Big Data Analytics

Case Study: Social Network Analysis

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SKKU

Introduction

- **Gephi** is an interactive visualization and exploration platform for all kinds of networks.
- OS: Windows, Linux and Mac OS X
- Open-source and free
  - Download: https://gephi.org/

Introduction

- Supported Data Formats:
  - GEXF, GDF, GML, GraphML, Pajek NET, GraphViz DOT, CSV, UCINET DL, Tulip TPL, Netdraw VNA, Spreadsheet
- Sample datasets are available at:

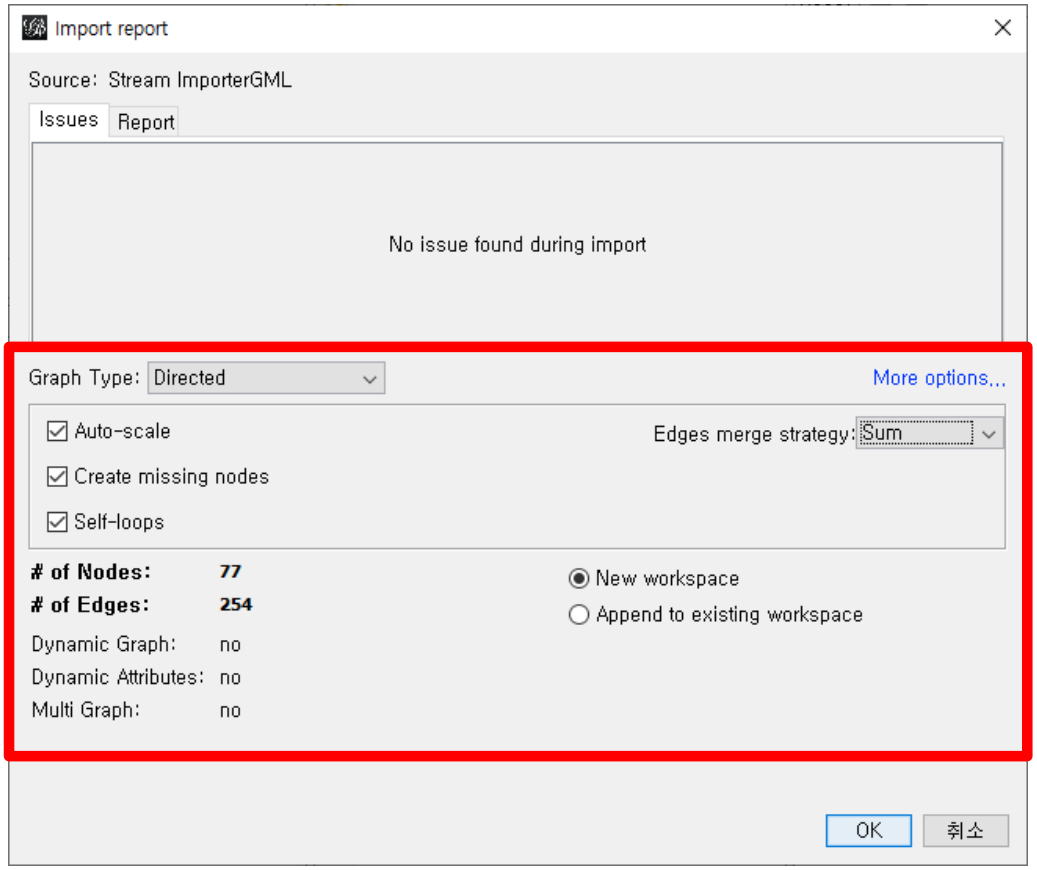
https://github.com/gephi/gephi/wiki/Datasets

- Gephi Wiki

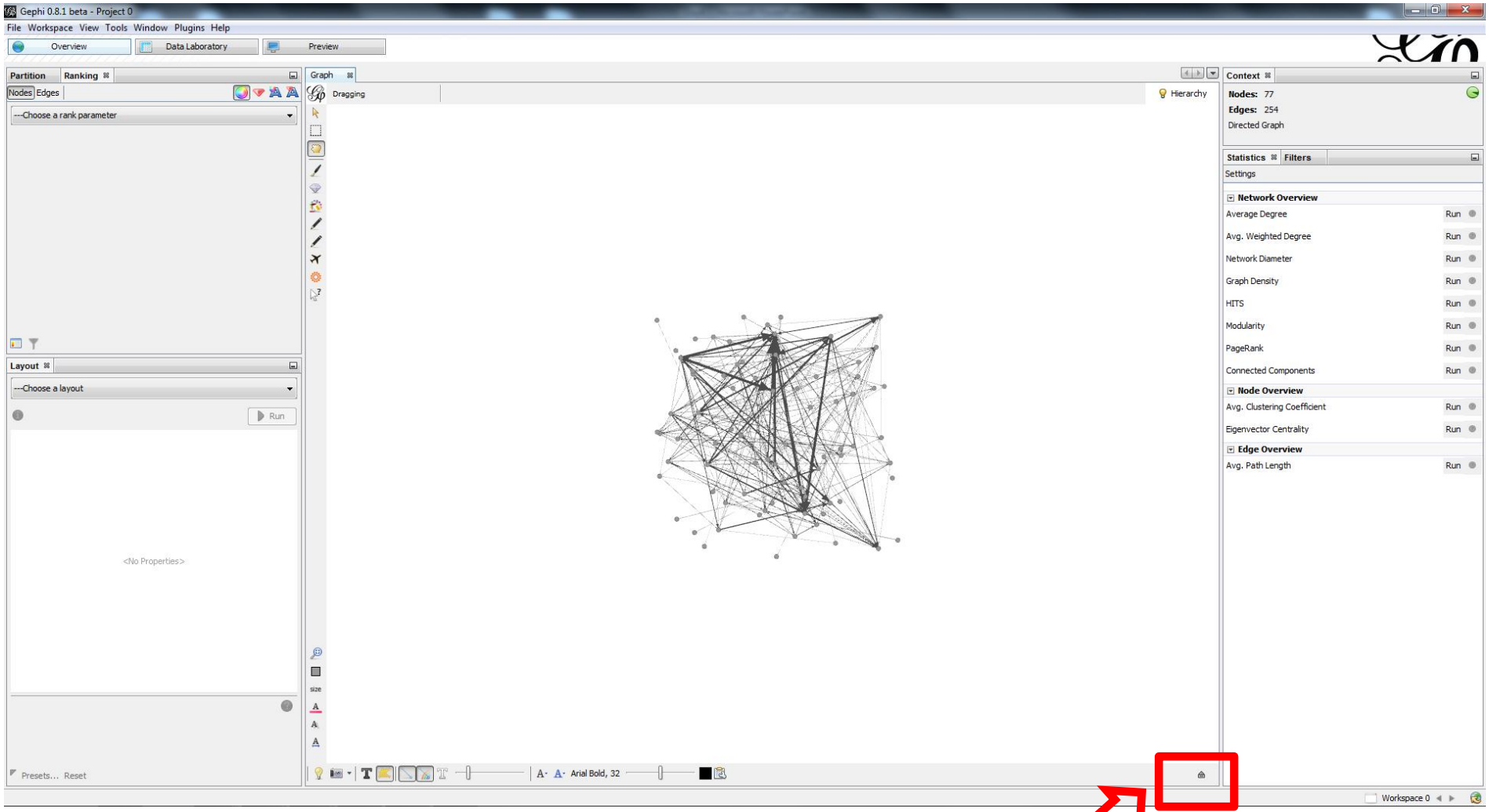
https://github.com/gephi/gephi/wiki

Import Graph

- File > Open > Select “lesmiserables.gml”

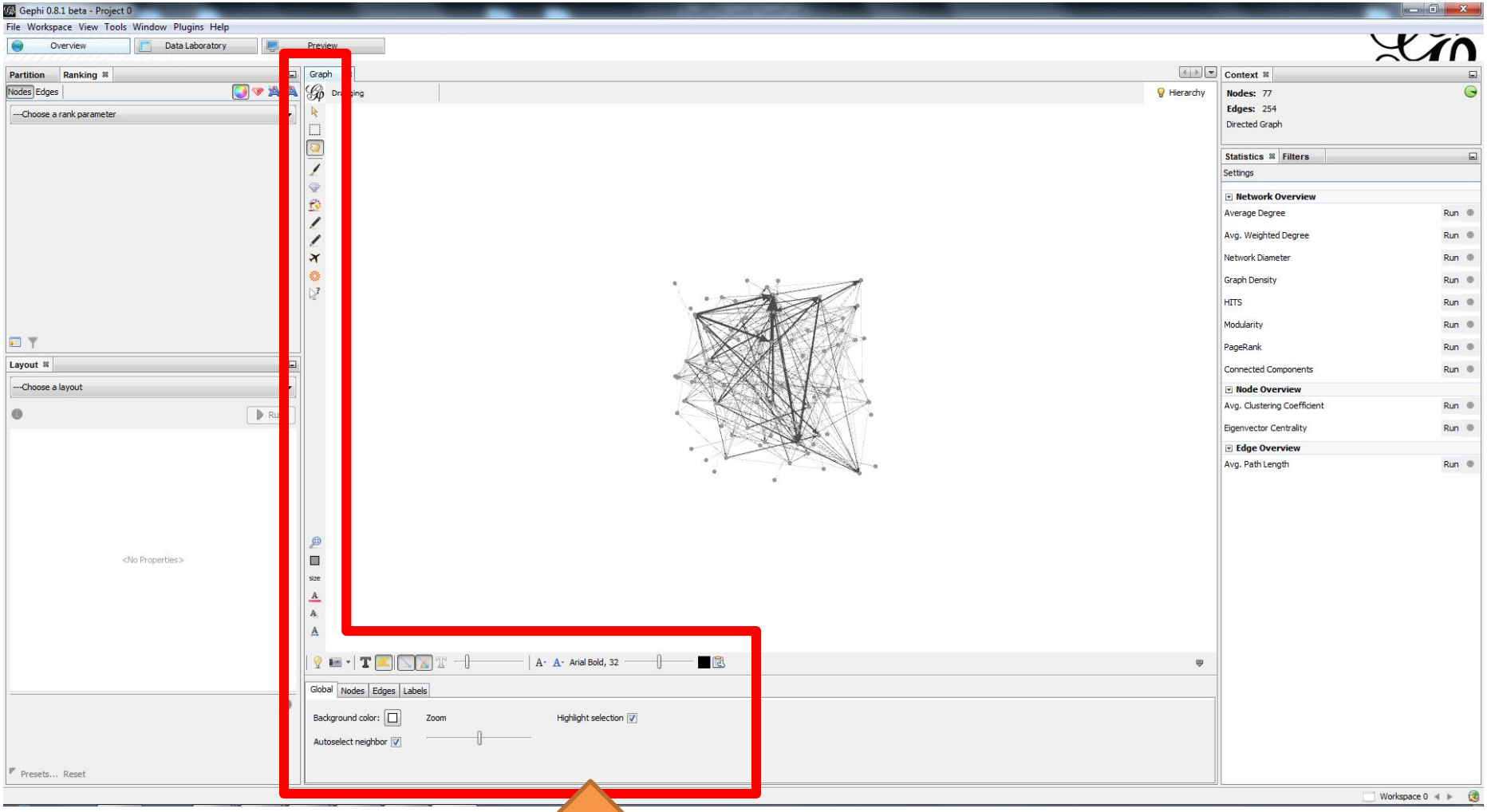


Visualization



Click this icon to see more visualization options.

