



Introduction to a Network Visualisation Tool

Jan 2014

Outline

1. Software
 - ▶ Purpose and Success Criteria
2. Importing Network
3. Edges Properties
4. Nodes Properties
5. Network Properties
6. Working with Gephi

1. Introduction

➤ Software

- ▶ Gephi (visualisation and basic network metrics)
- ▶ Download from:
<http://gephi.org/>
- ▶ download the dataset file lesmiserables.gephi from
<http://wiki.gephi.org/index.php/Datasets>
- ▶ let's play

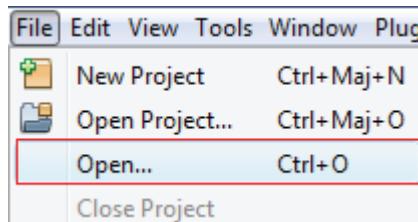


2. Import Data

➤ Import network

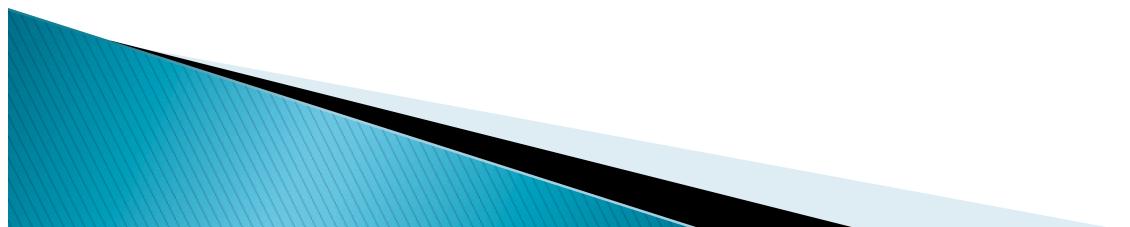
► Open data file:

In the menu bar, go to File Menu and Open...



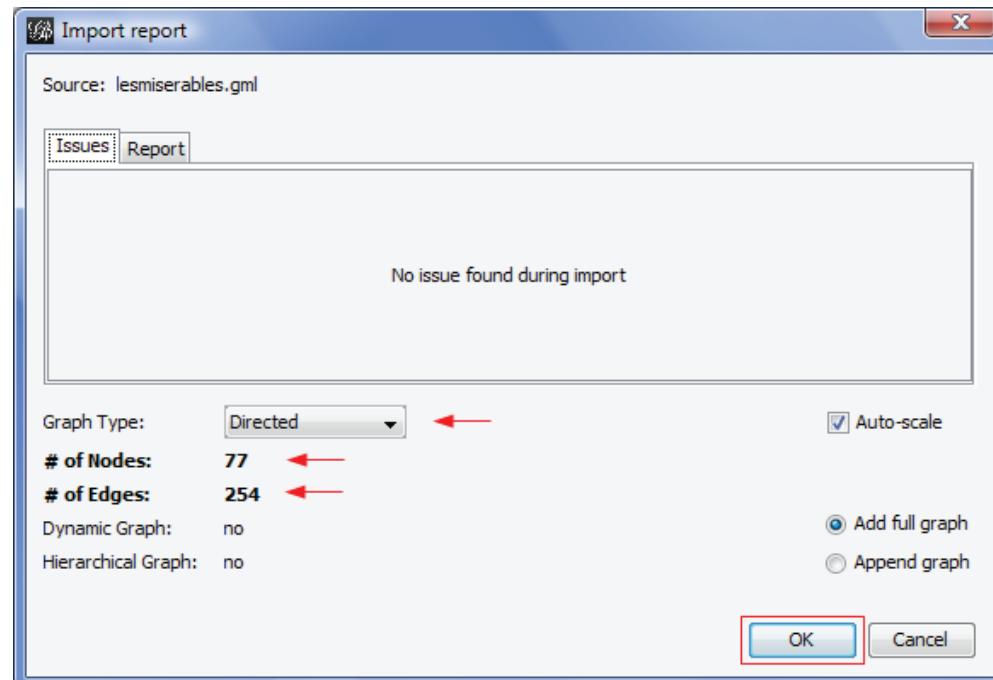
► Supported Graph format:

