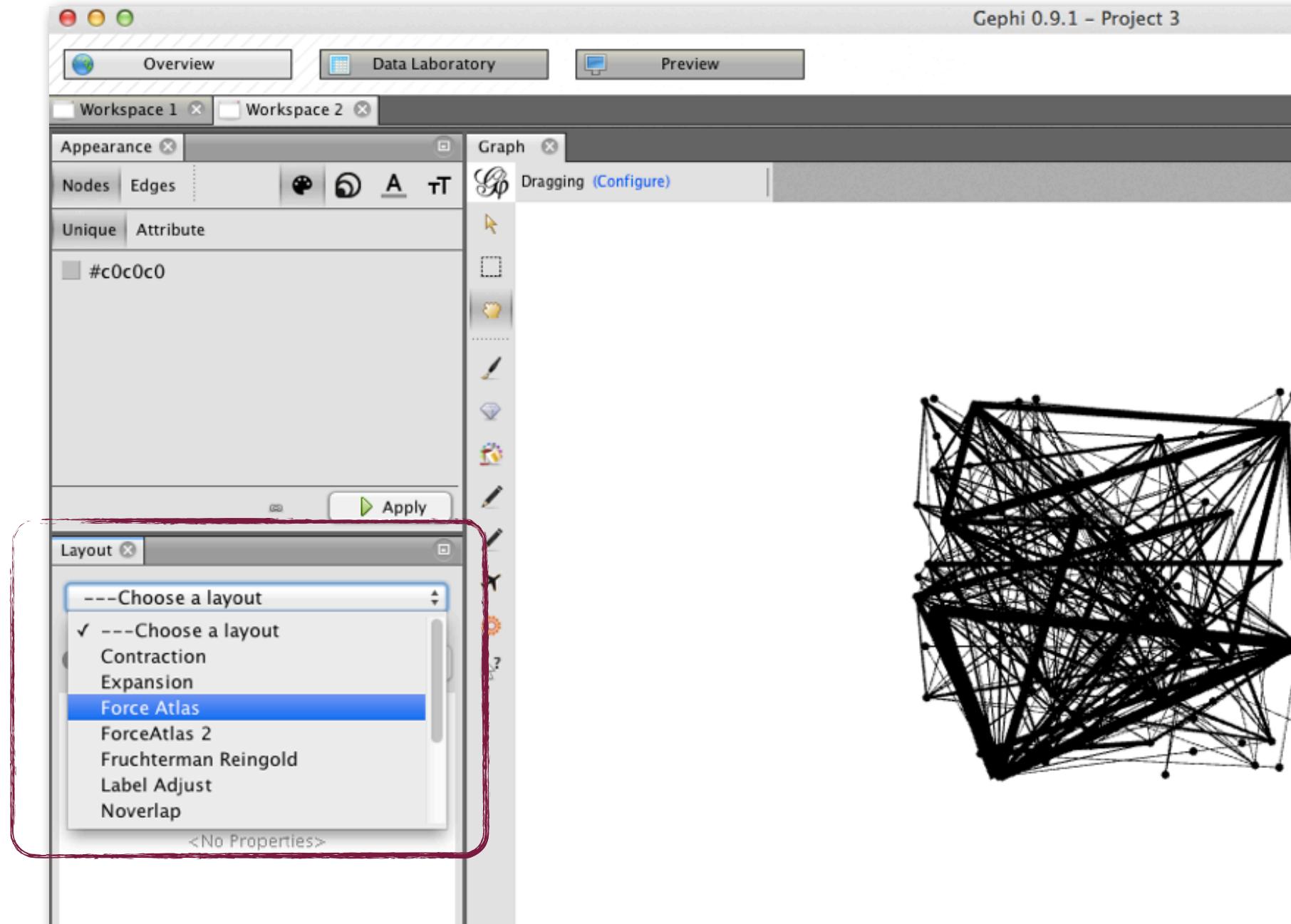
Overview Data Laboratory Preview

Workspace 1 Workspace 2

Appearance Nodes Edges Unique Attribute #c0c0c0

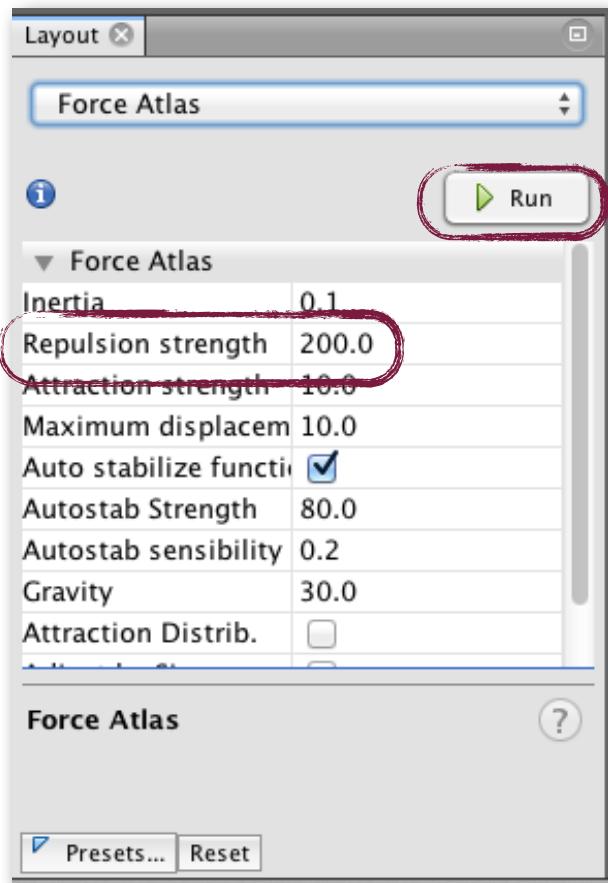
Graph Dragging (Configure)

Layout ---Choose a layout
---Choose a layout
Contraction
Expansion
Force Atlas
ForceAtlas 2
Fruchterman Reingold
Label Adjust
Noverlap
<No Properties>





Fine tuning attraction/repulsion



You will need to adjust the parameters...



Fine tuning attraction/repulsion

Gephi 0.9.1 – Project 3

Overview Data Laboratory Preview

Workspace 1 Workspace 2

Appearance Graph

Nodes Edges Unique Attribute

#c0c0c0

Apply

Layout Force Atlas

Stop

Inertia 0.1

Repulsion strength 10000.0

Attraction strength 10.0

Maximum displacement 10.0

Auto stabilize function

Autostab Strength 80.0

Autostab sensibility 0.2

Gravity 30.0

Attraction Distrib.

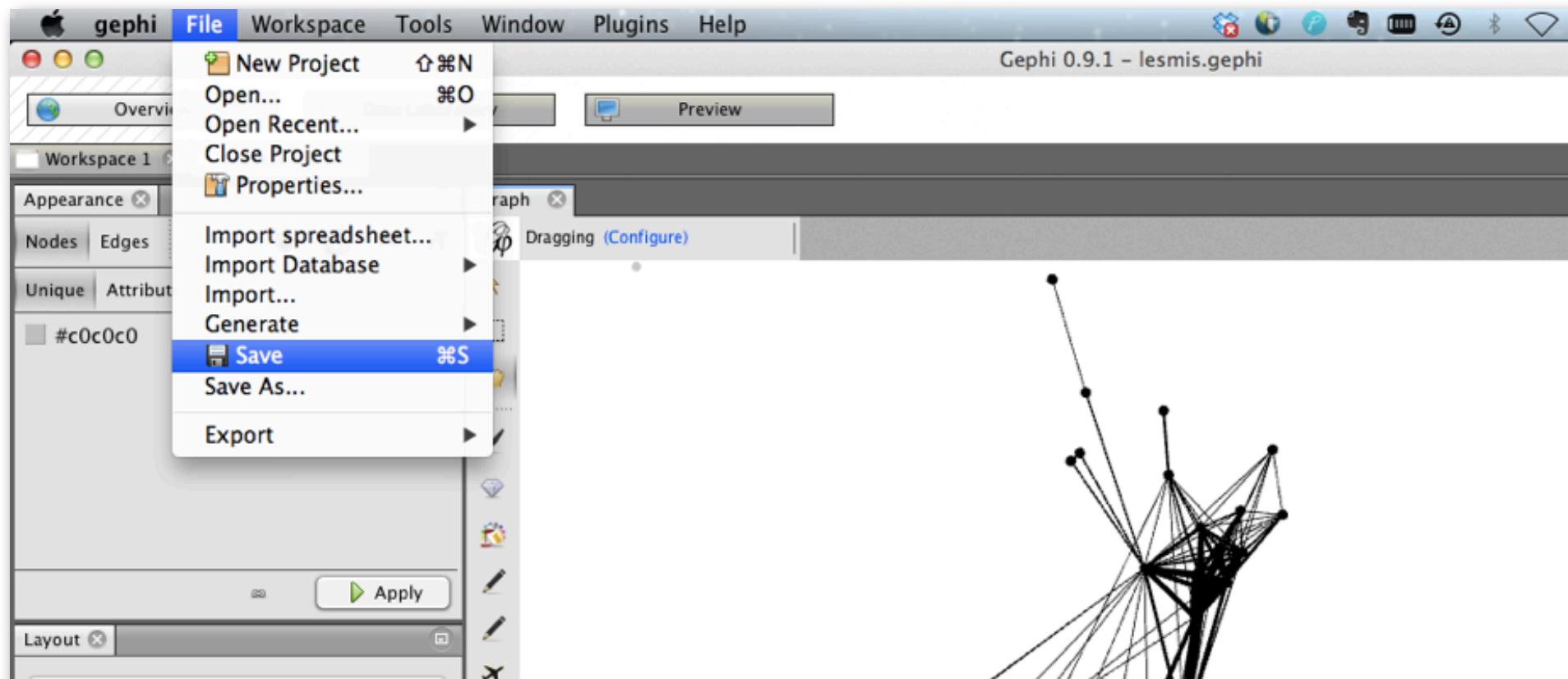
Dragging (Configure)



Sidenote: saving

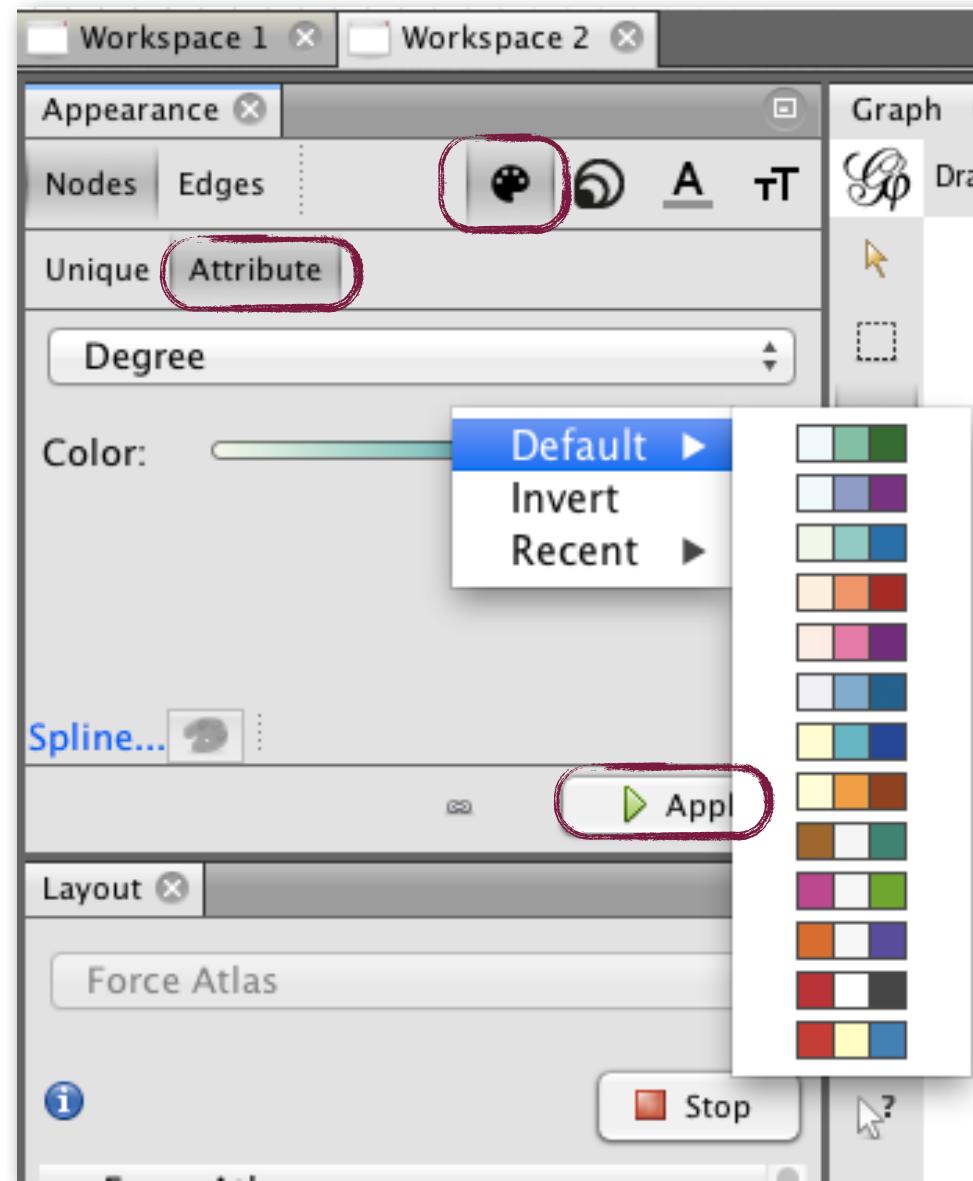
You may have noticed by now that Gephi has one particularly annoying feature... A distinct lack of an undo button.