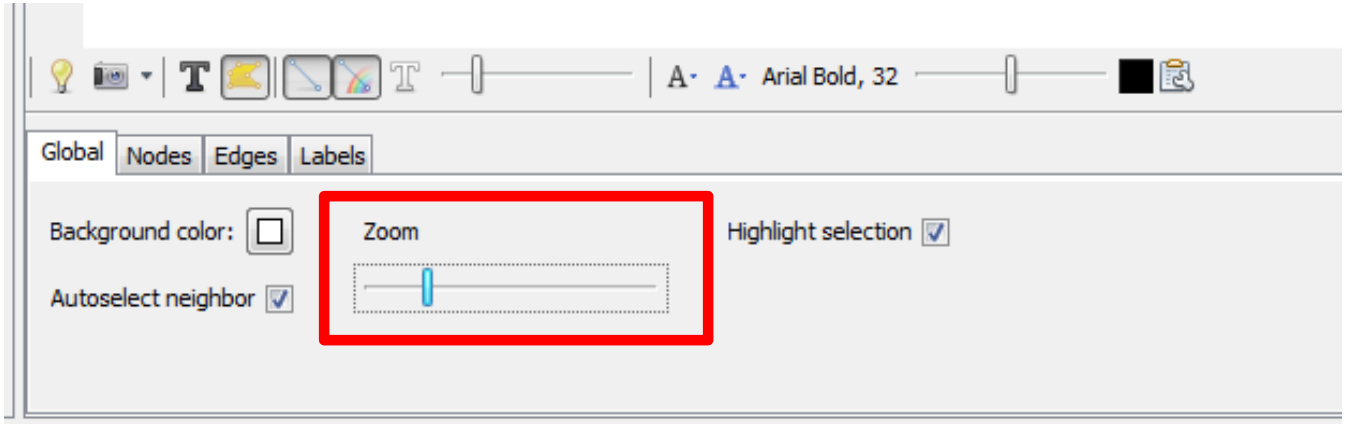
Visualization



Visualization Options

Visualization

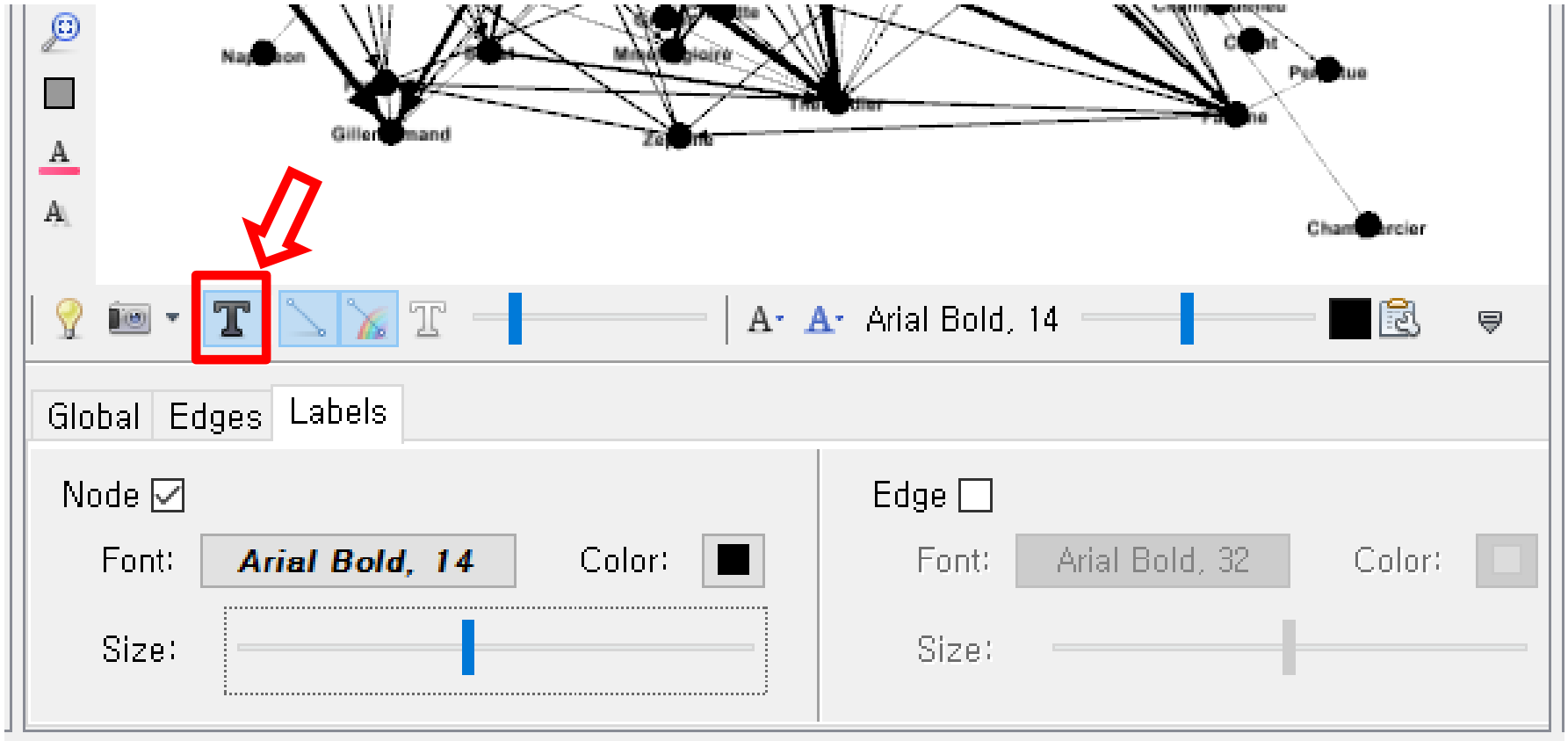
- Zoom In/Out (bottom panel)