- GEXF, GraphML, Pajek NET, GDF, GML, Tulip TLP, CSV,
Compressed ZIP



2. Import Data (2)

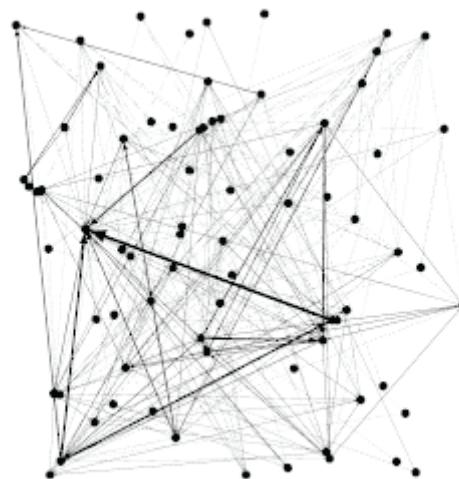
- When the file is opened:
 - ▶ Data found and issues:
 - ▶ Number of nodes
 - ▶ Number of edges
 - ▶ Type of graph



- ▶ Click on OK to validate and see the graph

2. Import Data (3)

- **Network of “Les Miserables”:**
 - ▶ Dataset: “Les Miserables”, Co-appearance weighted network of characters in the novel “Les Miserables” from Victor Hugo, D. E. Knuth, The Stanford GraphBase: A Platform for Combinatorial Computing, Addison-Wesley, Reading, MA (1993).



3. Edge Attributes

➤ Edges Properties:

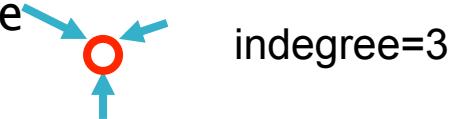
- ▶ Directed Network: A \rightarrow B 
- ▶ Undirected Network: A \leftrightarrow B or A - B 
- ▶ Weight: e.g. frequency of communication, appearance
- ▶ Ranking: e.g. best friend, second best friend
- ▶ Other Properties depending on the structure:
e.g. betweenness

4. Node Attributes

- **Nodes Properties:**

- ▶ **Indegree**

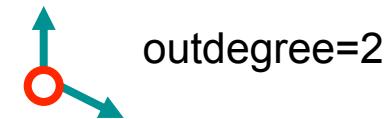
how many directed edges are incident on a node



indegree=3

- ▶ **Outdegree**

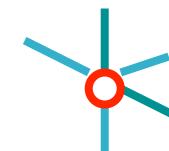
how many directed edges originate at a node



outdegree=2

- ▶ **Degree (in or out)**

number of edges on a node



degree=5

5. Graph Attributes

- **Graph Properties:**
 - ▶ Centrality: Number of ties for a node
 - Closeness Centrality:
Length of paths to other nodes (direct bargaining and exchange position)
 - Betweenness Centrality:
Lying between each other pairs of nodes (brokering contacts among other nodes to isolate them or prevent connections)
 - ▶ Degree distribution: A frequency count of the occurrence of each degree
 - ▶ Average shortest path: How many hops on average between each pair of nodes?

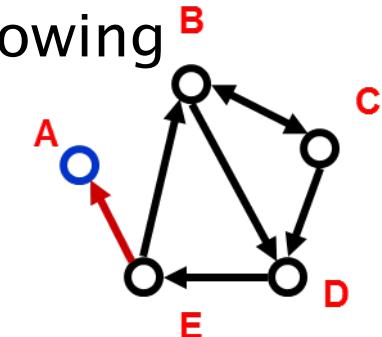
5. Graph Attributes (2)

➤ Connected Components:

► Strongly Connected Components:

Each node within the component can be reached from every other node in the component by following directed links.