Save your work in progress regularly. Saves as .gephi so you can pick up where you left off.



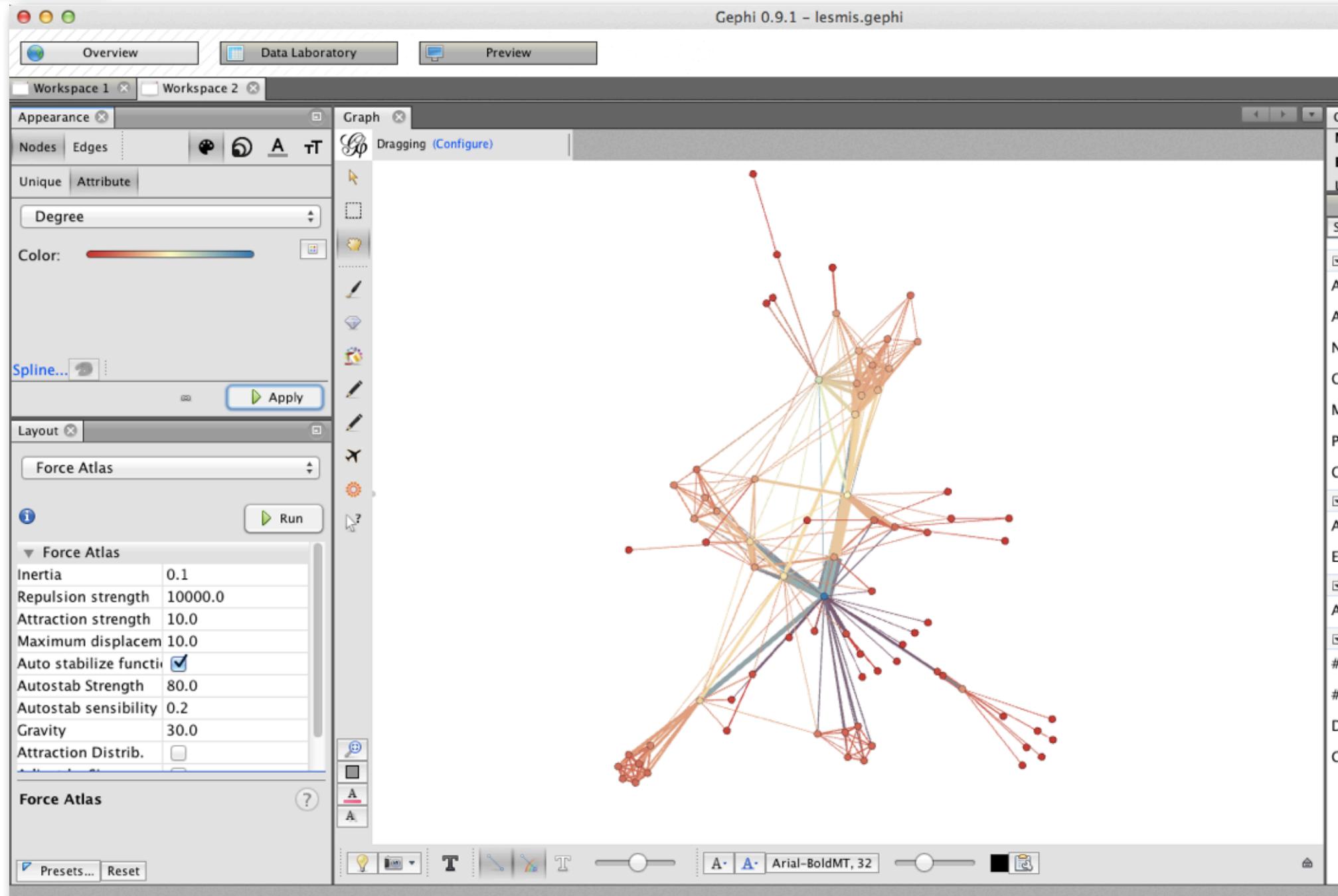


Ranking nodes: colour





Ranking nodes: colour





Ranking nodes: colour

Gephi 0.9.1 – lesmis.gephi

Overview Data Laboratory Preview

Workspace 1 Workspace 2

Appearance Graph

Nodes Edges Unique Attribute

Degree

Color:

Spline...

Apply

Layout Force Atlas

Run

Inertia: 0.1
Repulsion strength: 10000.0
Attraction strength: 10.0
Maximum displacement: 10.0
Auto stabilize function:
Autostab Strength: 80.0
Autostab sensibility: 0.2
Gravity: 30.0
Attraction Distrib.

Force Atlas

Presets... Reset

Dragging (Configure)

Interpolate

Spline Editor

Drag control points in the display to change the shape of the spline

Templates

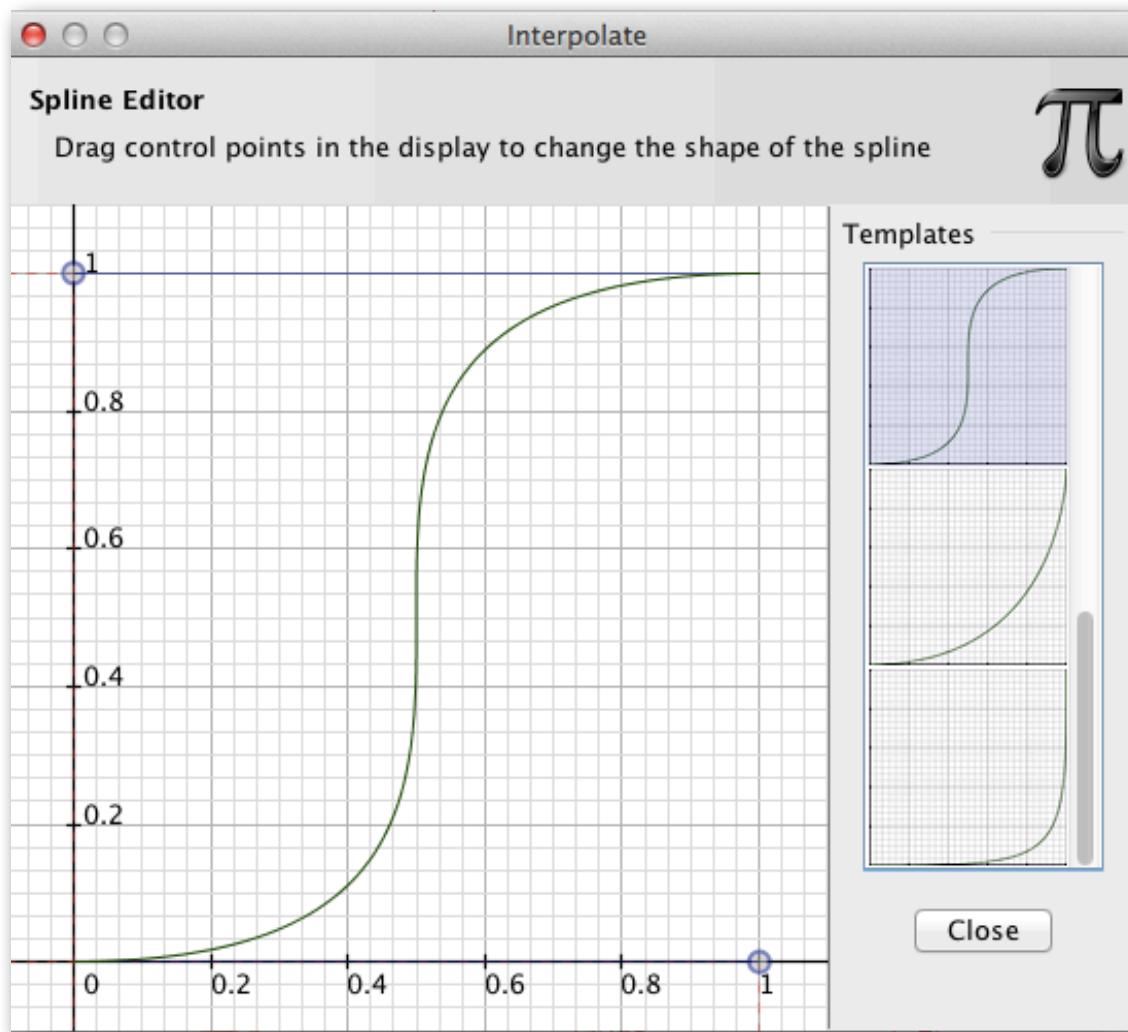
Close

Arial-BoldMT, 32

The screenshot shows the Gephi 0.9.1 interface with the "lesmis.gephi" network loaded. The main workspace displays a network graph with nodes colored by their degree. A "Spline..." tool is active, opening a "Spline Editor" dialog. This dialog contains a coordinate system where a green curve is plotted, representing a ranking function. The x-axis ranges from 0 to 1, and the y-axis ranges from 0 to 1. Two control points are visible on the curve at approximately (0, 0) and (1, 1). To the right of the plot are several spline template curves. The top menu bar includes "Overview", "Data Laboratory", and "Preview". The left sidebar contains tabs for "Appearance" and "Graph", along with various node and edge editing tools. The bottom toolbar includes icons for selection, zoom, and text entry, along with font settings set to "Arial-BoldMT, 32".