- Move the screen
  - Mouse right click + Drag

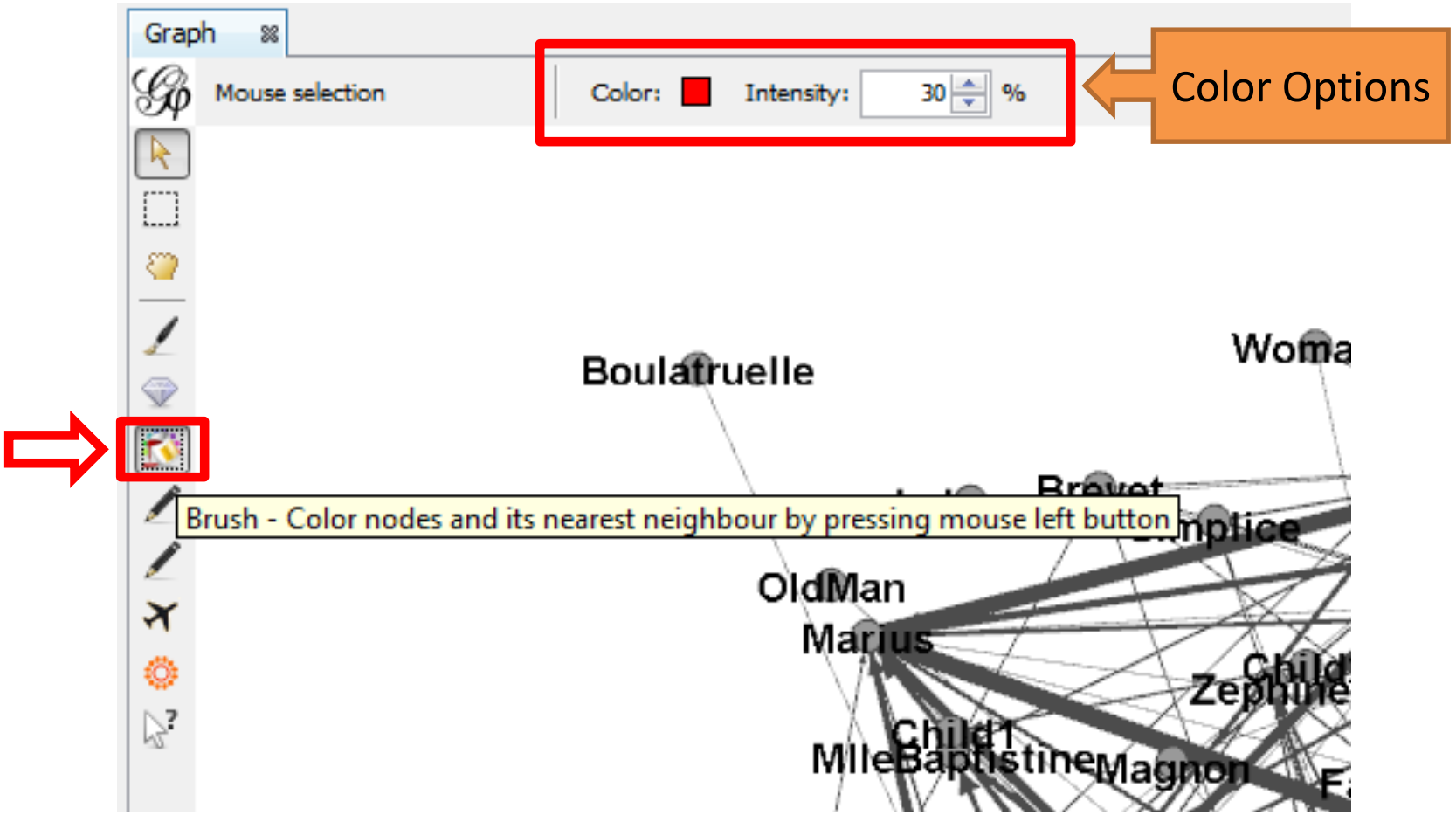
Show Node Label

- At the bottom panel, click 



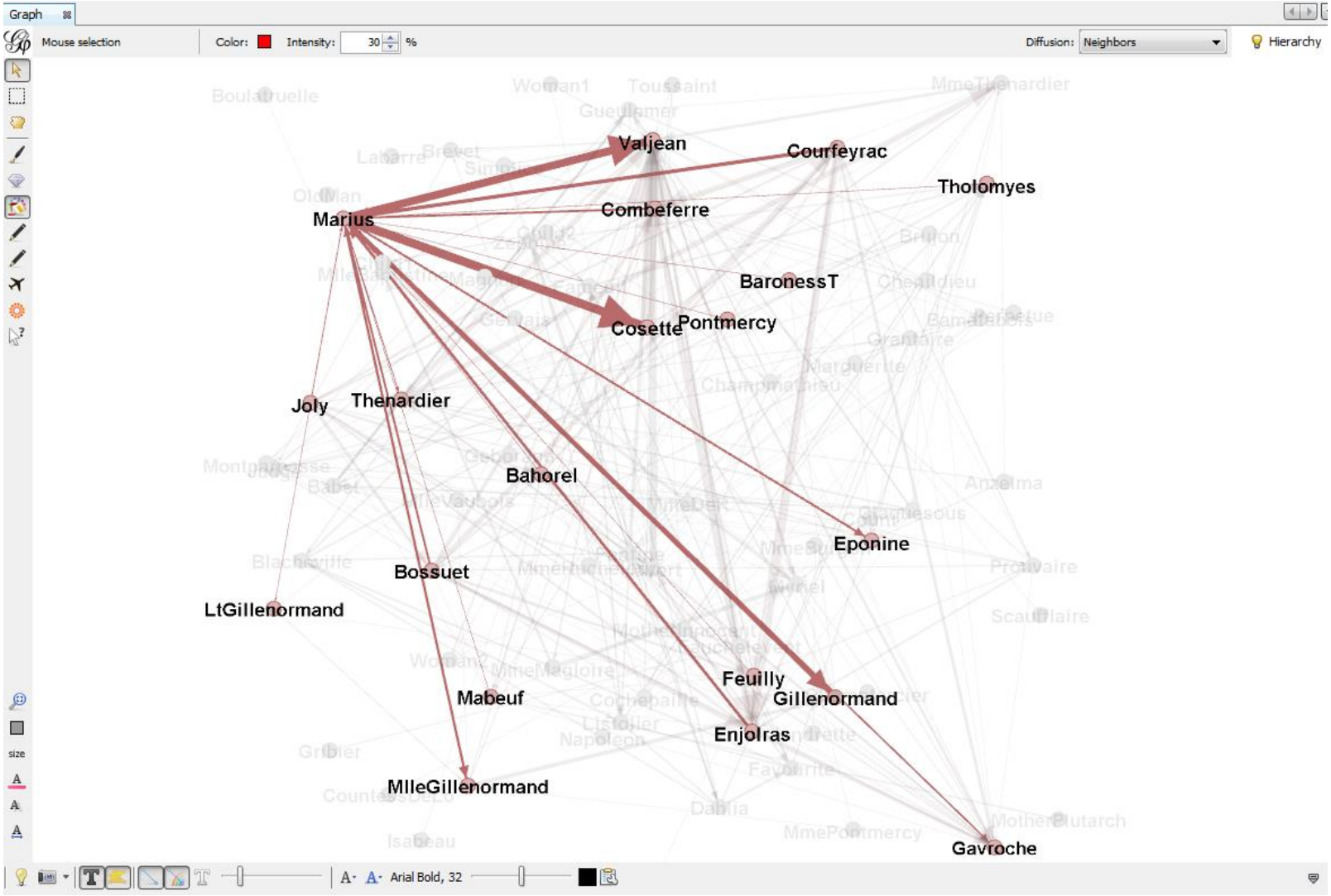
Color a particular node and its neighbors

- On the left panel, click 



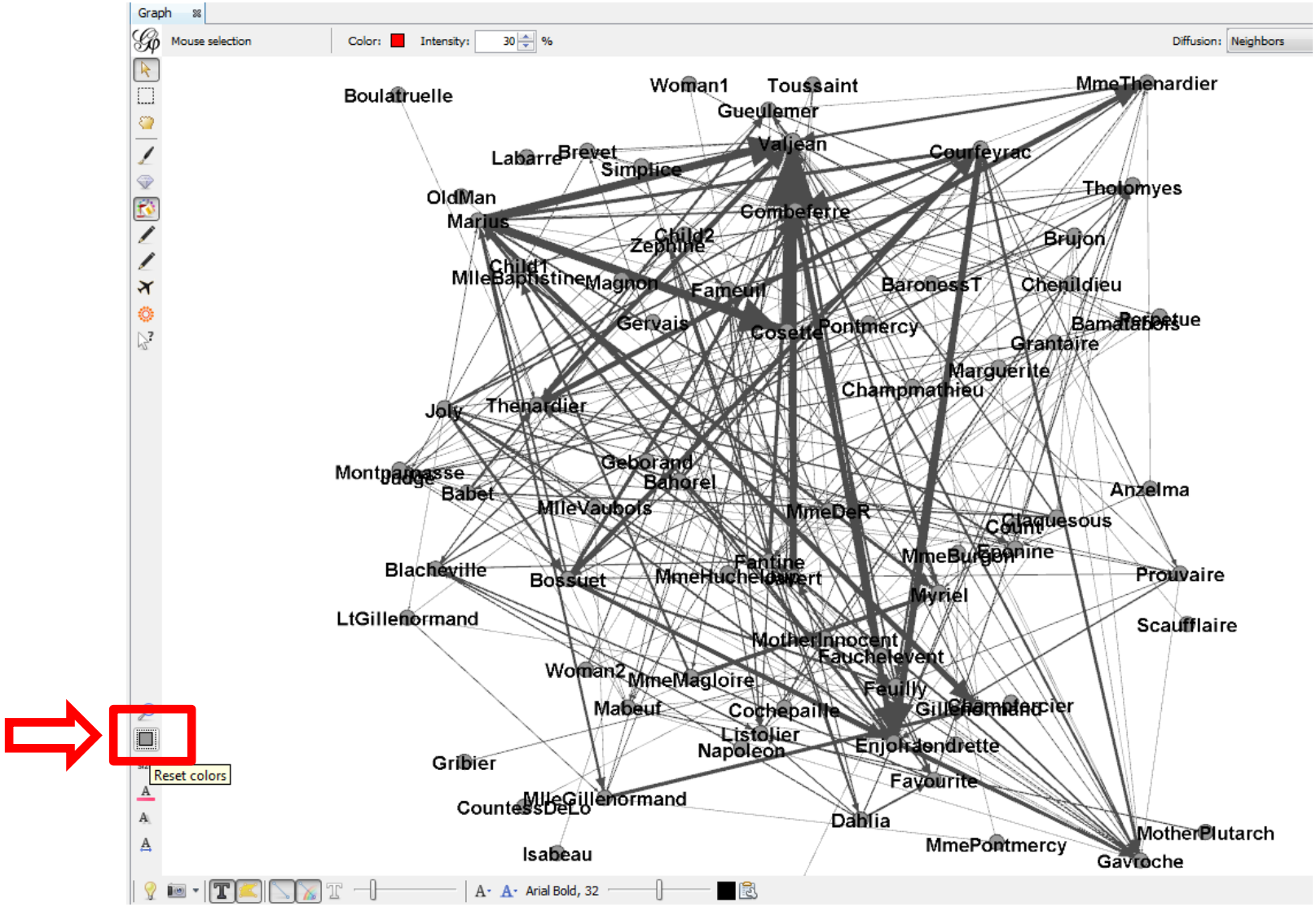
Color a particular node and its neighbors

- Click the target node.