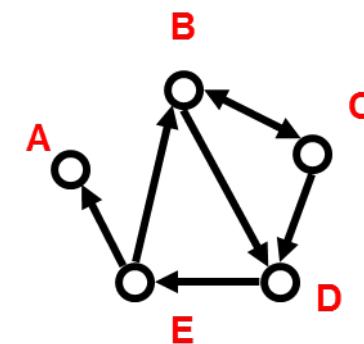
Example: B C D E



► Weakly Connected Components (undirected):

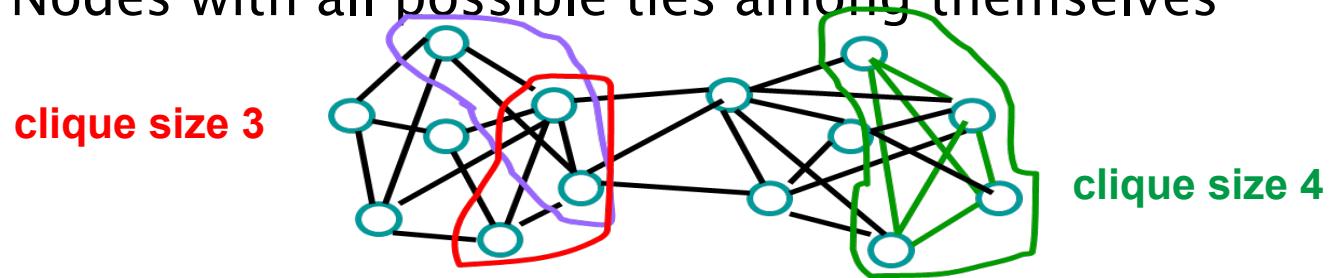
Every node can be reached from every other node by following links in either direction.

Example A B C D E

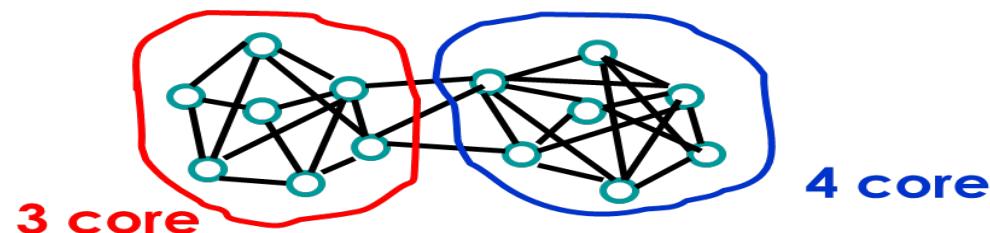


5. Graph Attributes (3)

- ▶ Strongly Connected Components:
Each node within the component can be reached from every other node in the component by following directed links. (e.g. B,C,D,E)
- ▶ Cliques: Nodes with all possible ties among themselves



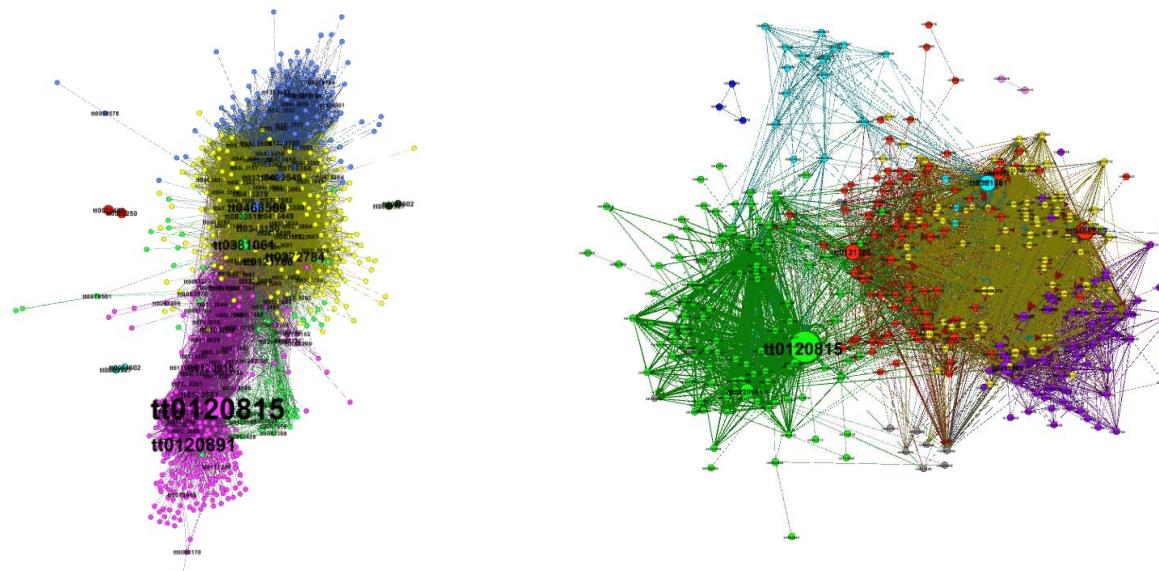
- ▶ K-Core: Nodes are connected to k nodes in the group