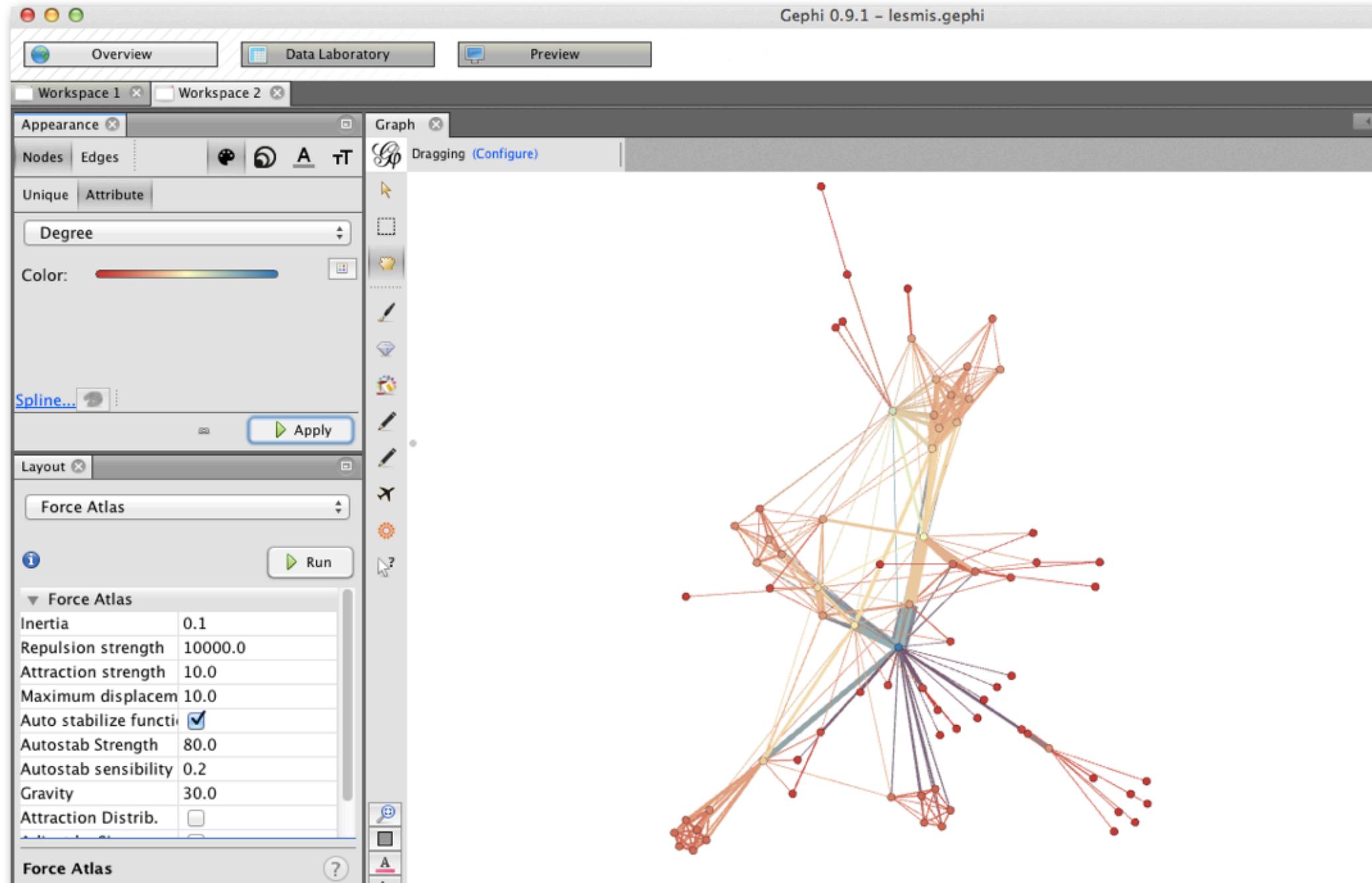


Ranking nodes: colour



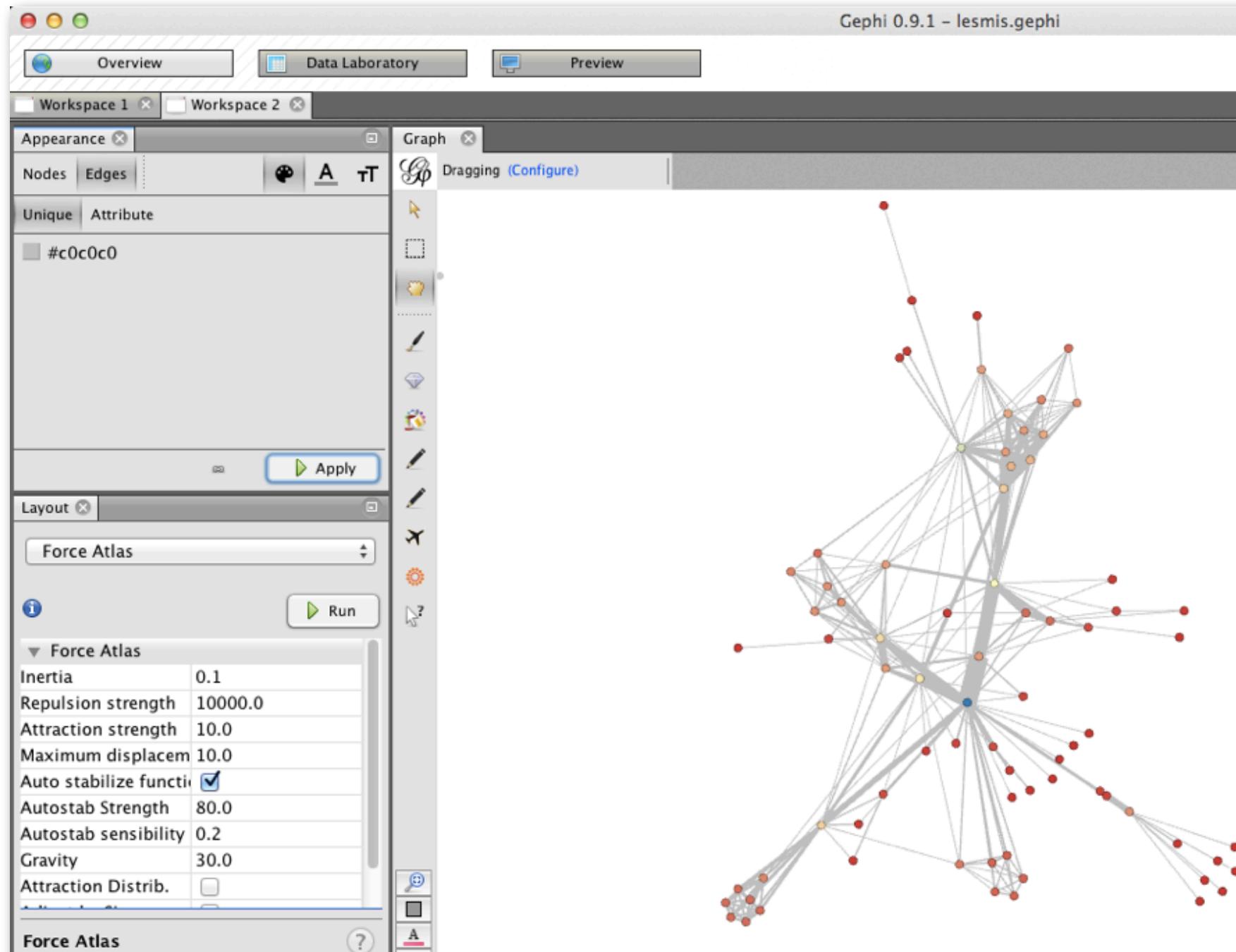


Ranking nodes: colour



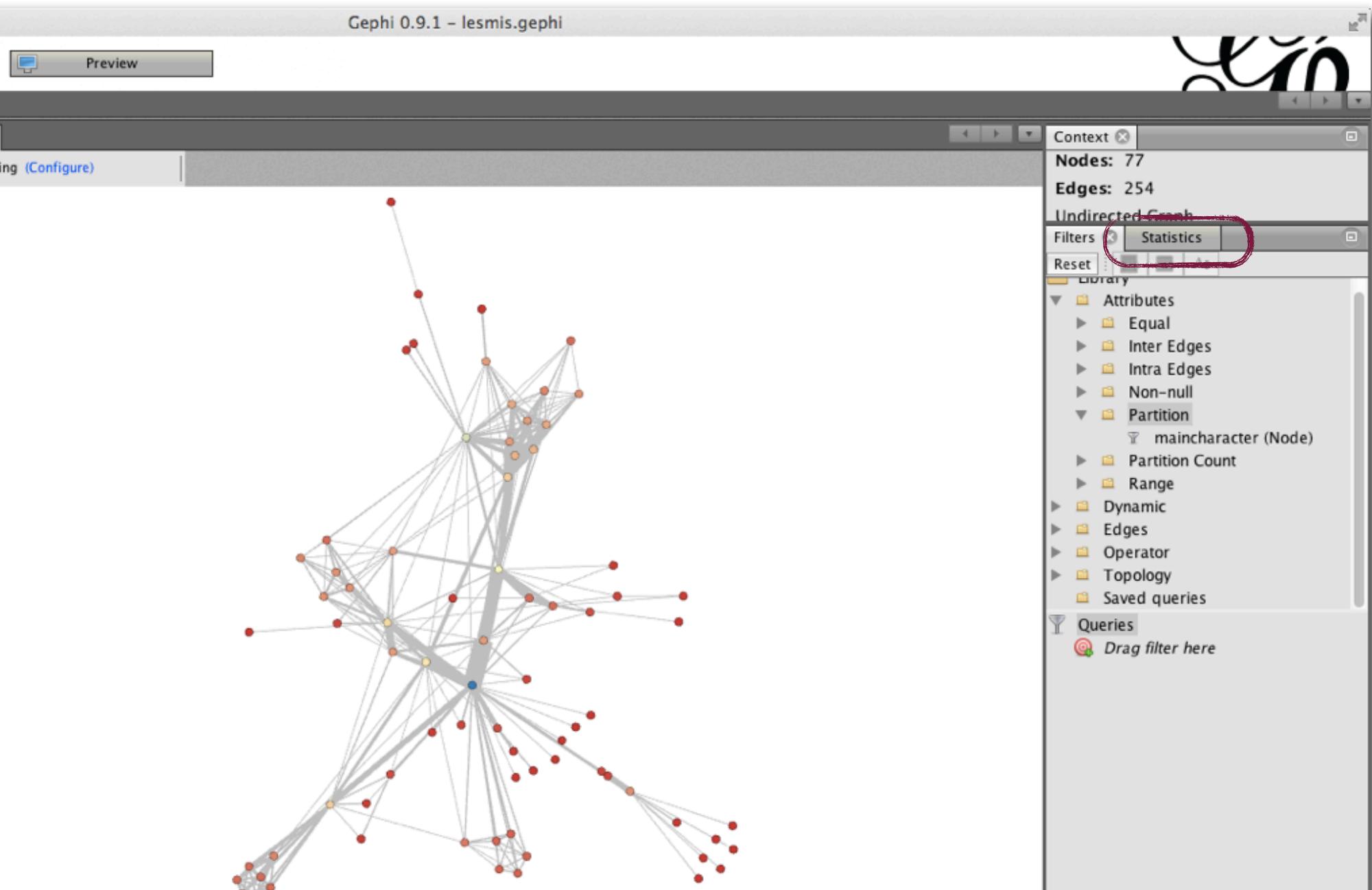


Ranking nodes: colour





Metrics



Gp Metrics

Context

Nodes: 77
Edges: 254
Undirected Graph

Filters **Statistics**

Settings

Network Overview

Average Degree

Avg. Weighted Degree

Network Diameter

Graph Density

Modularity

PageRank

Connected Components

Node Overview

Avg. Clustering Coefficient

Eigenvector Centrality

Edge Overview

Avg. Path Length

Dynamic

Nodes

Edges

Degree

Clustering Coefficient



Gephi 0.9.1 – lesmis.gephi

Preview

Graph Dragging

HTML Report

Degree Report

Results:

Average Degree: 6.597

Degree Distribution

The scatter plot shows the distribution of node degrees. The x-axis represents the degree value, and the y-axis represents the count of nodes with that degree. The distribution is highly right-skewed, with most nodes having a low degree (mostly between 0 and 10) and a few nodes having a very high degree (up to 36). The highest frequency is at degree 3, with approximately 17 nodes.

Value	Count
3	17
2	10
4	3
6	5
8	1
10	5
12	2
14	2
16	1
18	1
20	1
22	1
36	1

Print Copy Save Close

Context

Nodes: 77
Edges: 254
Undirected Graph

Filters Statistics Settings

Network Overview

Average Degree 6.597 Run

Avg. Weighted Degree Run

Network Diameter Run

Graph Density Run

Modularity Run

PageRank Run

Connected Components Run

Node Overview

Avg. Clustering Coefficient Run

Eigenvector Centrality Run

Edge Overview

Avg. Path Length Run

Dynamic

Nodes Run

Edges Run

Degree Run

Clustering Coefficient Run



Metrics

Graph Context

Dragging (Configure)

Nodes: 77
Edges: 254
Undirected Graph

Filters Statistics Settings

Network Overview

Average Degree 6.597 Run ?

Avg. Weighted Degree 21.299 Run ?

Network Diameter Run ?

Graph Density Run ?

Modularity Run ?

PageRank Run ?

Connected Components Run ?

Node Overview

Avg. Clustering Coefficient Run ?

Eigenvector Centrality Run ?

Edge Overview

Avg. Path Length Run ?

Dynamic

Nodes Run ?

Edges Run ?

Degree Run ?

Clustering Coefficient Run ?

Graph Distance settings

Distance
The average graph-distance between all pairs of nodes. Connected nodes have graph distance 1. The diameter is the longest graph distance between any two nodes in the network. (i.e. How far apart are the two most distant nodes).

Directed Normalize Centralities in [0,1]

Undirected

Betweenness Centrality: Measures how often a node appears on shortest paths between nodes in the network.

Closeness Centrality: The average distance from a given starting node to all other nodes in the network.

Eccentricity: The distance from a given starting node to the farthest node from it in the network.

Cancel OK



Metrics



HTML Report

Graph Distance Report

Parameters:

Network Interpretation: undirected

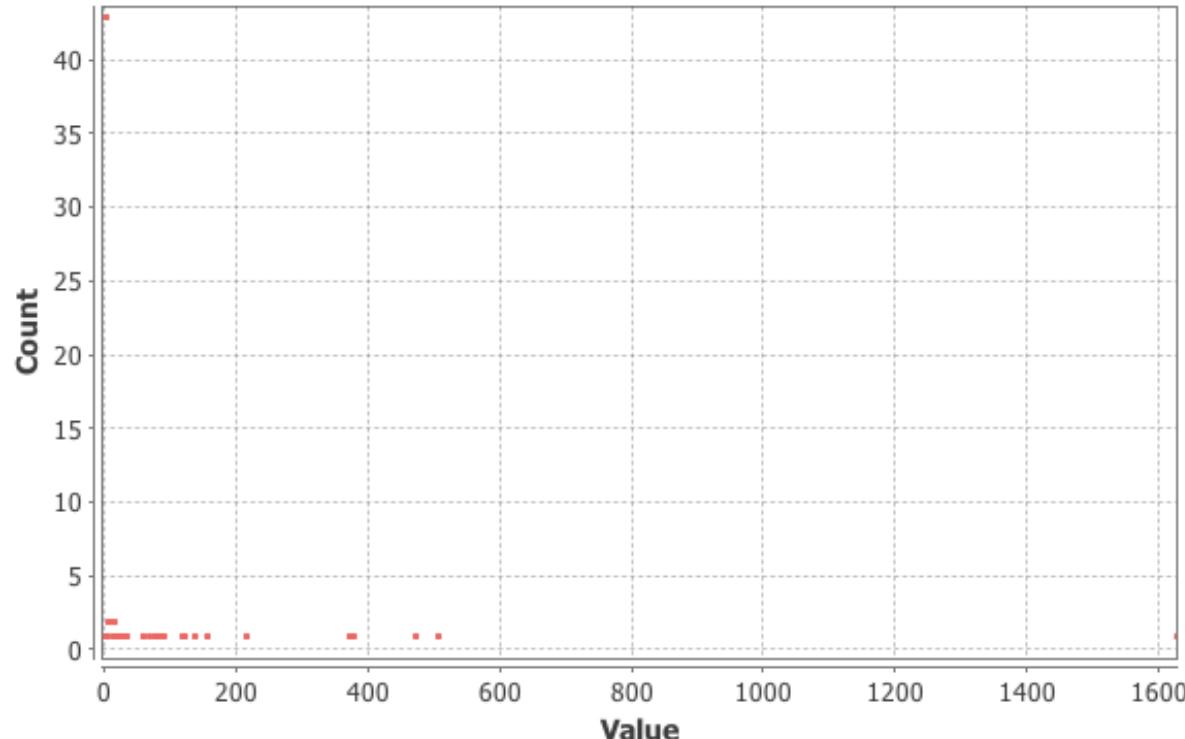
Results:

Diameter: 5

Radius: 3

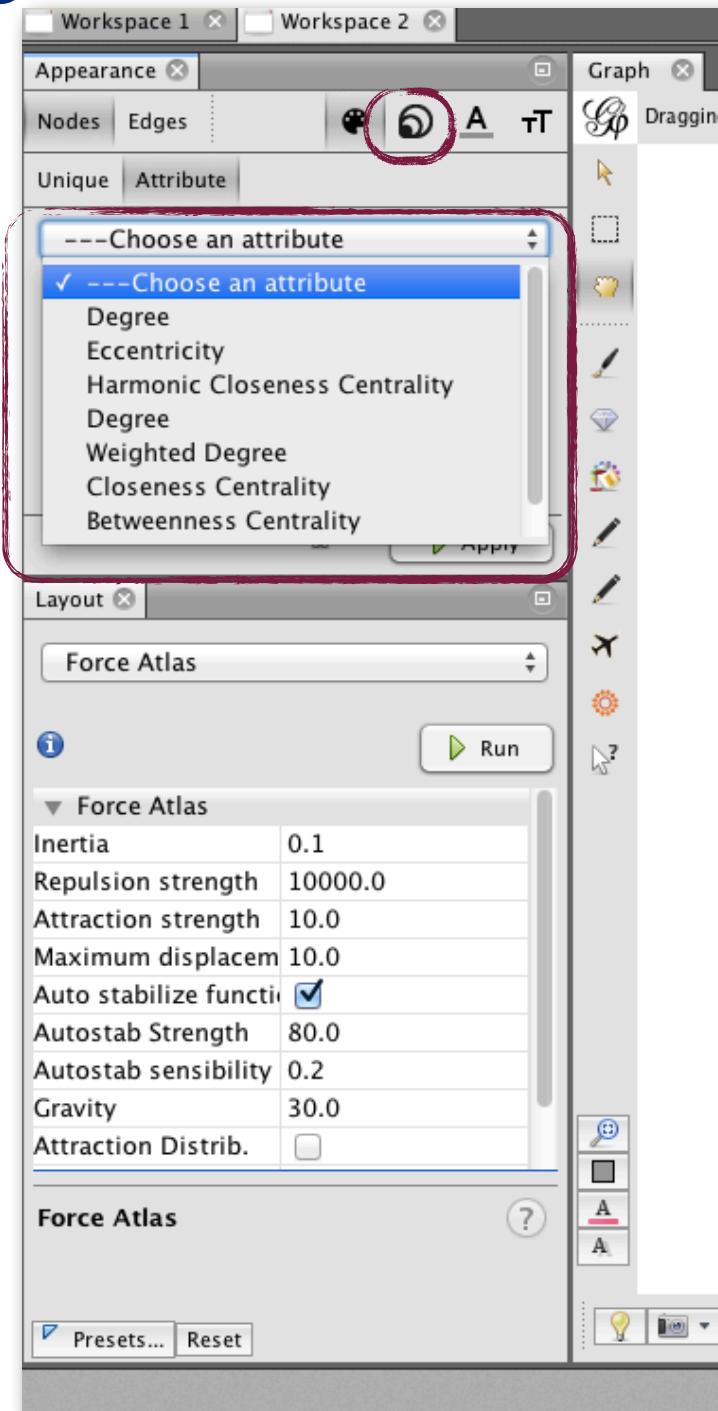
Average Path length: 2.6411483253588517

Betweenness Centrality Distribution



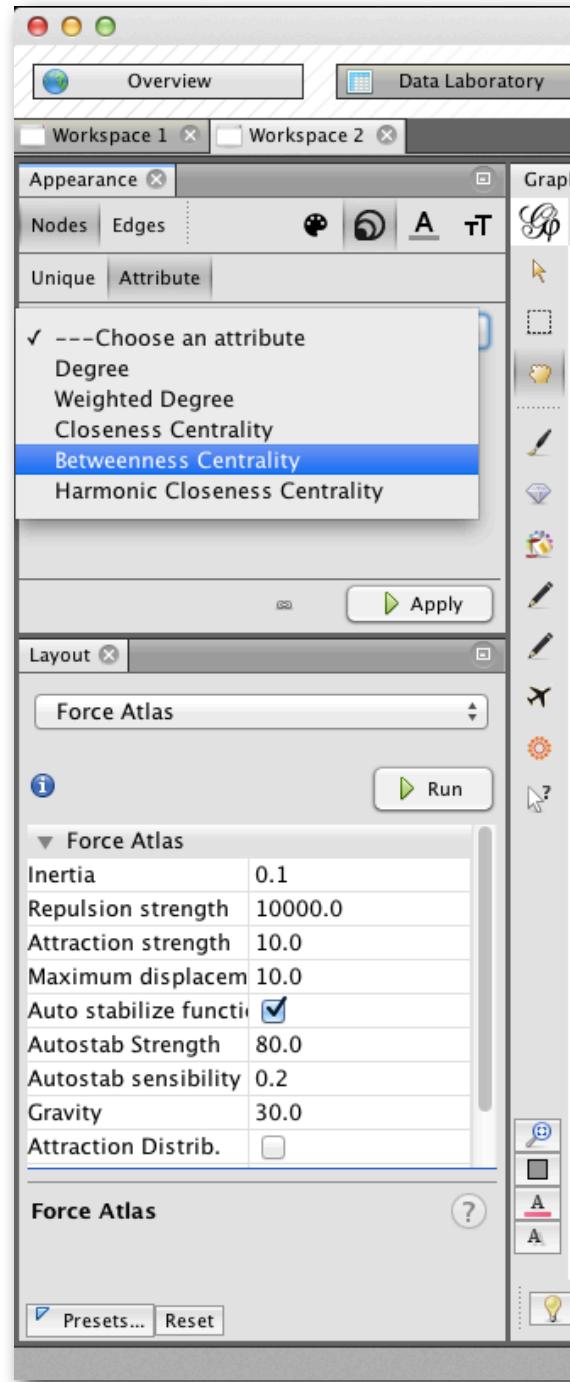


Node ranking: size



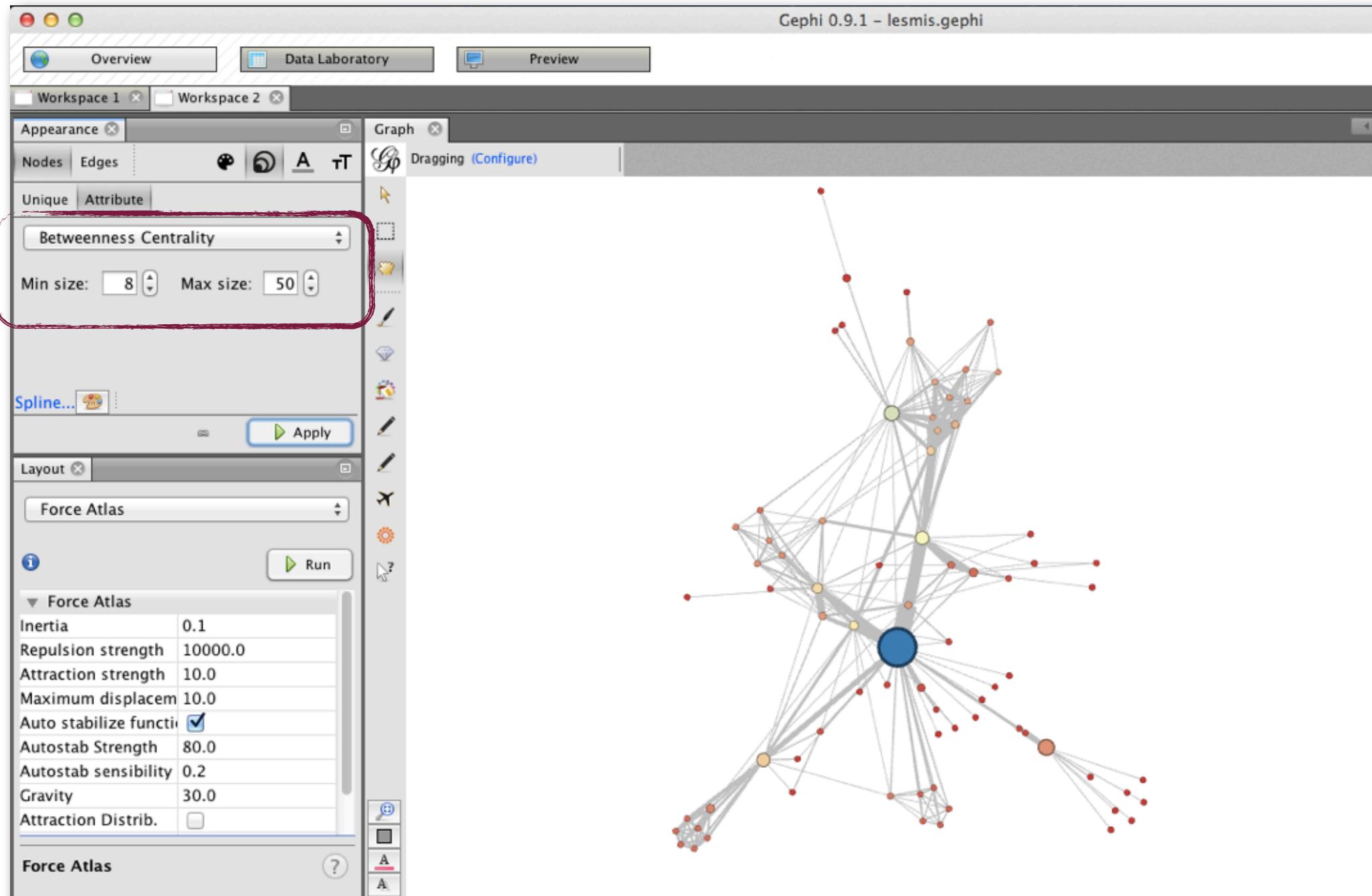


Node ranking: size



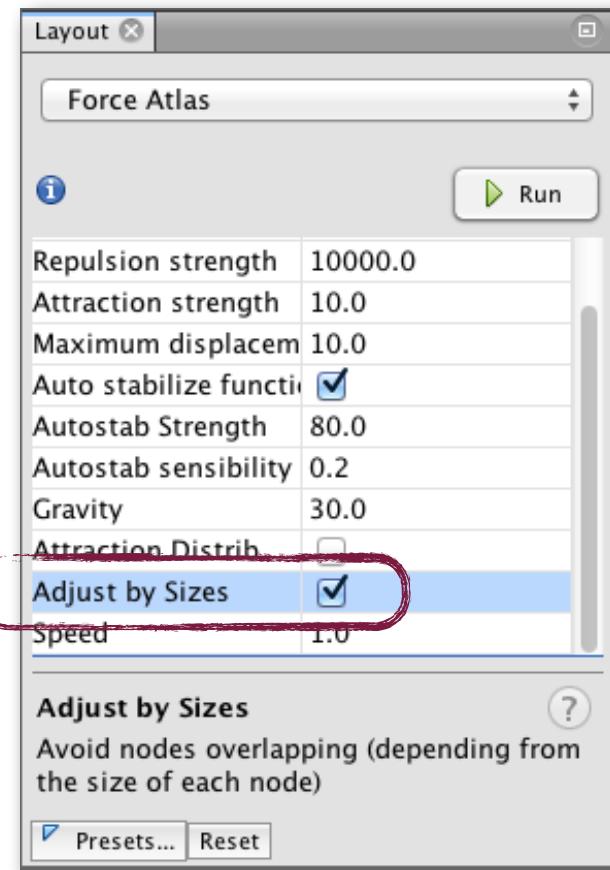


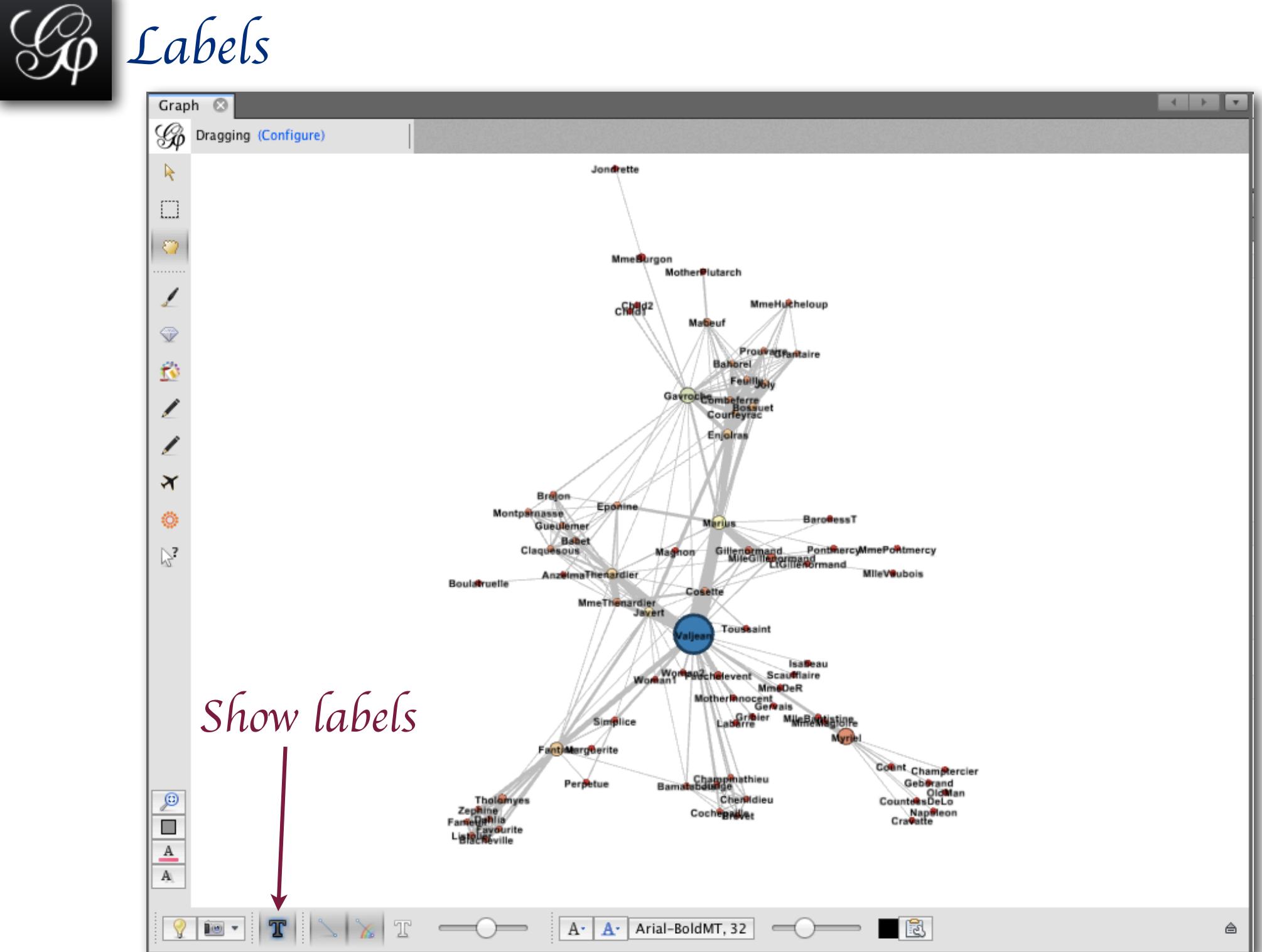
Node ranking: size

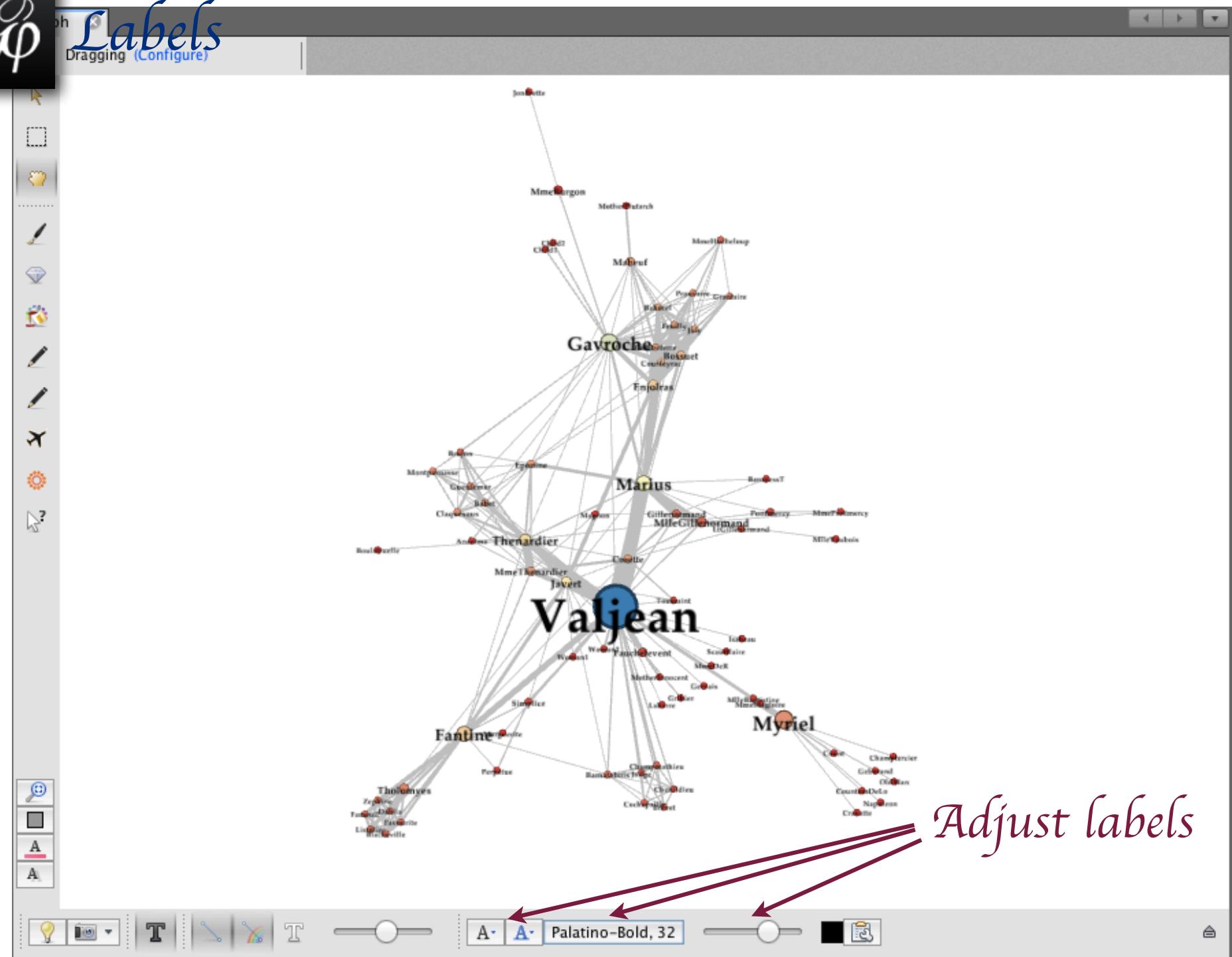




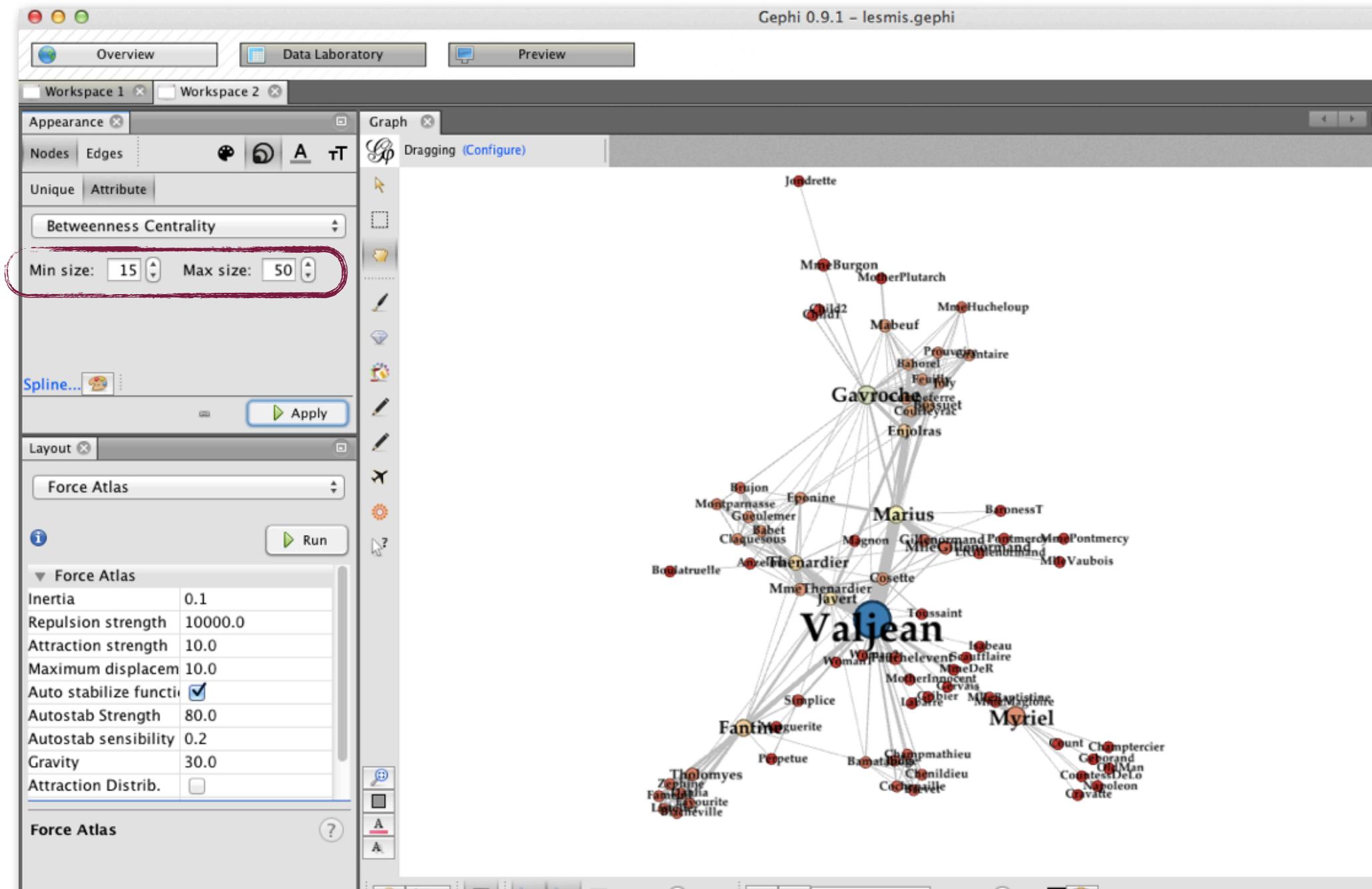
Adjust layout







Gp Labels



Gp Labels

Graph Dragging (Configure)

Label text settings

Nodes Edges Show properties

Select attributes to display as labels

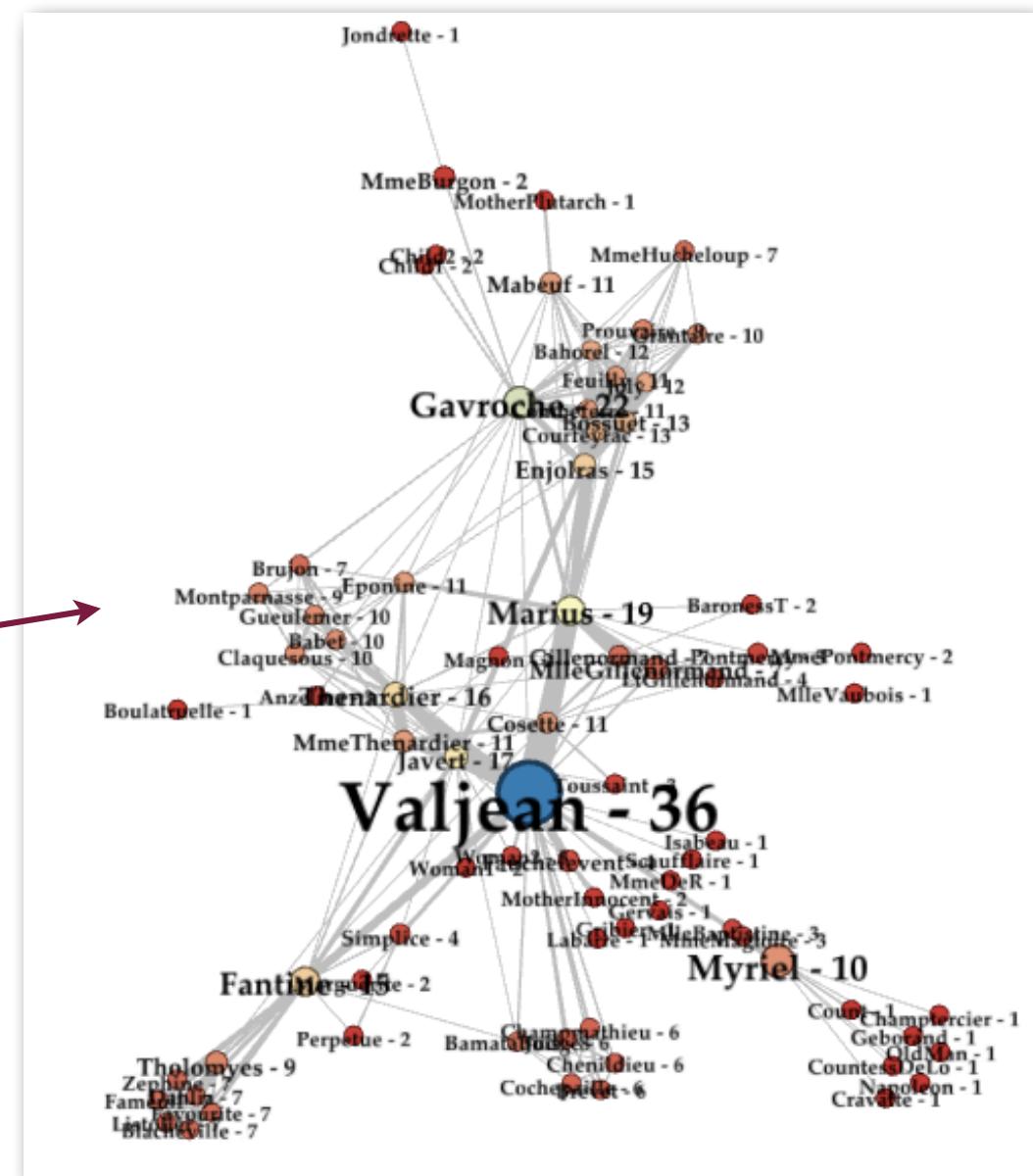
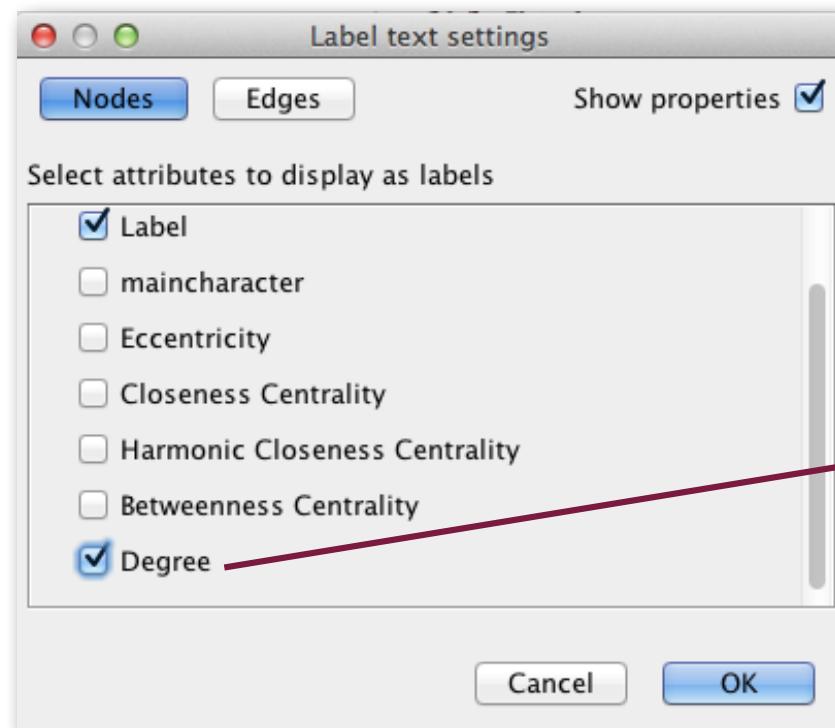
Id
 Label
 maincharacter
 Eccentricity
 Closeness Centrality
 Harmonic Closeness Centrality
 Betweenness Centrality

Cancel OK

Display other info

The screenshot shows a network graph of characters from Victor Hugo's Les Misérables. Nodes represent characters, and edges represent relationships. In the center, the character 'Fantine' is highlighted. Other prominent characters like 'Myriel', 'Jondrette', and 'Tholomyes' are also visible. A context menu is open over the node 'MmeBurgon', specifically the 'Label text settings' dialog. This dialog allows users to choose which attributes to display as labels for the nodes. The 'Label' checkbox is checked, while others like 'Id', 'maincharacter', and various centrality measures are unchecked. At the bottom right of the dialog, there are 'Cancel' and 'OK' buttons. A red arrow originates from the text 'Display other info' on the right side and points towards the 'OK' button of the dialog. The Gephi interface includes a toolbar on the left with various tools for selection, drawing, and analysis, and a bottom navigation bar with icons for file operations and styling.