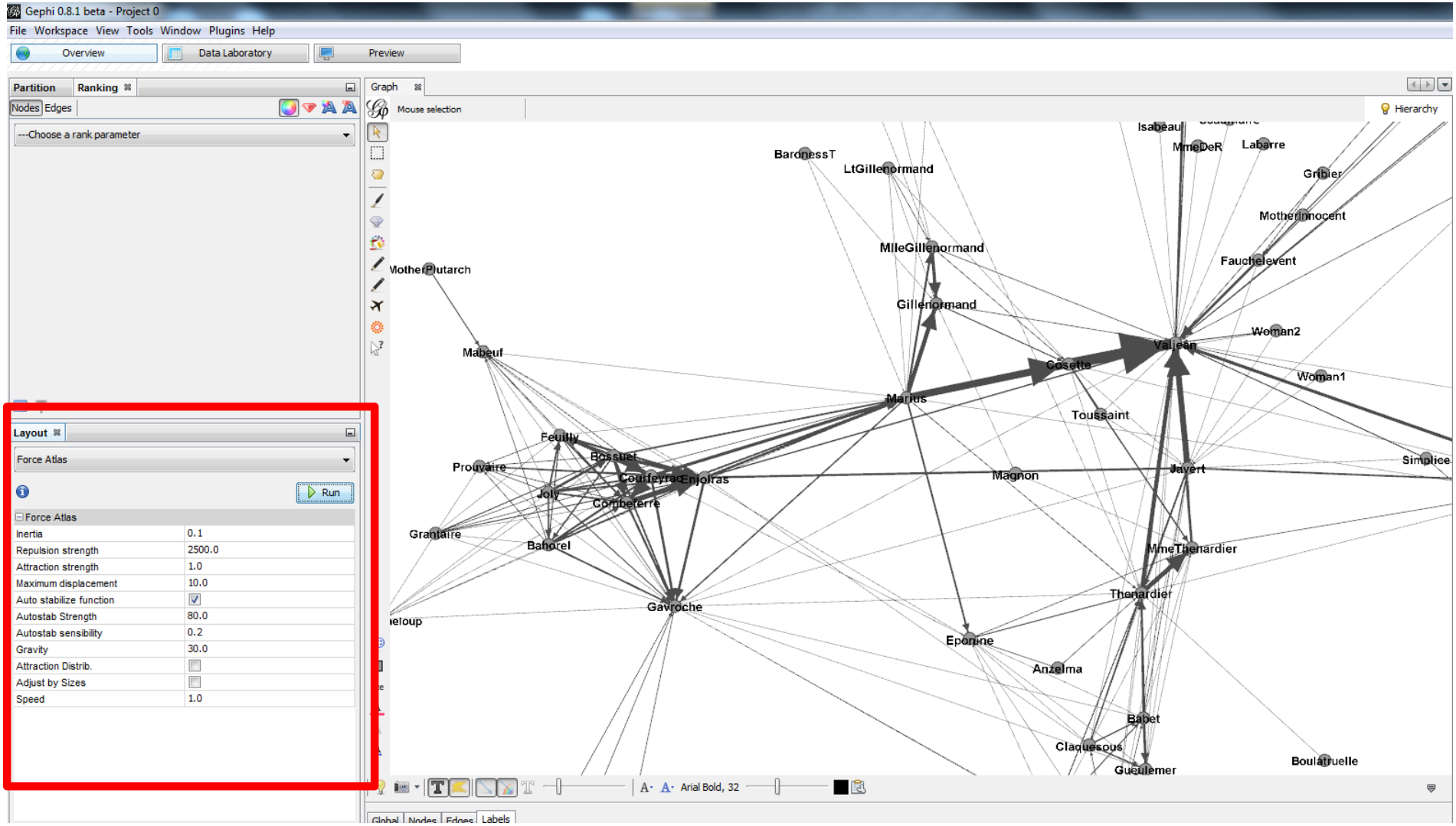


Reset the color

- On the left panel, click 

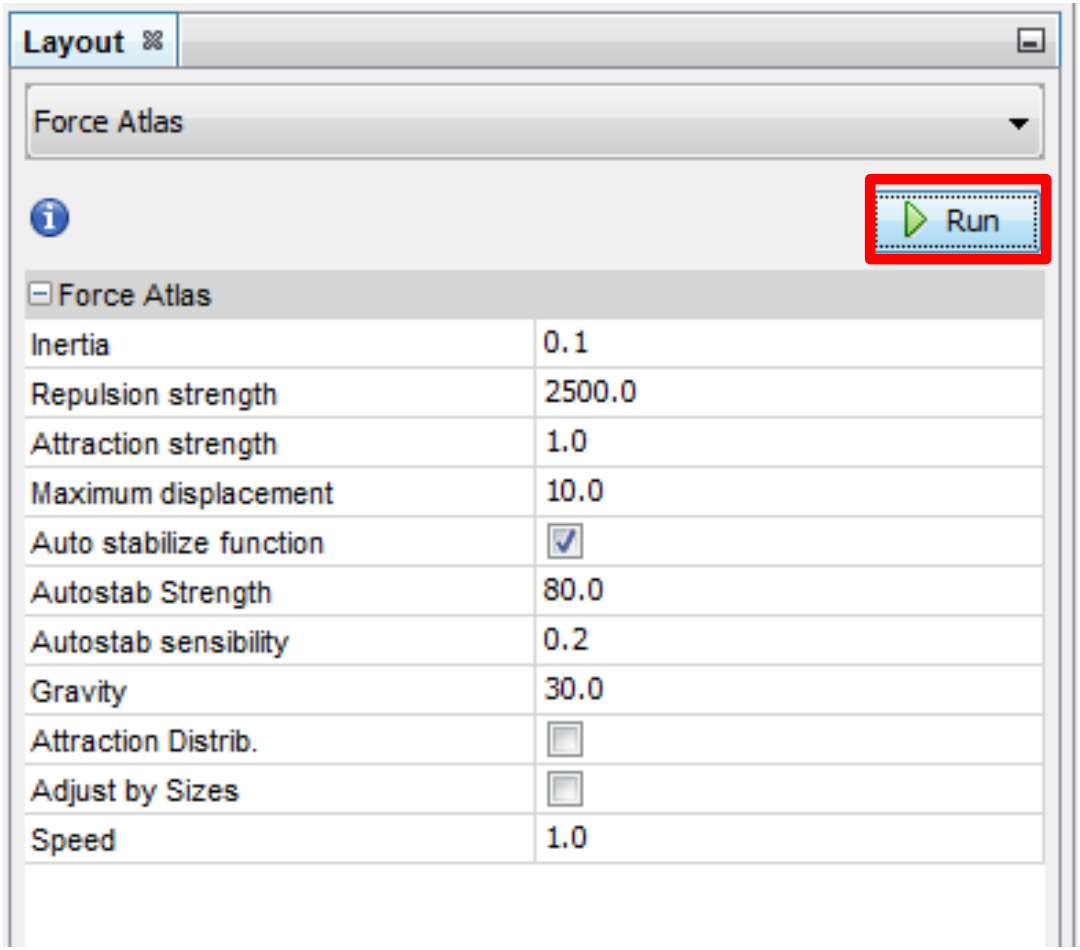


Graph Layout



Graph Layout

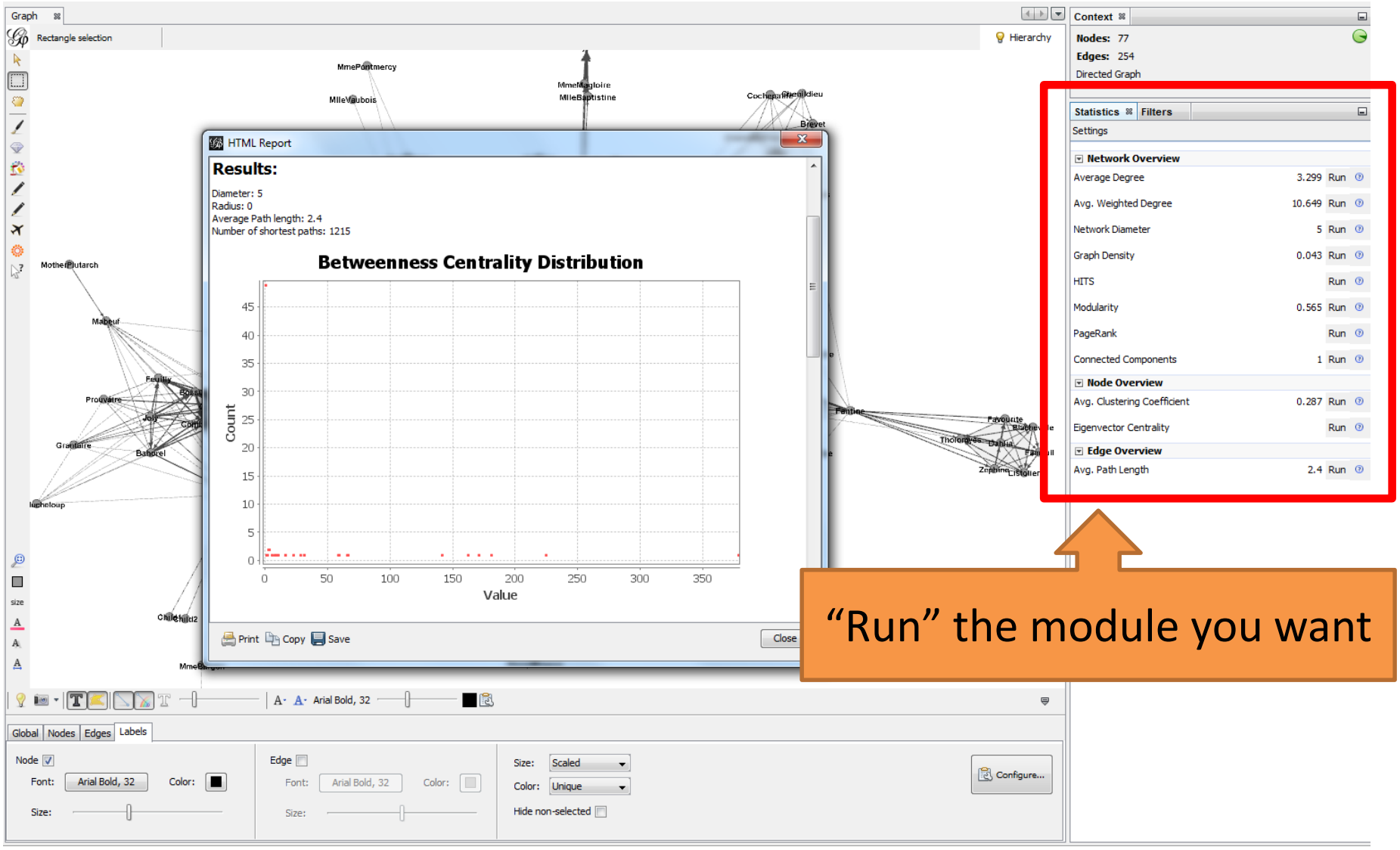
- Change the parameters as follows:



Network Statistics

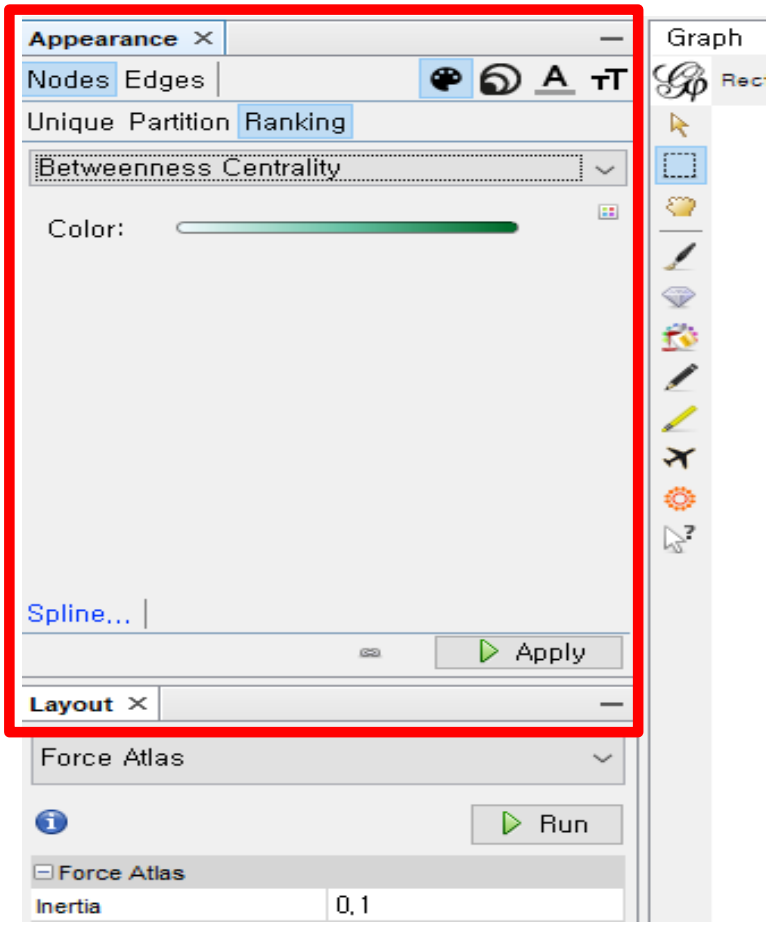
- We can calculate the following statistics:
  - Average Degree
  - Network Diameter
  - Graph Density
  - Hubs and Authorities
  - Modularity
  - PageRank
  - Clustering Coefficient
  - Eigenvector Centrality