5. Graph Attributes (4)

➤ Community:

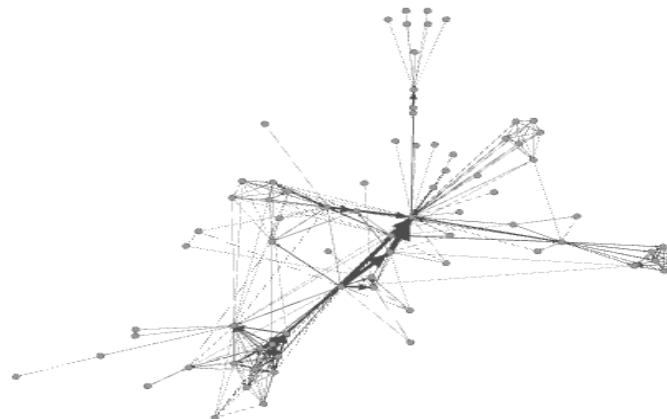
- ▶ Social and other networks have a natural community structure
- ▶ group of node which are more closely and densely tied to one another than any other part of the network.
- ▶ Subject of common interest in network analysis.
- ▶ understanding the likely behaviour of the network as a whole.)



6. Layout the graph in Gephi

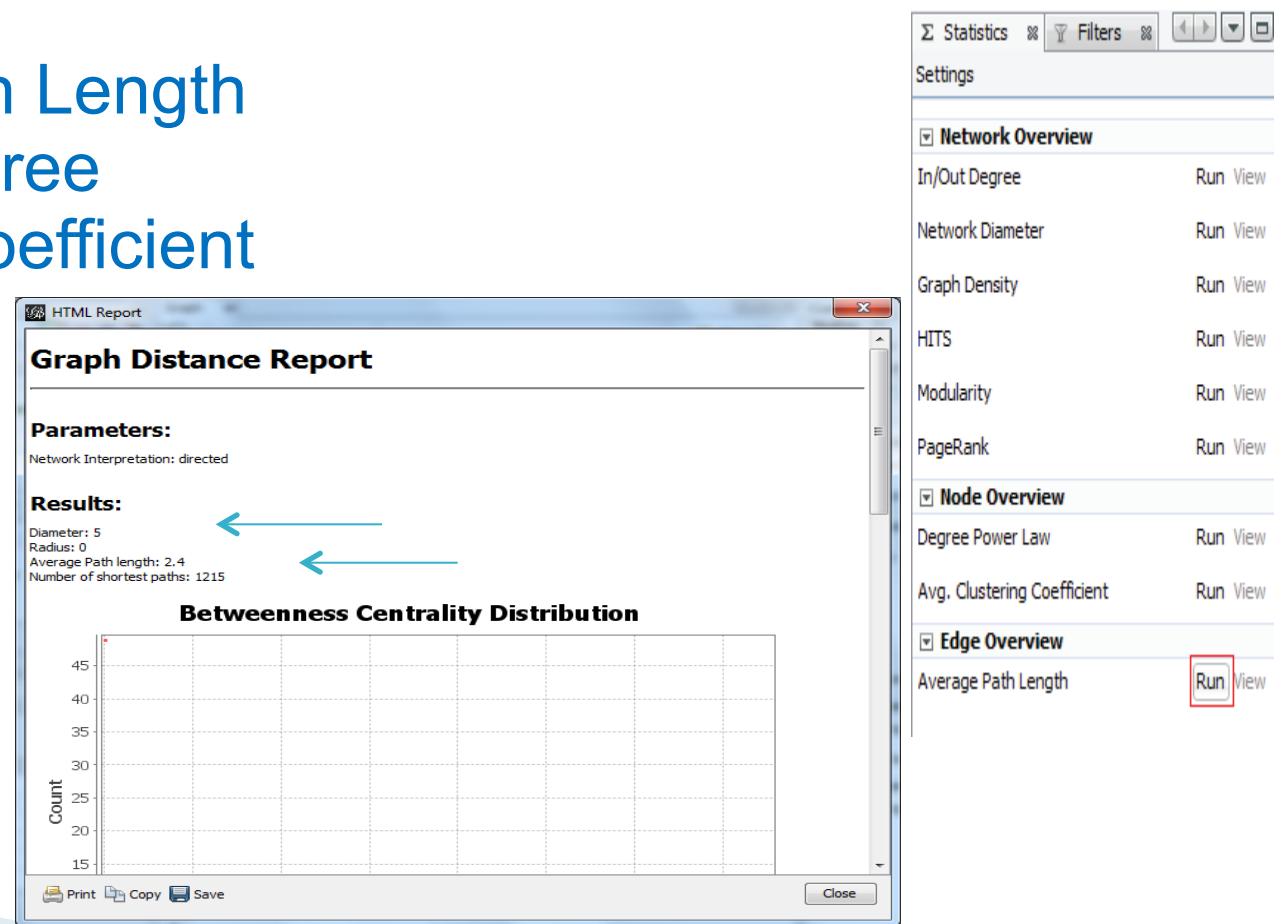
➤ Force Atlas Layout:

- Graphs are usually layouted with “Force-based” algorithms. Their principle is easy, linked nodes attract each other and non-linked nodes are pushed apart.
- Set the “Repulsion strength” to 10 000 to expand the graph.



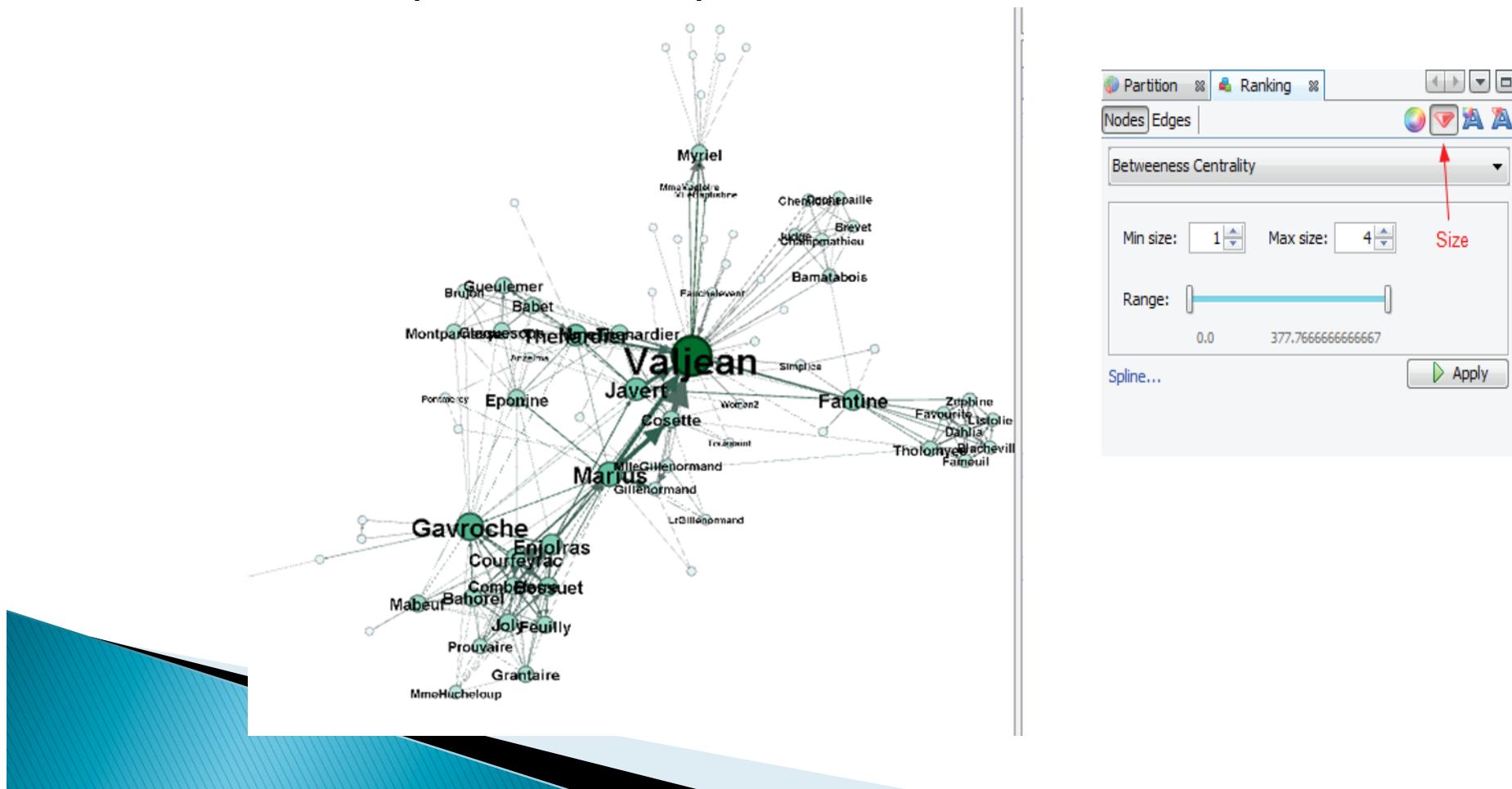
7. Calculations in Gephi

- Colouring:
 - Degree: Apply colour and size according to degree
 - Average Path Length
 - Average Degree
 - Clustering Coefficient