Gp Labels





Community detection

Filters Statistics

Settings

Network Overview

Average Degree 6.597 Run

Avg. Weighted Degree Run

Network Diameter 5 Run

Graph Density Run

Modularity Run

PageRank Run

Connected Components Run

Node Overview

Avg. Clustering Coefficient Run

Eigenvector Centrality Run

Edge Overview

Avg. Path Length 2.641 Run

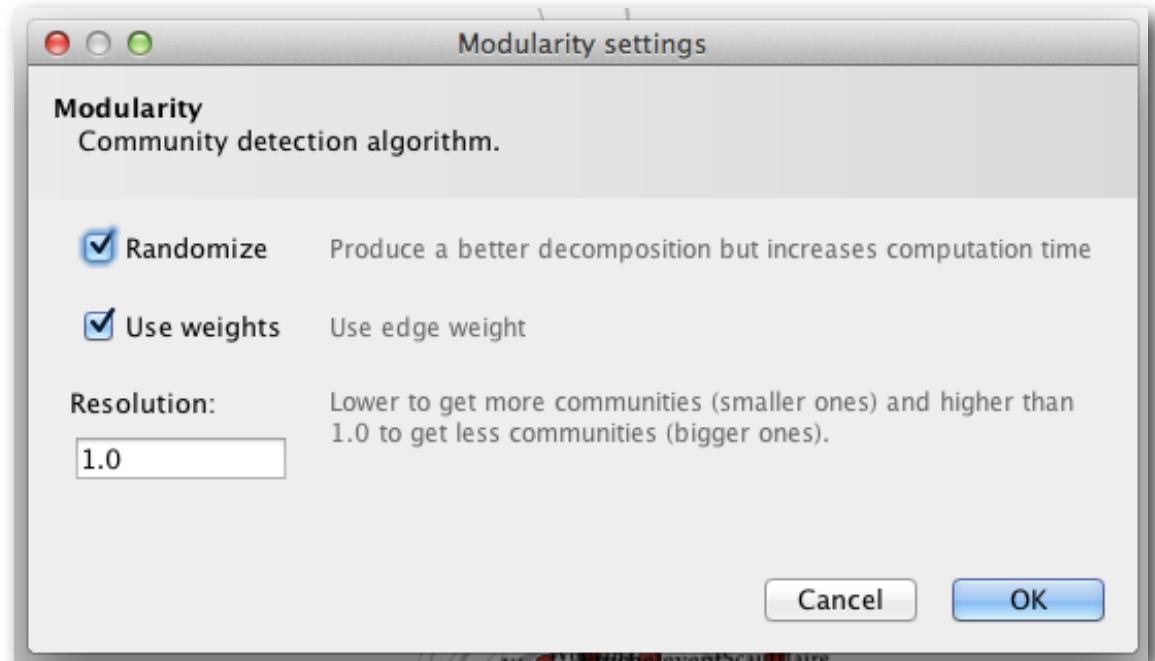
Dynamic

Nodes Run

Edges Run

Degree Run

Clustering Coefficient Run





Community detection

Now you have run the “modularity” function, it appears as an “attribute” under “nodes” in “appearance” -> colour by modularity.

Workspace 1 Workspace 2

Appearance Graph

Nodes Edges

Unique Attribute

Degree

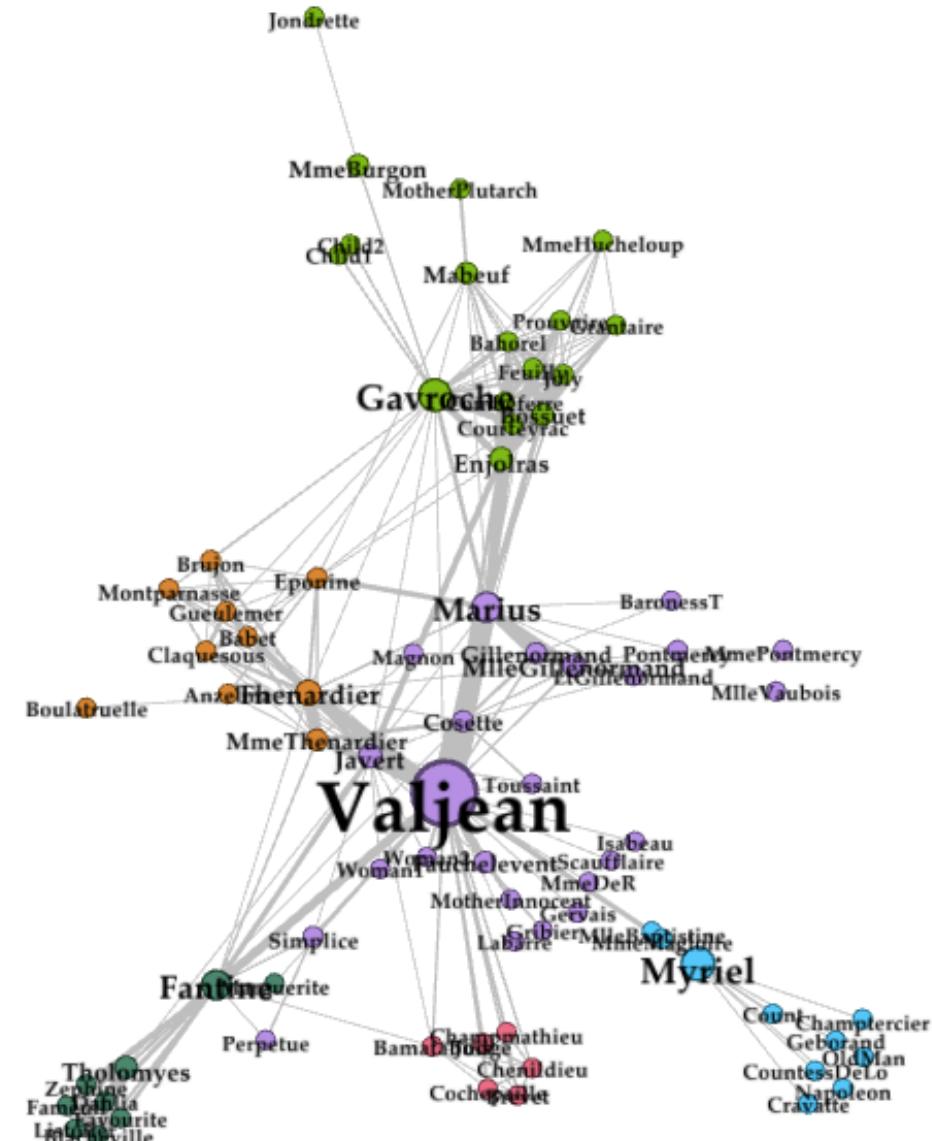
Color: Default ▶

- Default ▶
- Invert
- Recent ▶

Spline... Apply

Layout

Force Atlas





Filters

The screenshot illustrates the Gephi interface for applying filters to a graph. On the left, the 'Context' panel displays basic statistics: Nodes: 77 and Edges: 254. Below these, the 'Undirected Graph' section includes tabs for 'Filters' (which is active) and 'Statistics'. The 'Filters' tab contains a 'Reset' button and a sidebar with categories: Library, Attributes, Dynamic, Edges, Operator, Topology, and Saved queries. A red circle highlights the 'Topology' category. At the bottom of the sidebar is a 'Queries' section with a placeholder 'Drag filter here'. A large red arrow points from the left panel to the right panel, indicating the transition to the detailed filter configuration. The right panel shows the expanded 'Topology' filters, including Degree Range, Ego Network, Giant Component, Has Self-loop, In Degree Range, K-core (which is also highlighted with a red circle), Mutual-Degree Range, Neighbors Network, Out Degree Range, and Saved queries. It also features a 'Queries' section with a 'Drag filter here' placeholder and a 'Filter' button at the bottom.

Context X

Nodes: 77

Edges: 254

Undirected Graph

Filters X Statistics

Reset

Library

- Attributes
- Dynamic
- Edges
- Operator
- Topology
- Saved queries

Queries

Drag filter here

Filter

Context X

Nodes: 77

Edges: 254

Undirected Graph

Filters X Statistics

Reset

Attributes

- Dynamic
- Edges
- Operator
- Topology
- Degree Range
- Ego Network
- Giant Component
- Has Self-loop
- In Degree Range
- K-core
- Mutual-Degree Range
- Neighbors Network
- Out Degree Range
- Saved queries

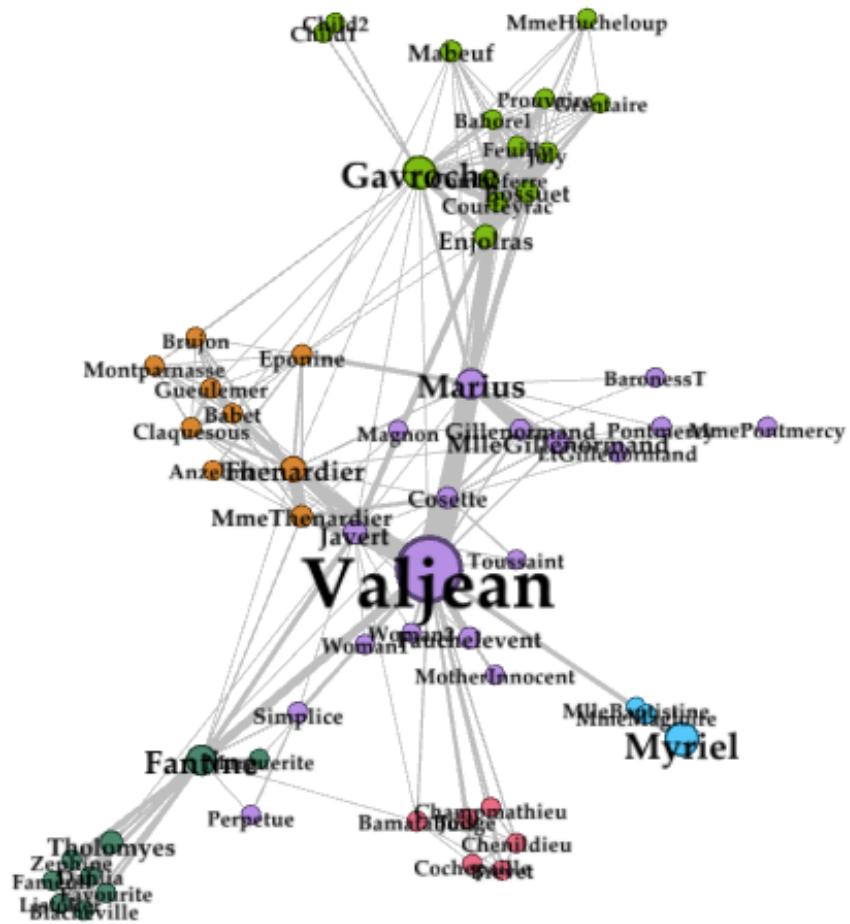
Queries

Drag filter here

Filter



Filters



Context ✖ □

Nodes: 77
Edges: 254
Undirected Graph

Filters ✖ Statistics □

Reset ✖ Filter A+

Attributes

- Dynamic
- Edges
- Operator
- ▼ Topology
 - ☒ Degree Range
 - ☒ Ego Network
 - ☒ Giant Component
 - ☒ Has Self-loop
 - ☒ In Degree Range
 - ☒ K-core
 - ☒ Mutual Degree Range
 - ☒ Neighbors Network
 - ☒ Out Degree Range
- Saved queries