Network Statistics



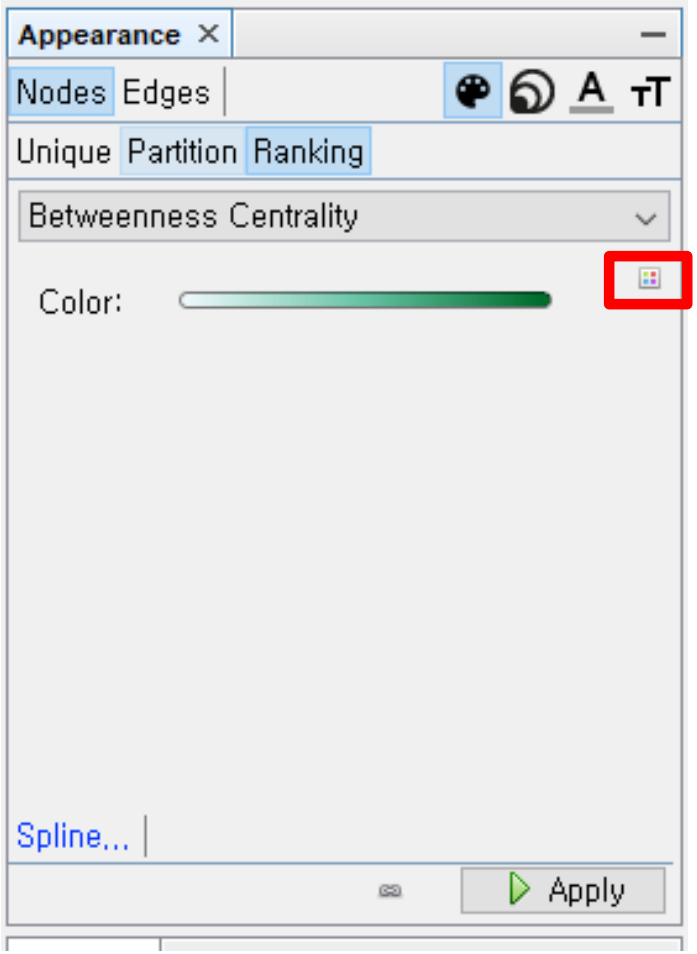
Change Node Color

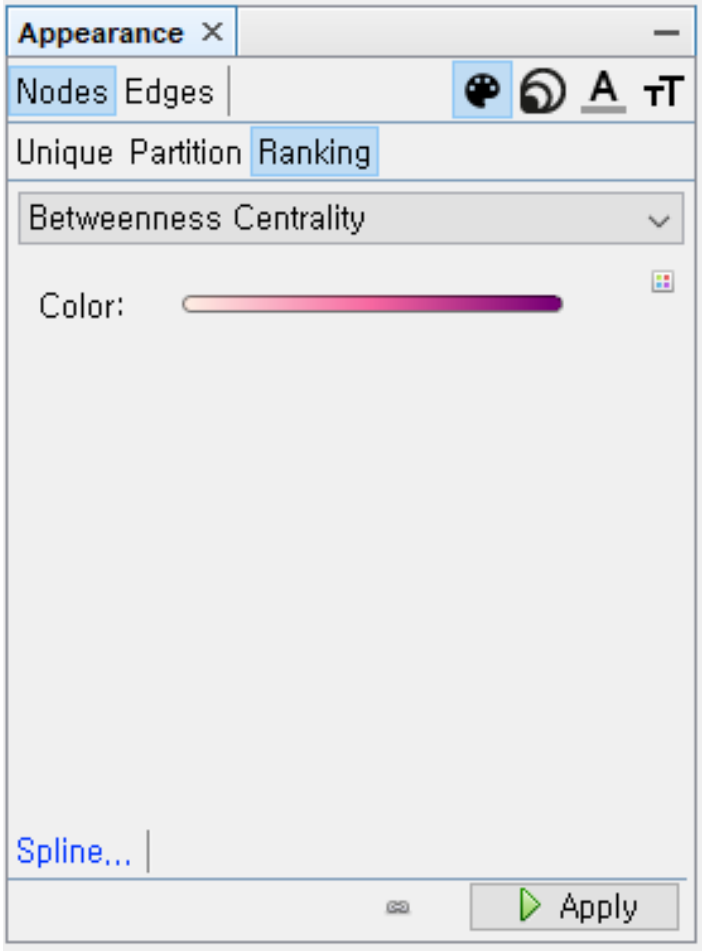
- We can change node color according to its statistics (e.g. degree, Betweenness centrality, …)



Change Node Color

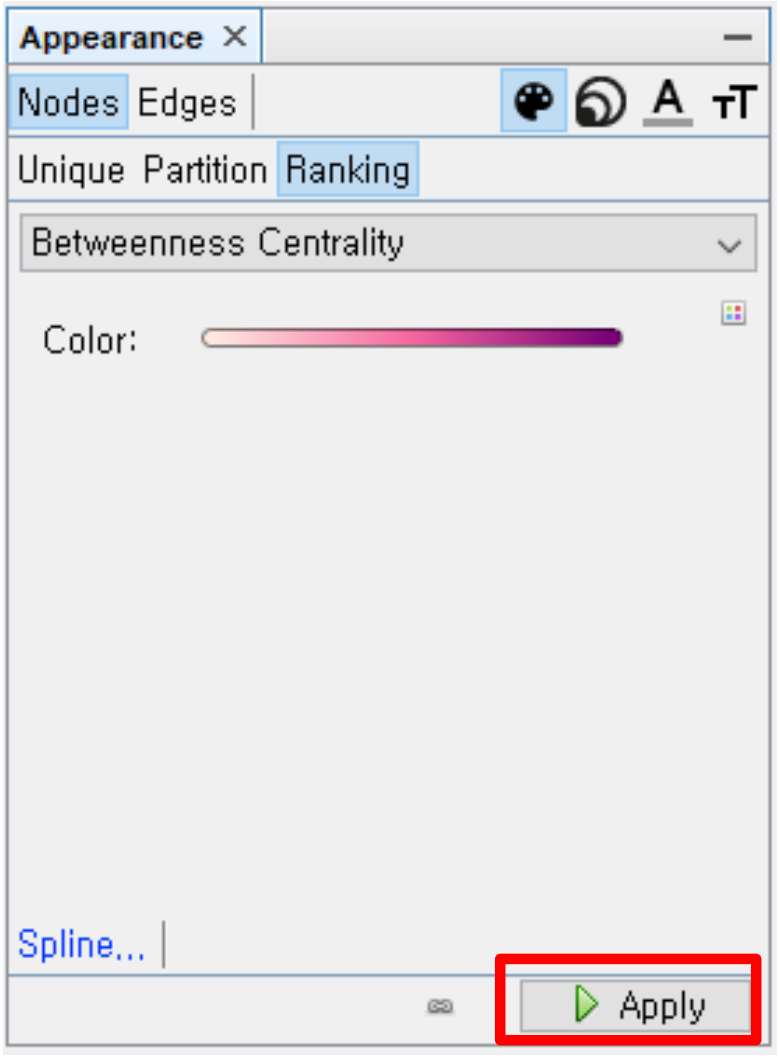
- Right Icon click > Default > Select color



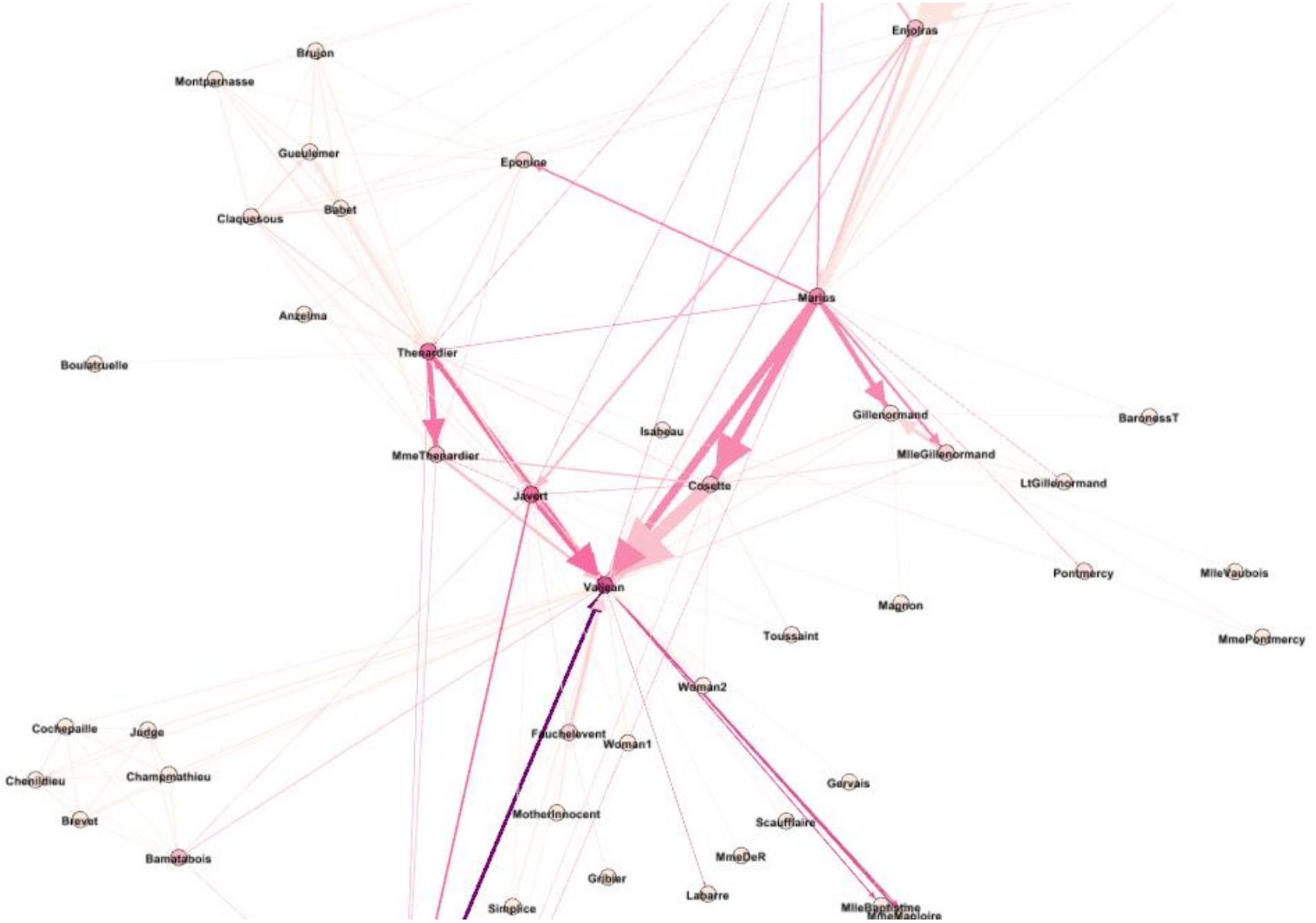


Change Node Color

- Click “apply”