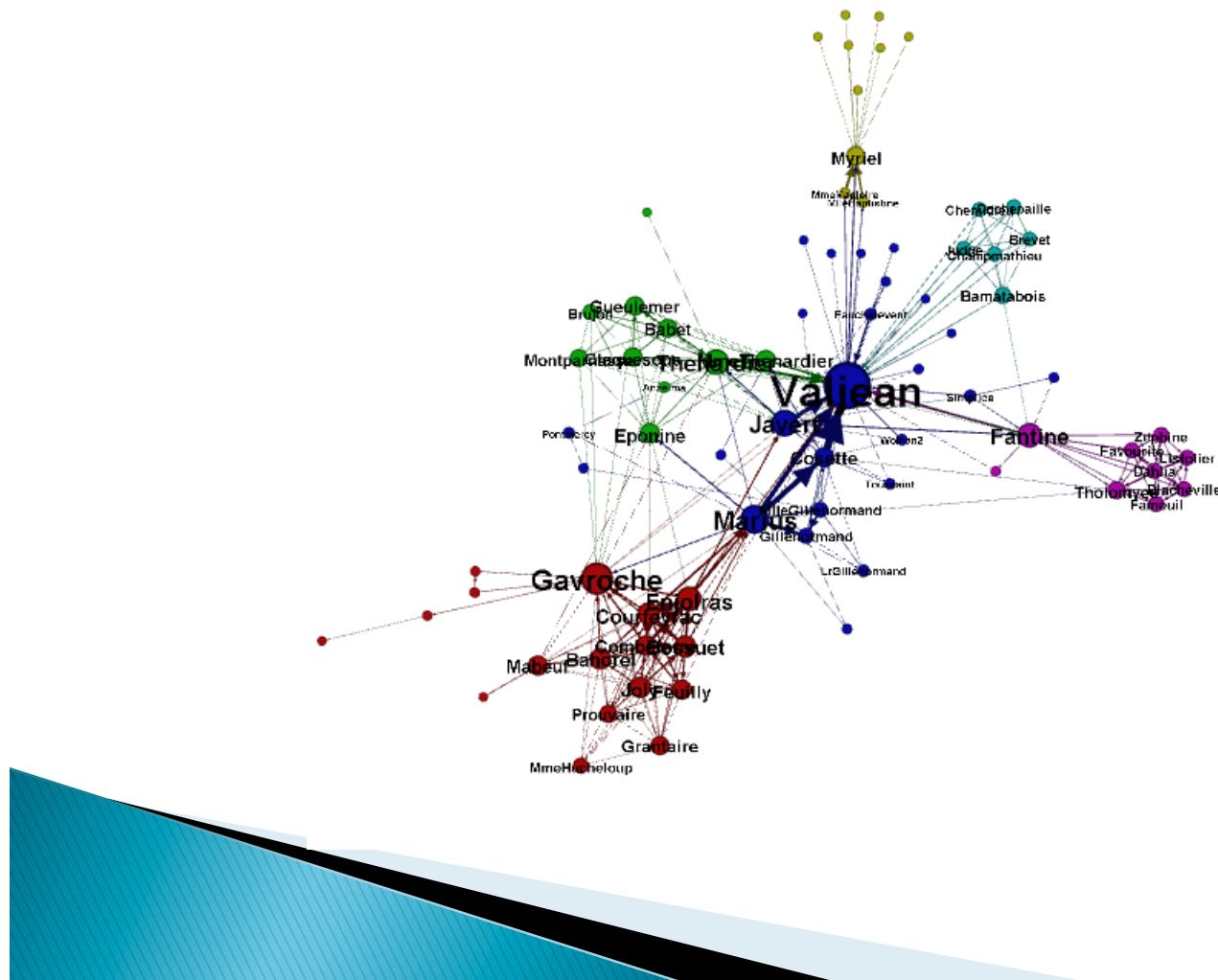
7. Calculations in Gephi (2)

- Ranking :
 - According to: Betweenness Centrality, Closeness Centrality, Eccentricity.



7. Calculations in Gephi (3)

- Community Detection:
 - Louvain method1. Click on near the “Modularity”.



8. Data Laboratory

The screenshot shows the Gephi 0.8.2 interface with the 'Data Laboratory' tab selected. The main window displays a table of nodes from the 'lesmiserables.gephi' dataset. The table includes columns for Node ID, Label, Eccentricity, Closeness Centrality, Betweenness Centrality, and Modularity Class. Below the table are various data manipulation tools.