Queries

▼ K-core

Parameters

Drag subfilter here

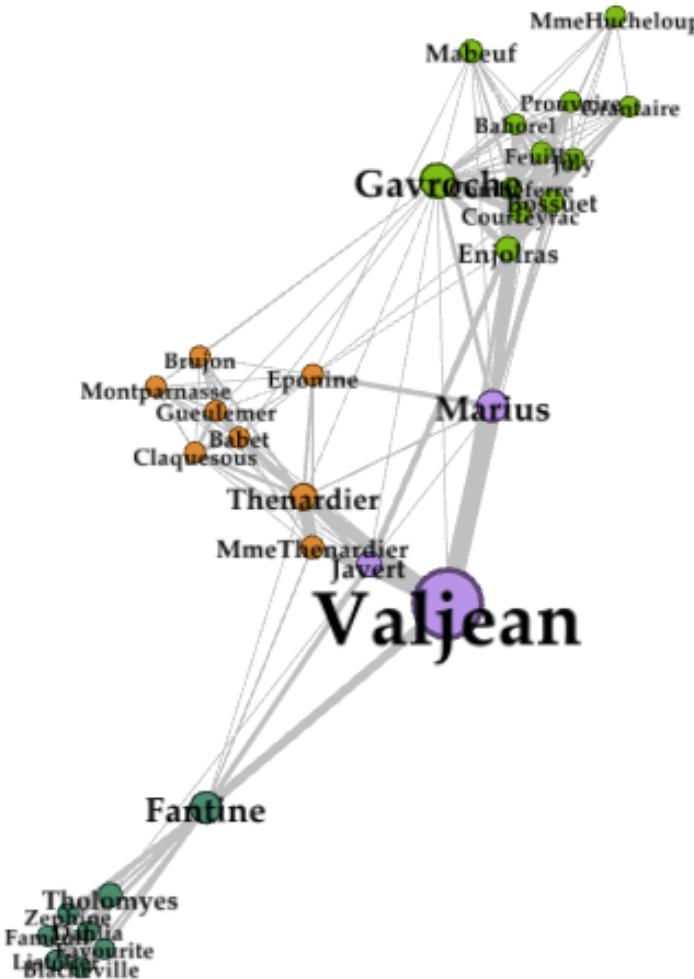
K-core Settings

2

Filter



Filters



Context X

Nodes: 31 (40.26% visible)
Edges: 157 (61.81% visible)

Undirected Graph

Filters Statistics

Reset A

Attributes

- Dynamic
- Edges
- Operator
- ▼ Topology
 - ▼ Degree Range
 - ▼ Ego Network
 - ▼ Giant Component
 - ▼ Has Self-loop
 - ▼ In Degree Range
 - ▼ K-core
 - ▼ Mutual Degree Range
 - ▼ Neighbors Network
 - ▼ Out Degree Range
- Saved queries

Queries

▼ K-core

- Parameters
- Drag subfilter here

K-core Settings

7

Stop



Exporting the image

Gephi 0.9.1 – lesmis.gephi

Overview Data Laboratory Preview

Workspace 1 Workspace 2

Preview Settings Presets Default

Settings Manage renderers

Nodes

- Border Width: 1.0
- Border Color: custom [0,0,0]
- opacity: 100.0

Node Labels

- Show Labels:
- Font: Arial 12 Plain
- Proportional size:
- Color: custom [0,0,0]
- Shorten label:
- Max characters: 30
- Outline size: 0.0
- Outline color: custom [255,255,255]
- Outline opacity: 80.0
- Box:
- Box color: parent
- Box opacity: 100.0

Edges

- Show Edges:
- Thickness: 1.0
- Rescale weight:
- Color: mixed
- Opacity: 100.0
- Curved:

Preview ratio: 100%

Refresh

Export: SVG/PDF/PNG

Background Reset zoom - +

The screenshot displays the Gephi 0.9.1 interface with a network graph titled "lesmis.gephi". The "Preview" tab is highlighted with a red circle. The left sidebar contains the "Preview Settings" panel with sections for "Nodes" and "Edges". The "Nodes" section includes settings for border width (1.0), border color (custom [0,0,0]), and opacity (100.0). The "Edges" section includes settings for show edges (checked), thickness (1.0), rescale weight (unchecked), color (mixed), opacity (100.0), and curved edges (checked). The main canvas shows a complex network of nodes and edges, with nodes colored in various shades of green, orange, purple, blue, and red, and edges in matching colors.



Exporting the image

Gephi 0.9.1 – lesmis.gephi

Overview Data Laboratory Preview

Workspace 1 Workspace 2 Preview

Preview Settings Presets Default

Settings Manage renderers

Nodes

- Border Width: 1.0
- Border Color: custom [0,0,0]
- opacity: 100.0

Node Labels

- Show Labels:
- Font: Arial 12 Plain
- Proportional size:
- Color: custom [0,0,0]
- Shorten label:
- Max characters: 30
- Outline size: 0.0
- Outline color: custom [255,2...
- Outline opacity: 80.0
- Box:
- Box color: parent
- Box opacity: 100.0

Edges

- Show Edges:
- Thickness: 1.0
- Rescale weight:
- Color: mixed
- Opacity: 100.0
- Curved:

Preview ratio: 100%

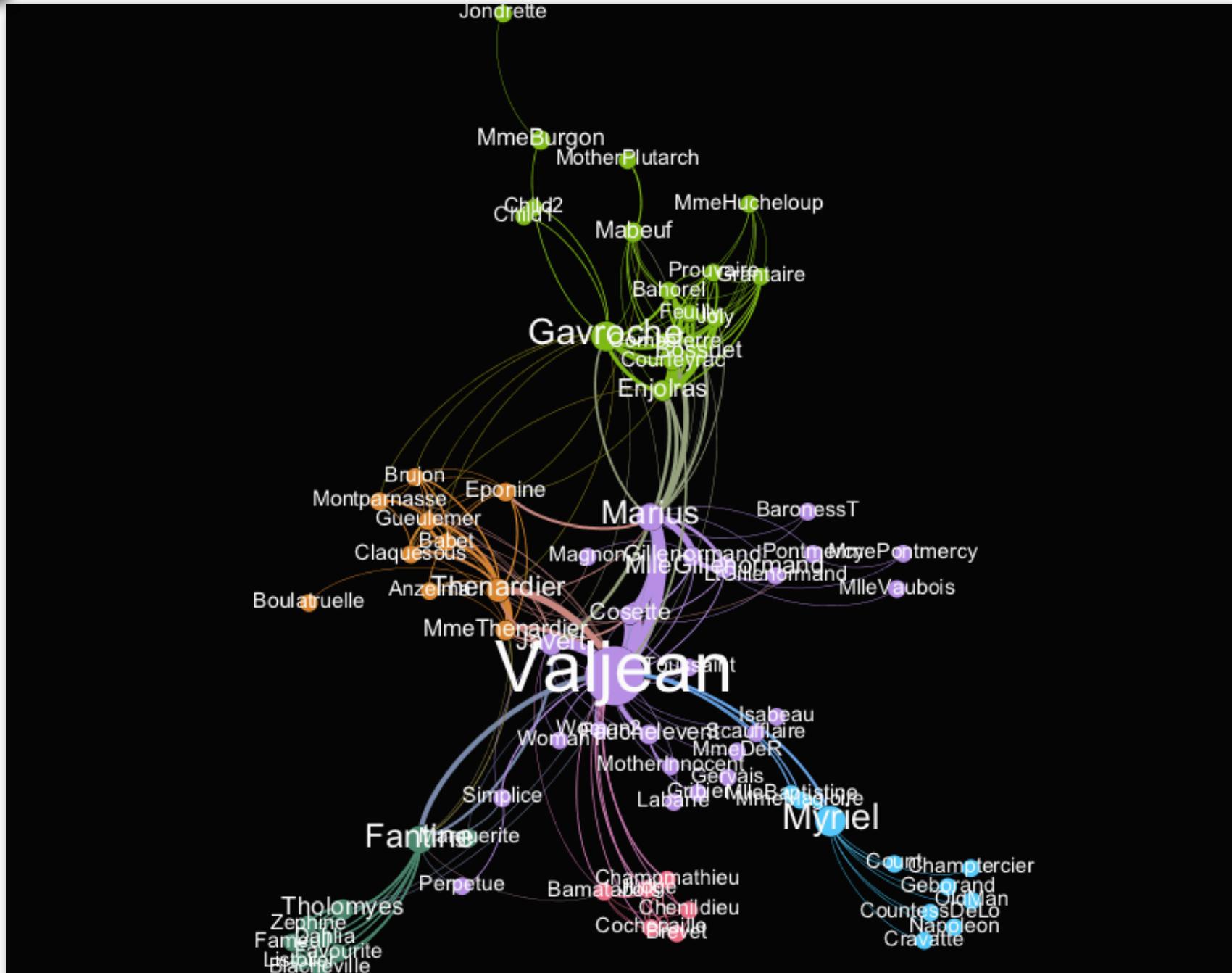
Refresh Export: SVG/PDF/PNG Background Reset zoom - +

The network graph displays character relationships in Les Misérables. Key clusters include:

- Valjean Cluster (Purple):** Valjean, Cosette, Marius, BaronneT, MmeGillormand, Gillormand, Pontmercy, MmePontmercy, MilleGillormand, LChillormand, MilleVaubois.
- Thénardier Cluster (Orange):** Thénardier, Eponine, Brujon, Montparnasse, Gueulemer, Babot, Claquebous, Boulattruelle, AnzelThénardier, MmeThénardier, Javert, Tuguet.
- Gavroche Cluster (Yellow):** Gavroche, Child1, Child2, Mabeuf, Prougeon, Banorel, Feuilly, Combeferre, Courfeyrac, Enjolras.
- Fantine Cluster (Green):** Fantine, Perpetue, Simplice, Labane, MmeBaptistine, Isabeau, Woman2, BouHelever, Rcauffaire, MmeDeR, MotherInnocent, Gervais, Labane, MmeMagloire.
- Other Clusters:** Jondrette, MmeBurgon, MotherPlutarch, MmeHucheloup, Gavroche, Mabeuf, Prougeon, Banorel, Feuilly, Combeferre, Courfeyrac, Enjolras, Marius, BaronneT, MmeGillormand, Gillormand, Pontmercy, MmePontmercy, MilleGillormand, LChillormand, MilleVaubois, Valjean, Cosette, Boulattruelle, AnzelThénardier, MmeThénardier, Javert, Tuguet, Tholomyes, Zephine, Famaglira, Fancourtine, Blacheville, Champmathieu, Bamatabielle, Chendieu, Cocheville, Brevet, CountChamptercier, Geborand, OldMan, CountessDeLo, Napoleon, Cravatelle.



Exporting the image





Exporting the image

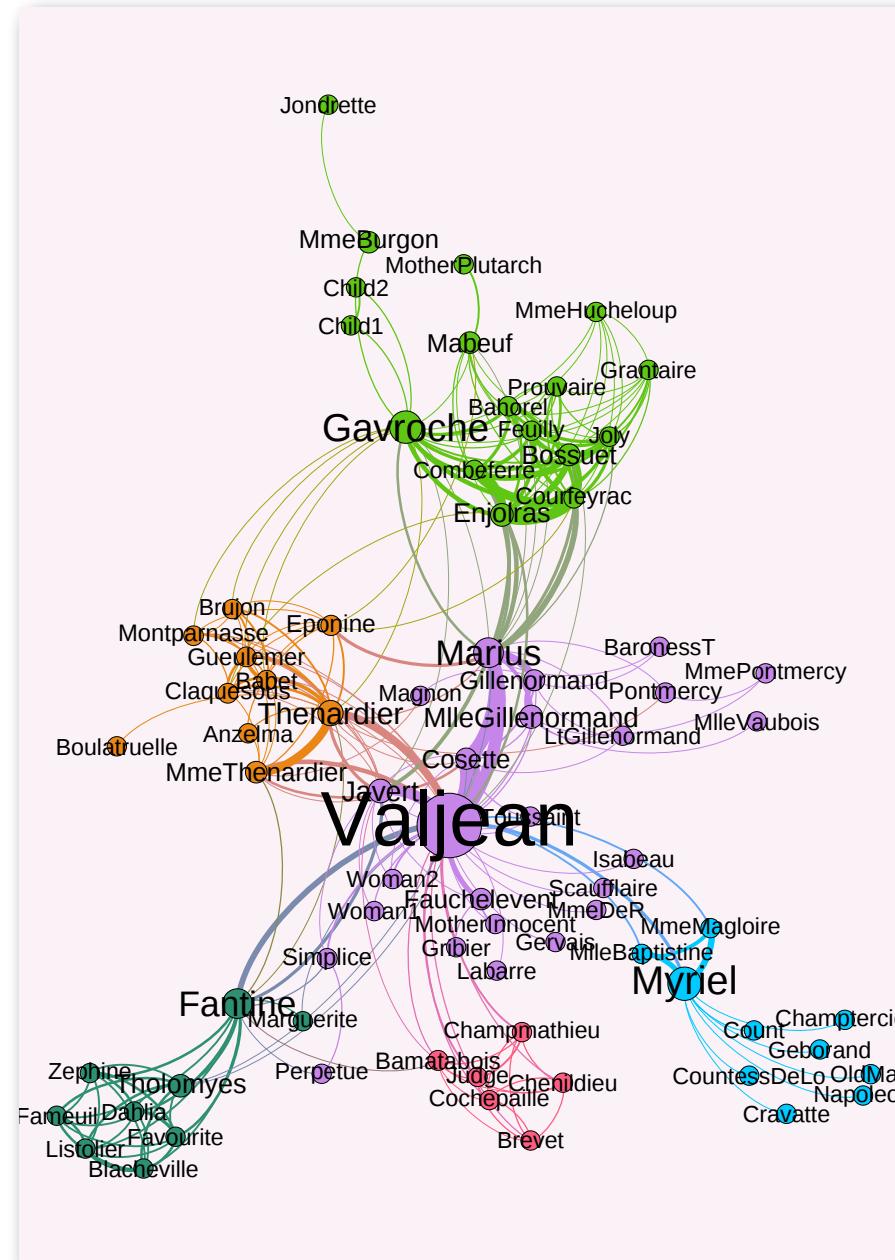
Screenshot of Gephi 0.9.1 interface showing the export process for a network visualization of characters from Les Misérables.