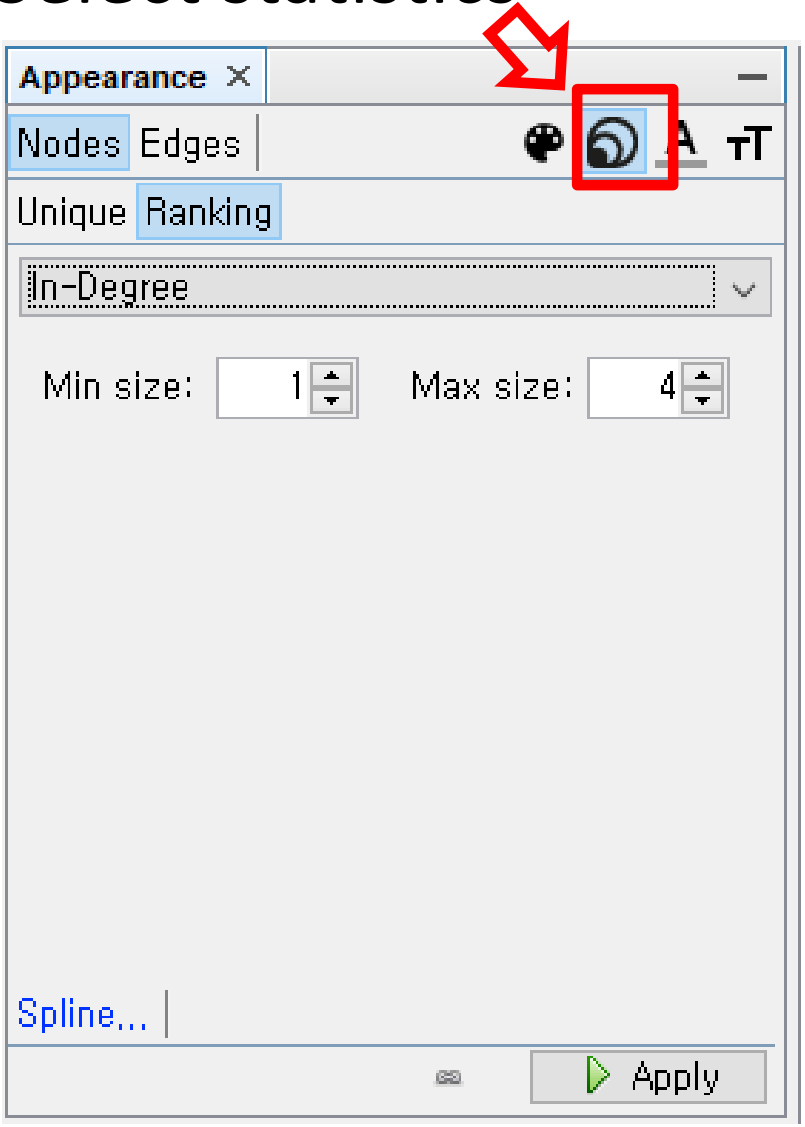


Change Node Color



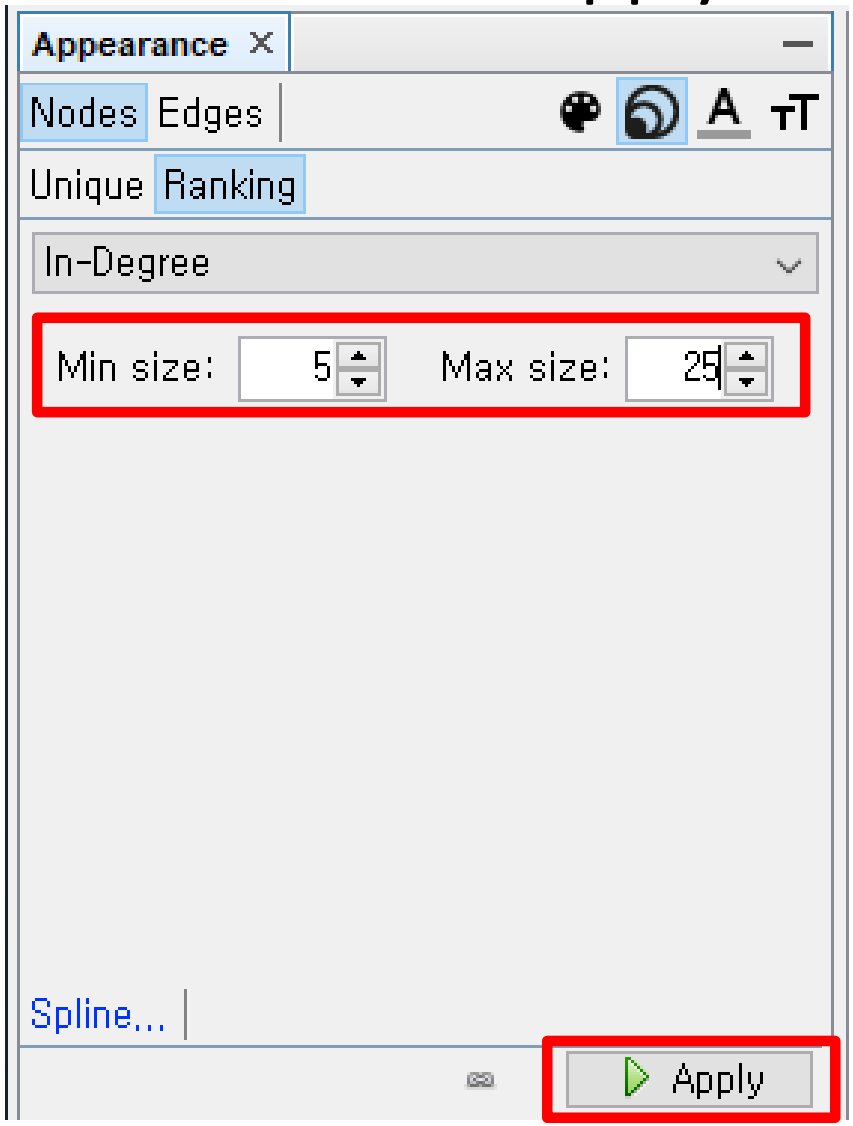
Change Node Size

- Click  > Select statistics

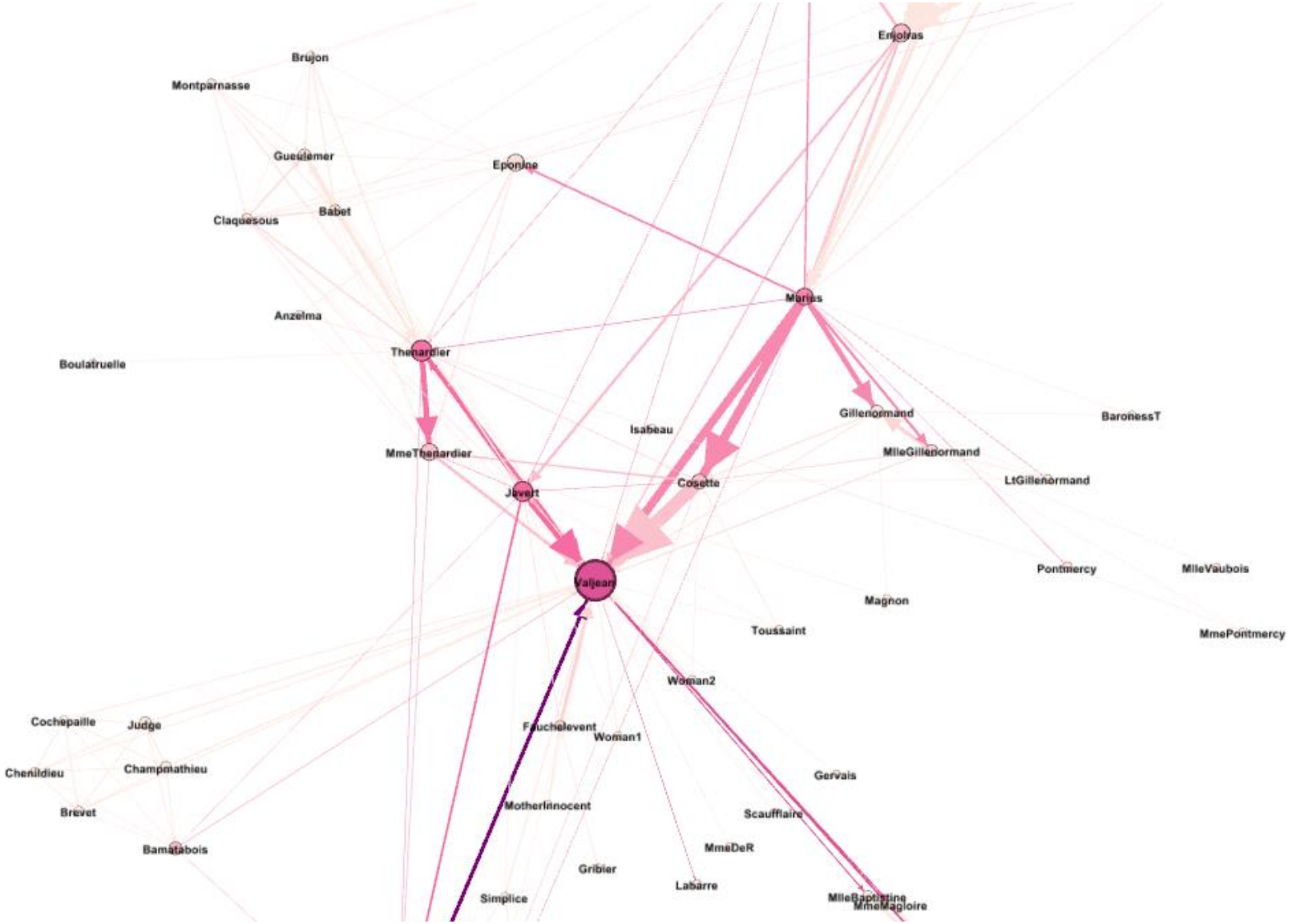


Change Node Size

- Set Min/Max size > Click “apply”