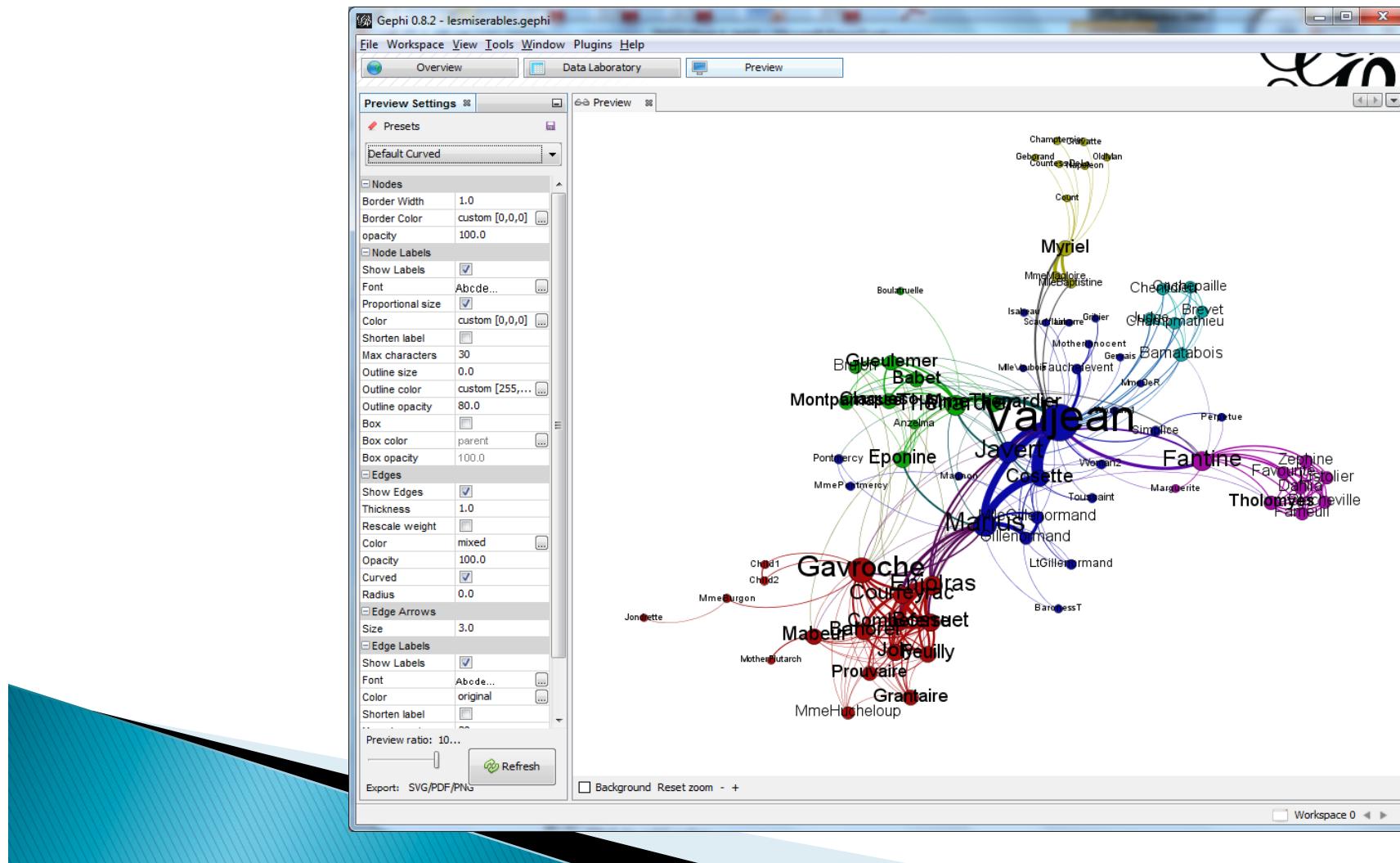
Nodes	Id	Label	Eccentricity	Closeness Centrality	Betweenness Centrality	Modularity Class
Myriel	0.0	Myriel	0	0	0	0
Napoleon	1.0	Napoleon	1	1	0	0
MlleBaptistine	2.0	MlleBaptistine	1	1	0	0
MmeMagloire	3.0	MmeMagloire	1	1	0	0
CountessDeLo	4.0	CountessDeLo	1	1	0	0
Geborand	5.0	Geborand	1	1	0	0
Champtercier	6.0	Champtercier	1	1	0	0
Cravatte	7.0	Cravatte	1	1	0	0
Count	8.0	Count	1	1	0	0
OldMan	9.0	OldMan	1	1	0	0
Labarre	10.0	Labarre	0	0	0	4
Valjean	11.0	Valjean	1	1	224	4
Marguerite	12.0	Marguerite	2	1.8	0	1
MmeDeR	13.0	MmeDeR	2	1.8	0	4
Isabeau	14.0	Isabeau	2	1.8	0	4
Gervais	15.0	Gervais	2	1.8	0	4
Tholomyes	16.0	Tholomyes	0	0	0	1
Listolier	17.0	Listolier	1	1	0	1
Fameuil	18.0	Fameuil	1	1	0	1
Blacheville	19.0	Blacheville	1	1	0	1
Favourite	20.0	Favourite	1	1	0	1
Dahlia	21.0	Dahlia	1	1	0	1

Below the table are several data manipulation tools:

- 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

8. Preview

- Export to pdf, svf, png



Question & Answer

Thank you!

Any Questions?