The interface includes:

- File menu:** New Project, Open..., Open Recent..., Close Project, Properties..., Import spreadsheet..., Import Database, Import..., Generate, Save, Save As... (highlighted), Export (highlighted), Graph file..., SVG/PDF/PNG file... (highlighted).
- Preview Settings panel:** Presets (Default selected), Nodes, Node Labels, Edges, Preview ratio: 100%, Refresh button, Export button (highlighted).
- Preview window:** Preview tab, Preview dialog.
- Network graph:** Nodes represent characters, edges represent relationships. Key clusters include "Valjean" (purple), "Gavroche" (green), "Fantine" (blue), and "Marius" (orange). Nodes include Jondrette, MmeBurgon, MotherPlutarch, Child2, MmeHucheloup, Prouvaire, Bahorel, Feuilly, Comerre, Courfeyrac, Enjolras, Brujon, Montparnasse, Gueulemer, Babet, Claquesous, Boulattruelle, Anzel, Thenardier, MmeThenardier, Magnon, Gillenormand, Pontmercy, BaronessT, Cosette, Toulssaint, Isabeau, Woman, Fauchever, Cauffaire, MmeDeR, MotherInnocent, Gervais, Labane, Minervois, Simplice, Perpetue, Tholomyes, Zephine, Famille, Lisbeth, Blacheville, Champmathieu, Bamatteuse, Chenildieu, Cocherelle, Brevet, Courfeyrac, Cr...



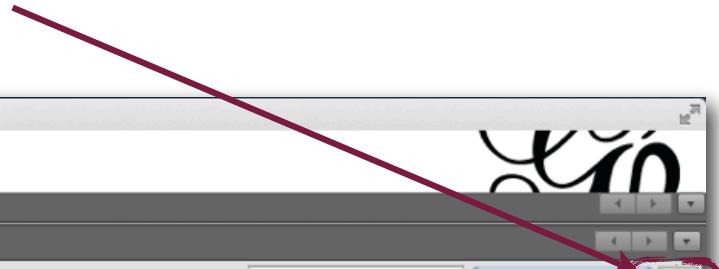
Exporting the image





Exporting statistics

Choose properties to display



Gephi 0.9.1 – lesmis.gephi

Overview Data Laboratory Preview

Workspace 1 Workspace 2

Data Table

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: Id

Id	Label	Interval	Degree	Weighted Degree	Clustering Coefficient	Number of triangles
0.0	Myriel		10	31.0	0.066667	3
1.0	Napoleon		1	1.0	0.0	0
2.0	MlleBaptistine		3	17.0	1.0	3
3.0	MmeMagloire		3	19.0	1.0	3
4.0	CountessDeLo		1	1.0	0.0	0
5.0	Geborand		1	1.0	0.0	0
6.0	Champtercier		1	1.0	0.0	0
7.0	Cravatte		1	1.0	0.0	0
8.0	Count		1	2.0	0.0	0
9.0	OldMan		1	1.0	0.0	0
10.0	Labarre		1	1.0	0.0	0
11.0	Valjean	36	158.0	0.120635	76	
12.0	Marguerite	2	3.0	1.0	1	
13.0	MmeDeR	1	1.0	0.0	0	
14.0	Isabeau	1	1.0	0.0	0	
15.0	Gervais	1	1.0	0.0	0	
16.0	Tholomyes	9	26.0	0.611111	22	
17.0	Listolier	7	24.0	1.0	21	
18.0	Fameuil	7	24.0	1.0	21	
19.0	Blacheville	7	25.0	1.0	21	
20.0	Favourite	7	26.0	1.0	21	
21.0	Dahlia	7	25.0	1.0	21	
22.0	Zephine	7	24.0	1.0	21	
23.0	Fantine	15	47.0	0.314286	33	
24.0	MmeThenardier	11	34.0	0.490909	27	
25.0	Thenardier	16	61.0	0.408333	49	
26.0	Cosette	11	68.0	0.381818	21	
27.0	Javert	17	47.0	0.323529	44	
28.0	Fauchelevent	4	14.0	0.333333	2	

Add column Merge columns Delete column Clear column Copy data to other column Fill column with a value Duplicate column Create a boolean column from regex match Create column with list of regex matching groups Negate boolean values Convert column to dynamic



Exporting statistics

Gephi 0.9.1 – lesmis.gephi

Overview Data Laboratory Preview

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7.0	Cravatte		1	1.0	0.0	0
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Update network

Gephi 0.9.1 – lesmis.gephi

Overview Data Laboratory Preview

Workspace 1 Workspace 2

Data Table

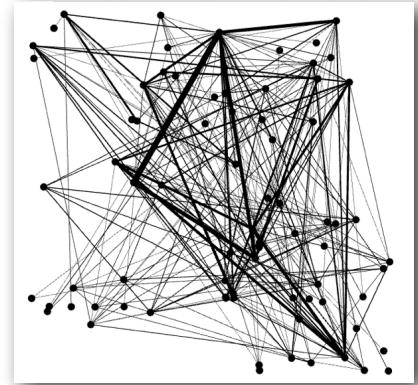
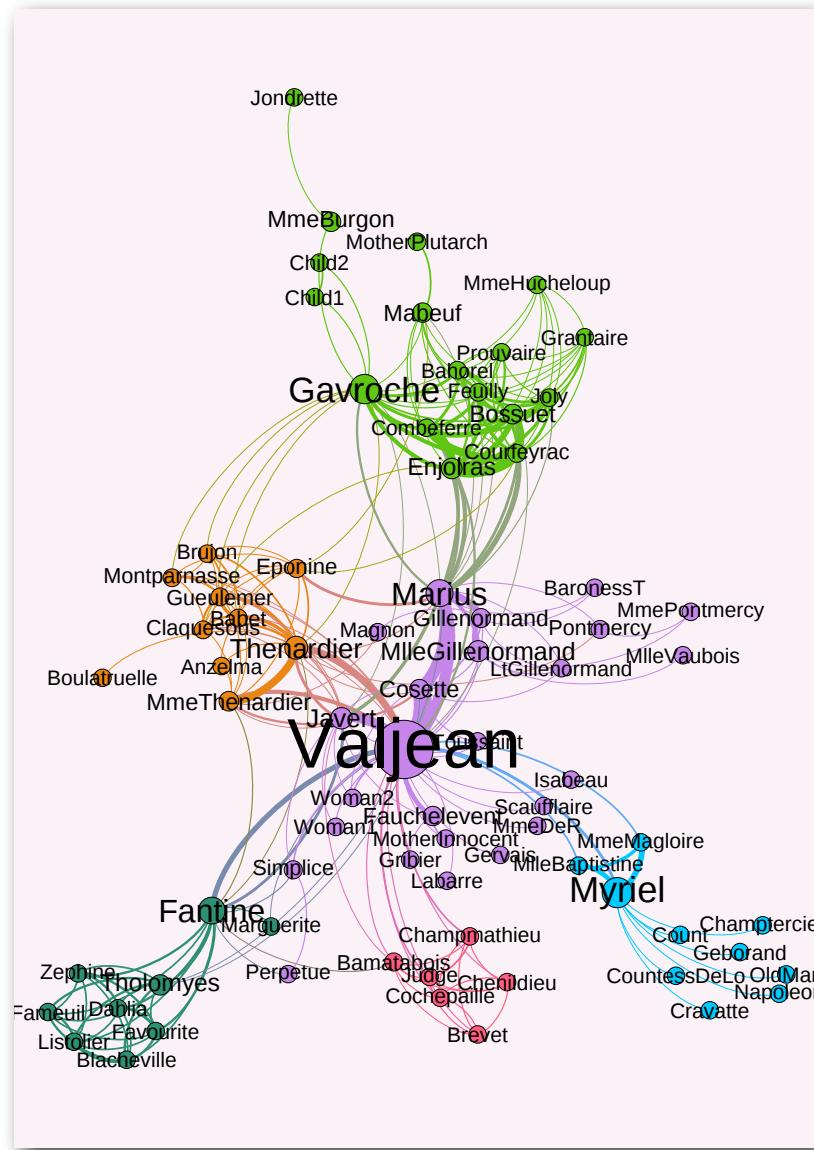
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7.0	Cravatte		1	1.0	0.0	0
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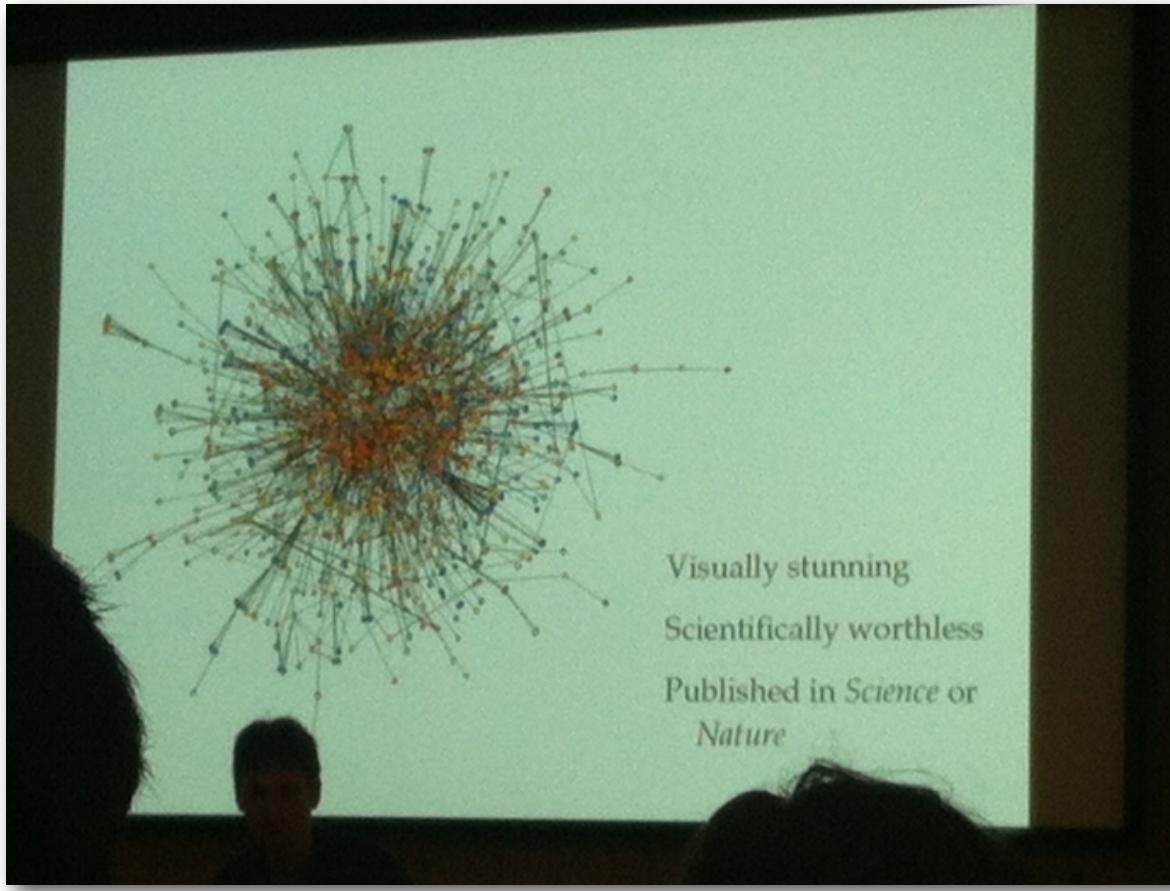
About the network



NOT done at this point! What have we learned about the network from the visualisation exercise? What are we showing?



Hairballs are not useful



Definition: “Ridiculogram”

Visually stunning. Scientifically worthless. Published in Science or Nature.

- Mark Newman 2014



Visualising networks

- Good to have a ‘feeling’ for the network
- It is possible to visualise very large networks, but the data should be processed in a meaningful way first
- If you work with networks, sooner or later you will need to implement operations that are not already implemented
- Start exploring/creating your own tools! One of your best friends in this process:





Practice, practice, practice!

Now it is your turn!

You have another network - a (rather outdated) network science collaboration network. Visualise and explore this network with Gephi.

Be prepared to comment on and tell us about it. Is it modular? If so, what does these modules correspond to? Are there hubs? If so, how would you interpret them? What do other centrality measures tell you?



Wednesday: NetworkX

NetworkX

[NetworkX Home](#) | [Documentation](#) | [Download](#) | [Developer \(Github\)](#)

High-productivity software for complex networks

NetworkX is a Python language software package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks.



[Documentation](#)

all documentation

[Examples](#)

using the library

[Reference](#)

all functions and methods

Features

- Python language data structures for graphs, digraphs, and multigraphs.
- Many standard graph algorithms
- Network structure and analysis measures
- Generators for classic graphs, random graphs, and synthetic networks
- Nodes can be "anything" (e.g. text, images, XML records)
- Edges can hold arbitrary data (e.g. weights, time-series)
- Open source [BSD license](#)
- Well tested: more than 1800 unit tests, >90% code coverage
- Additional benefits from Python: fast prototyping, easy to teach, multi-platform

Versions

Latest Release

networkx-1.11
30 January 2016
[downloads](#) | [docs](#) | [pdf](#)

Development

2.0dev
[github](#) | [docs](#) | [pdf](#)
[build](#) passing
[coverage](#) 94%

Contact

[Mailing list](#)
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