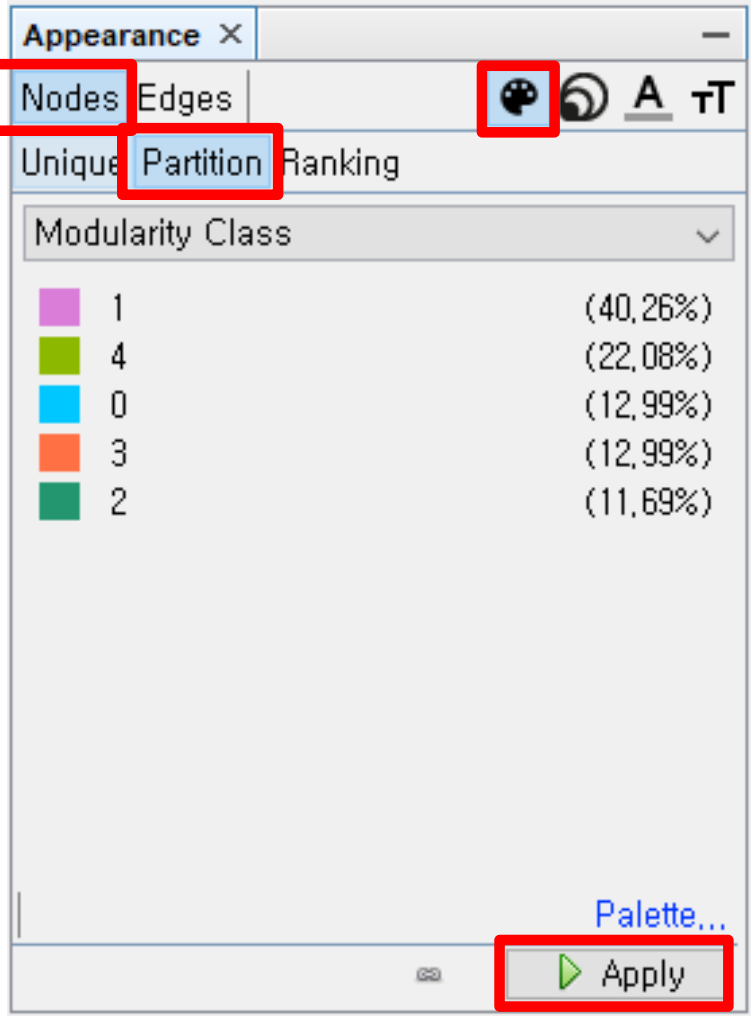


Change Node Size

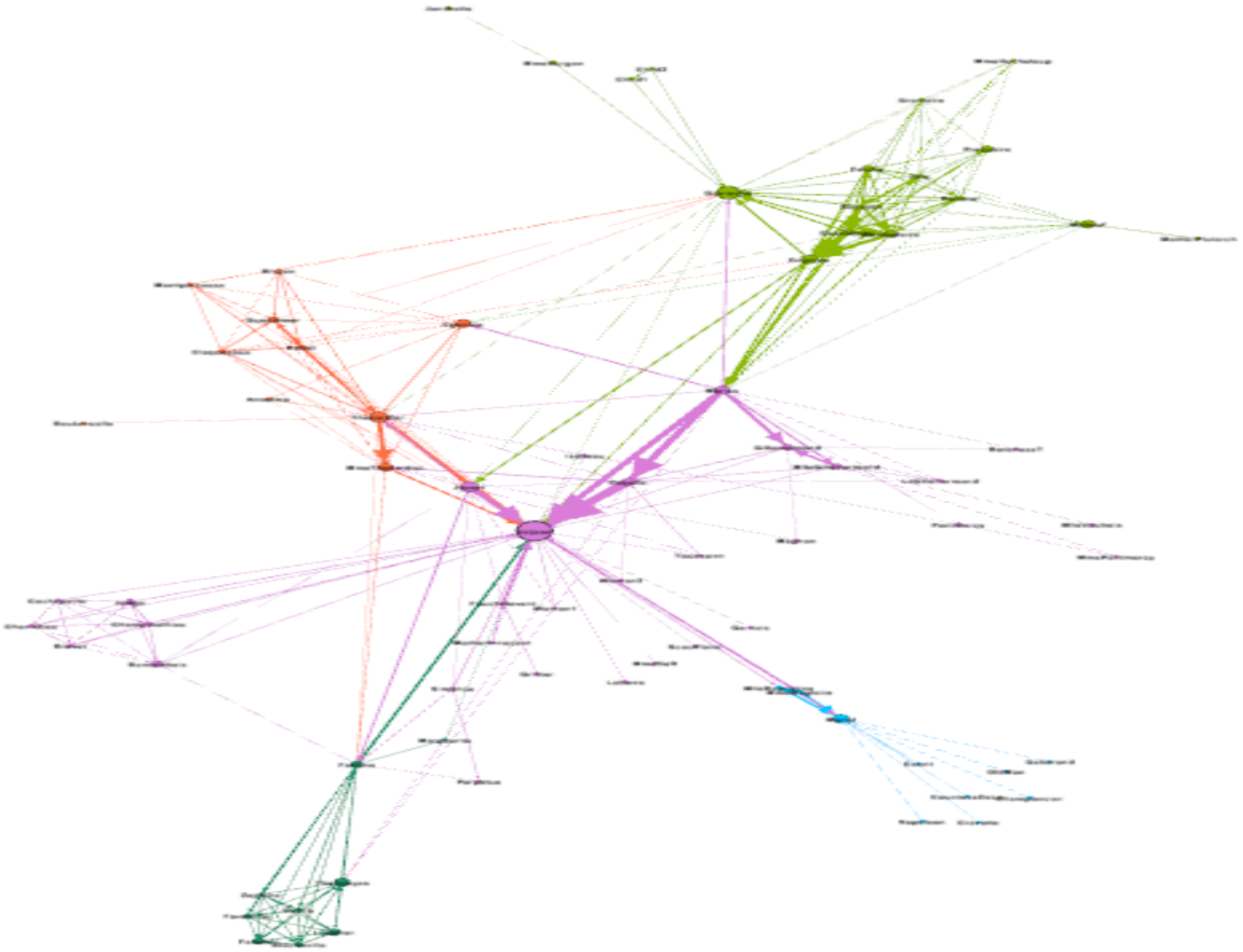


Partition the Graph

- Click Nodes > Click  > Click “Partition” tab > Select “Modularity Class” > Click “Apply”

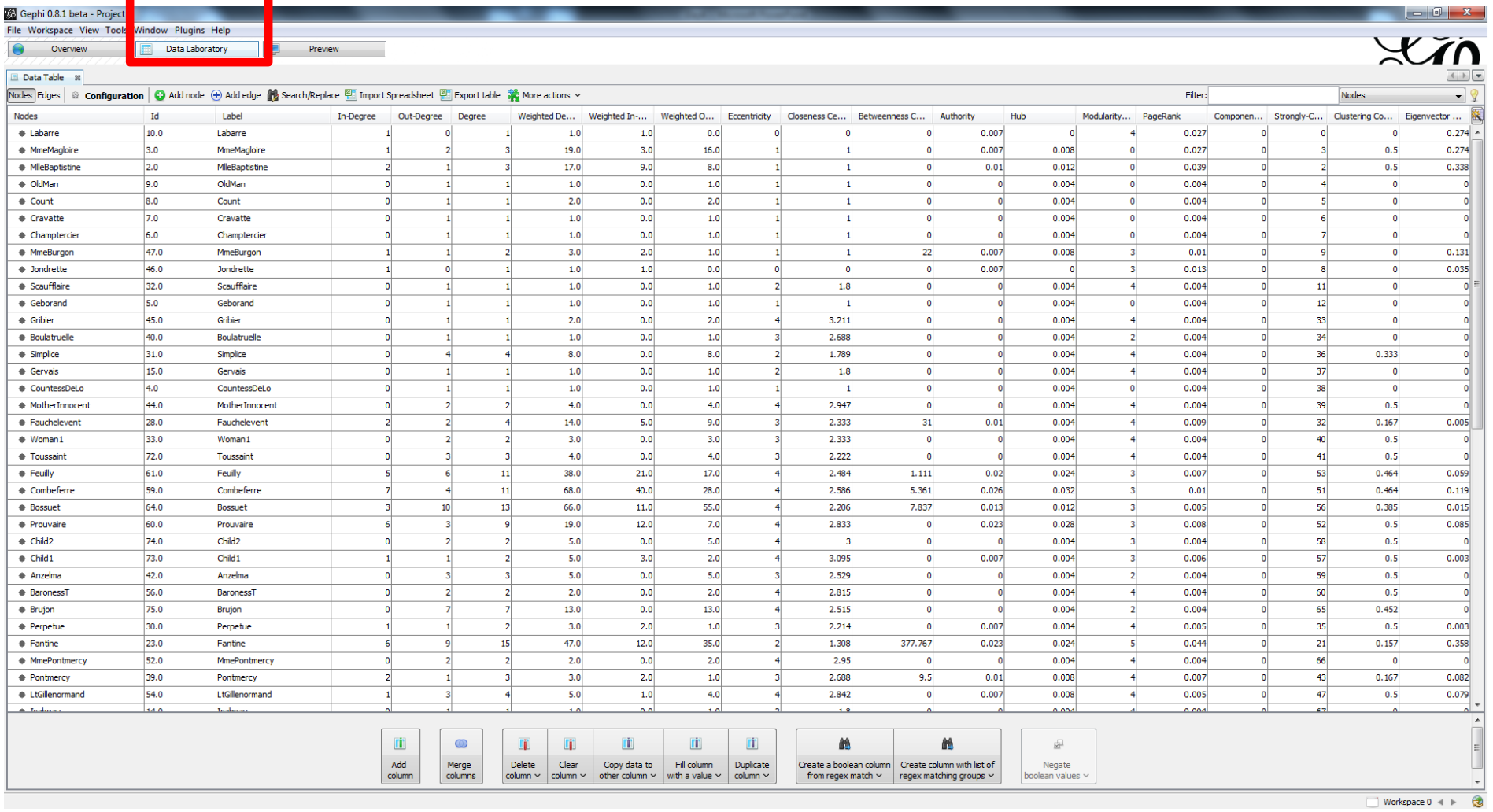


Partition the Graph



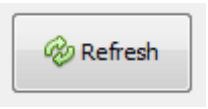
Data Editing

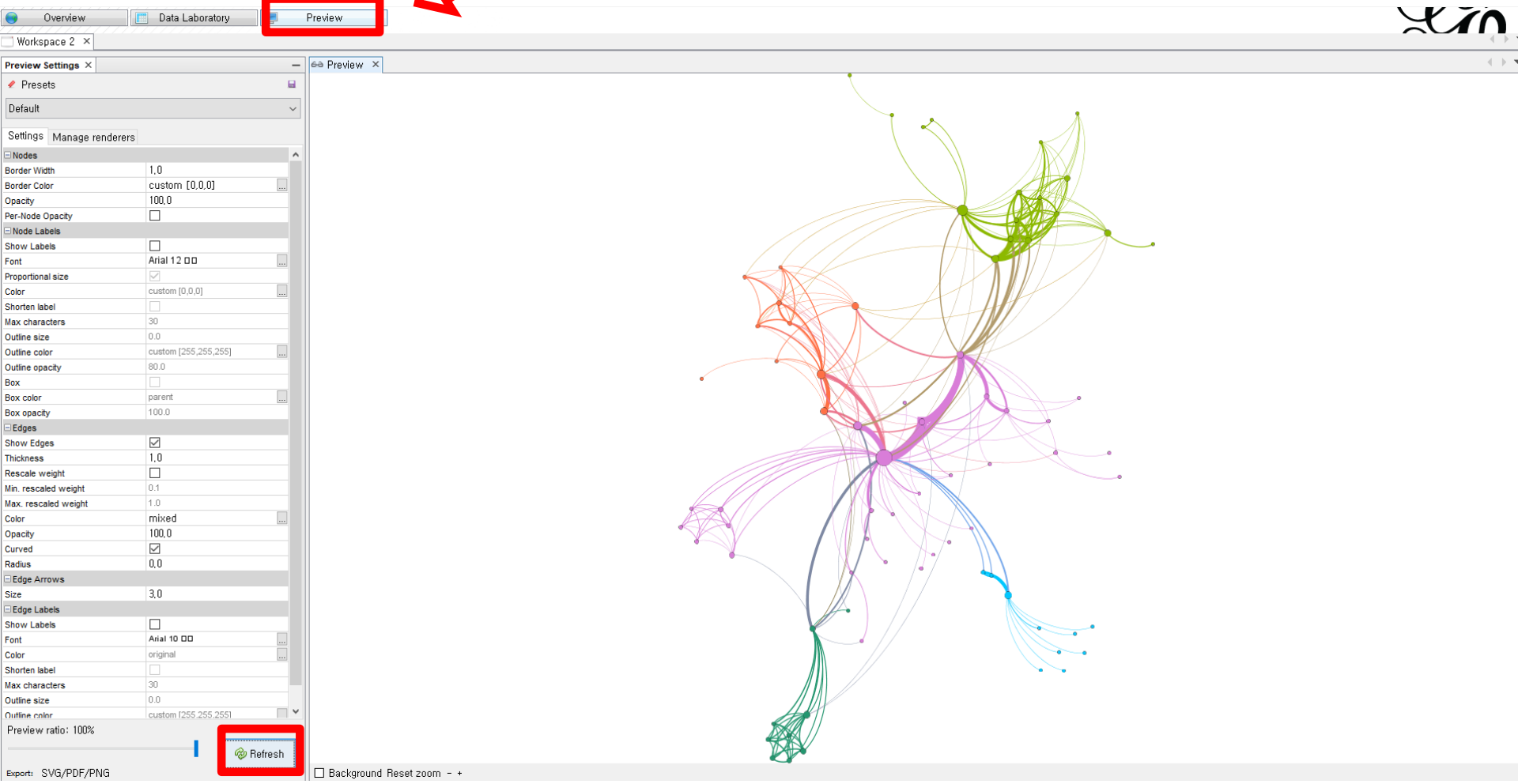
- Click “Data Laboratory” tab



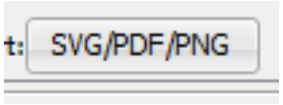
Nodes	Id	Label	In-Degree	Out-Degree	Degree	Weighted De...	Weighted In-...	Weighted O...	Eccentricity	Closeness Ce...	Betweenness C...	Authority	Hub	Modularity...	PageRank	Componen...	Strongly-C...	Clustering Co...	Eigenvector ...
Labarre	10.0	Labarre	1	0	1	1.0	1.0	0.0	0	0	0	0.007	0	4	0.027	0	0	0	0.274
MmeMagloire	3.0	MmeMagloire	1	2	3	19.0	3.0	16.0	1	1	0	0.007	0.008	0	0.027	0	3	0.5	0.274
MlleBaptistine	2.0	MlleBaptistine	2	1	3	17.0	9.0	8.0	1	1	0	0.01	0.012	0	0.039	0	2	0.5	0.338
OldMan	9.0	OldMan	0	1	1	1.0	0.0	1.0	1	1	0	0	0.004	0	0.004	0	4	0	0
Count	8.0	Count	0	1	1	2.0	0.0	2.0	1	1	0	0	0.004	0	0.004	0	5	0	0
Cravatte	7.0	Cravatte	0	1	1	1.0	0.0	1.0	1	1	0	0	0.004	0	0.004	0	6	0	0
Champtercier	6.0	Champtercier	0	1	1	1.0	0.0	1.0	1	1	0	0	0.004	0	0.004	0	7	0	0
MmeBurgon	47.0	MmeBurgon	1	1	2	3.0	2.0	1.0	1	1	22	0.007	0.008	3	0.01	0	9	0	0.131
Jondrette	46.0	Jondrette	1	0	1	1.0	1.0	0.0	0	0	0	0.007	0	3	0.013	0	8	0	0.035
Scaufflaire	32.0	Scaufflaire	0	1	1	1.0	0.0	1.0	2	1.8	0	0	0.004	4	0.004	0	11	0	0
Geborand	5.0	Geborand	0	1	1	1.0	0.0	1.0	1	1	0	0	0.004	0	0.004	0	12	0	0
Gribier	45.0	Gribier	0	1	1	2.0	0.0	2.0	4	3.211	0	0	0.004	4	0.004	0	33	0	0
Boulatruelle	40.0	Boulatruelle	0	1	1	1.0	0.0	1.0	3	2.688	0	0	0.004	2	0.004	0	34	0	0
Simplice	31.0	Simplice	0	4	4	8.0	0.0	8.0	2	1.789	0	0	0.004	4	0.004	0	36	0.333	0
Gervais	15.0	Gervais	0	1	1	1.0	0.0	1.0	2	1.8	0	0	0.004	4	0.004	0	37	0	0
CountessDeLo	4.0	CountessDeLo	0	1	1	1.0	0.0	1.0	1	1	0	0	0.004	0	0.004	0	38	0	0
MotherInnocent	44.0	MotherInnocent	0	2	2	4.0	0.0	4.0	4	2.947	0	0	0.004	4	0.004	0	39	0.5	0
Fauchelevent	28.0	Fauchelevent	2	2	4	14.0	5.0	9.0	3	2.333	31	0.01	0.004	4	0.009	0	32	0.167	0.005
Woman1	33.0	Woman1	0	2	2	3.0	0.0	3.0	3	2.333	0	0	0.004	4	0.004	0	40	0.5	0
Toussaint	72.0	Toussaint	0	3	3	4.0	0.0	4.0	3	2.222	0	0	0.004	4	0.004	0	41	0.5	0
Feuilly	61.0	Feuilly	5	6	11	38.0	21.0	17.0	4	2.484	1.111	0.02	0.024	3	0.007	0	53	0.464	0.059
Combeferre	59.0	Combeferre	7	4	11	68.0	40.0	28.0	4	2.586	5.361	0.026	0.032	3	0.01	0	51	0.464	0.119
Bossuet	64.0	Bossuet	3	10	13	66.0	11.0	55.0	4	2.206	7.837	0.013	0.012	3	0.005	0	56	0.385	0.015
Prouvaire	60.0	Prouvaire	6	3	9	19.0	12.0	7.0	4	2.833	0	0.023	0.028	3	0.008	0	52	0.5	0.085
Child2	74.0	Child2	0	2	2	5.0	0.0	5.0	4	3	0	0	0.004	3	0.004	0	58	0.5	0
Child1	73.0	Child1	1	1	2	5.0	3.0	2.0	4	3.095	0	0.007	0.004	3	0.006	0	57	0.5	0.003
Anzelma	42.0	Anzelma	0	3	3	5.0	0.0	5.0	3	2.529	0	0	0.004	2	0.004	0	59	0.5	0
BaronessT	56.0	BaronessT	0	2	2	2.0	0.0	2.0	4	2.815	0	0	0.004	4	0.004	0	60	0.5	0
Brujon	75.0	Brujon	0	7	7	13.0	0.0	13.0	4	2.515	0	0	0.004	2	0.004	0	65	0.452	0
Perpetue	30.0	Perpetue	1	1	2	3.0	2.0	1.0	3	2.214	0	0.007	0.004	4	0.005	0	35	0.5	0.003
Fantine	23.0	Fantine	6	9	15	47.0	12.0	35.0	2	1.308	377.767	0.023	0.024	5	0.044	0	21	0.157	0.358
MmePontmercy	52.0	MmePontmercy	0	2	2	2.0	0.0	2.0	4	2.95	0	0	0.004	4	0.004	0	66	0	0
Pontmercy	39.0	Pontmercy	2	1	3	3.0	2.0	1.0	3	2.688	9.5	0.01	0.008	4	0.007	0	43	0.167	0.082
LtGillenormand	54.0	LtGillenormand	1	3	4	5.0	1.0	4.0	4	2.842	0	0.007	0.008	4	0.005	0	47	0.5	0.079

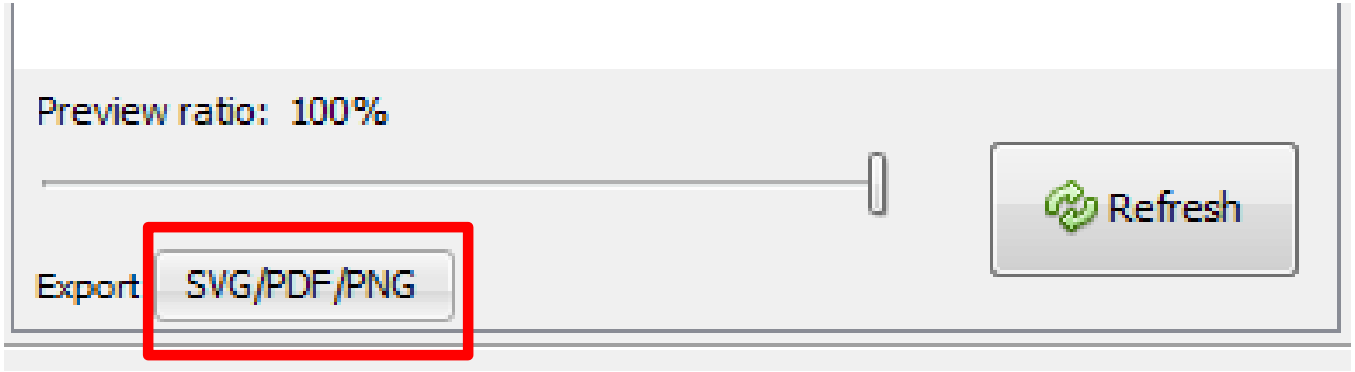
Export Graph

- Click “Preview” tab > Click 

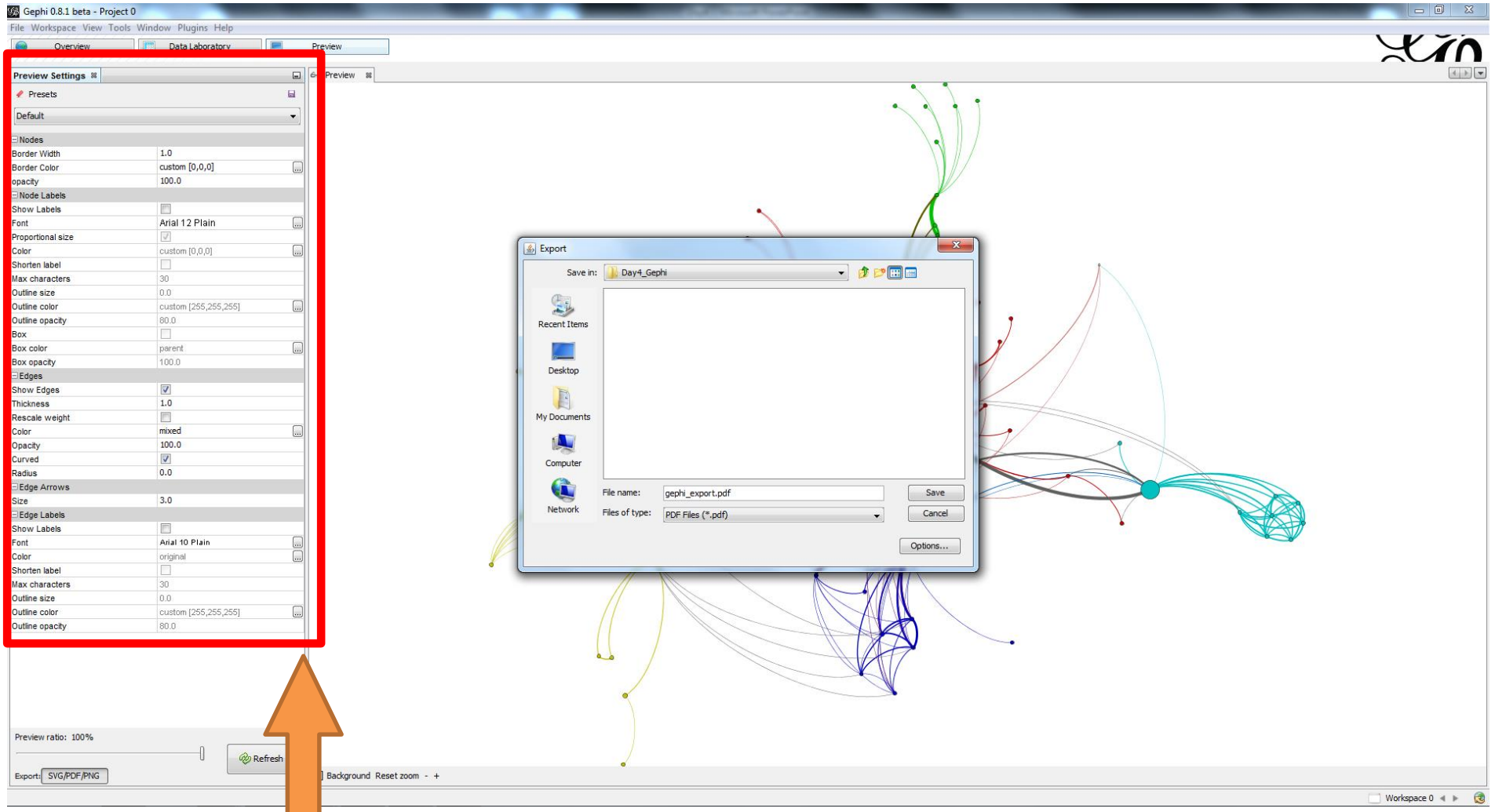


Export Graph

- At the bottom of the panel, click 



Export Graph



You can find more options, here. Before exporting graph, you can apply these options.

Dynamic Networks

- We have a network at three different year 2007, 2008 and 2009 with three nodes.

2007	2008	2009
n1	n1	
n2	n2	n2
	n3	n3

n1 → [2007, 2009)

n2 → [2007, 2009]

n3 → [2008, 2009]

```
<nodes>
  <node id="n1" label="Node 1" start="2007" endopen="2009" />
  <node id="n2" label="Node 2" start="2007" end="2009" />
  <node id="n3" label="Node 3" start="2008" end="2009" />
</nodes>
```

More information:

https://github.com/gephi/gephi/wiki/Import-Dynamic-Data

Reference

- Gephi Tutorial, https://gephi.org/