

# Gephi Tutorial: Quick Start

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# Introduction of Gephi

- Gephi is the leading visualization and exploration software for all kinds of networks. It is open-source and free.
- Gephi works on Windows, Mac OS and Linux, and can be downloaded and installed by following the official guide (<https://gephi.org/users/install/>).



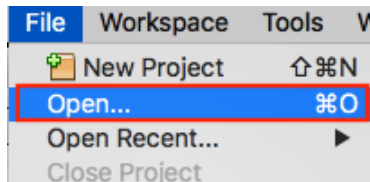
Features (See video: <https://gephi.org/features/>)

- Real-time visualization
- Layout
- Metrics
- Networks over time
- Dynamic filtering
- Data Table and Edition
- Extensible

In today's session, we will guide you to the basic steps of network **visualisation** and **metrics calculation** in Gephi.

# Let's Open a Graph File

- Download the file from <https://gephi.org/datasets/LesMiserables.gexf>
- In the menu bar, go to "**File Menu**" and "**Open**" LesMiserables.gexf.



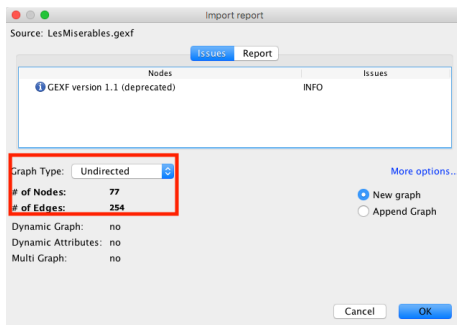
What is a .gexf file? gexf stands for Graph Exchange XML format and it is language for describing complex networks, their associated data and dynamics. It started with Gephi project in 2007.

<https://gephi.org/gexf/format/>

# Import Report

After your file is opened, you can see a summary report of data found and issues.

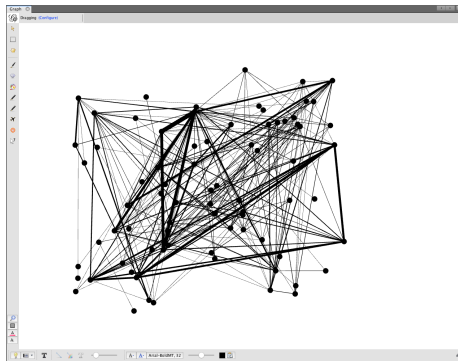
- number of nodes
- number of edges
- type of graph (undirected/directed)



# Congrats! You should now see your first network in Gephi!

We have imported "Les Miserables" dataset. Co-appearance weighted network of characters in the novel "Les Miserables" from Victor Hugo.

In the "**Graph**" module, you may see a slightly different representation as node position is random at first.

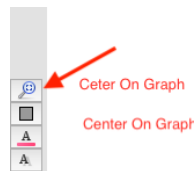


# Network Visualisation

You can manipulate the network visualisation in "**Graph**" module with your mouse and function buttons.

For example:

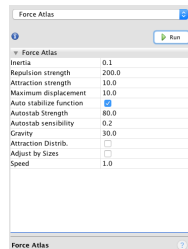
- Use your mouse to move and scale the visualisation
  - Zoom: mouse wheel
  - Drag: right mouse drag
- Reset your network position
- You can hover your mouse over the buttons to check their functions



# Network layout

Layout algorithms sets the network shape, it is the most essential action.

- **"Layout"** module is located at the bottom left
- Choose **"Force Atlas"**
- Click on the **"run"** to start the algorithm with default values. You will see a network visualisation below. (**Too compact!**)



## Layout algorithms

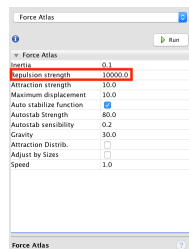
Network layouts are usually shown with **"Force-based"** algorithms. Their principle is simple, linked nodes attract each other and non-linked nodes are pushed apart.



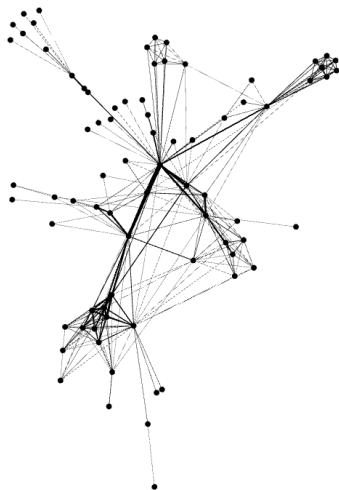
# Tune the layout

The purpose of "**Layout Properties**" is to let you control the algorithm in order to make a pleasing representation.

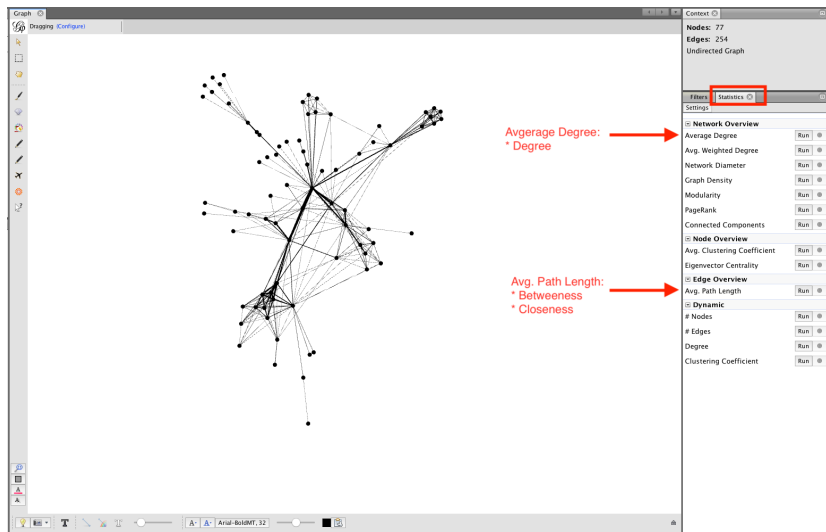
- Set the "**Repulsion strength**" at 10,000 to expand the graph.
- Type "**Enter**" to validate the changed value.
- When the layout is stable, click on "**stop**" to stop the algorithm



# Network with proper layout



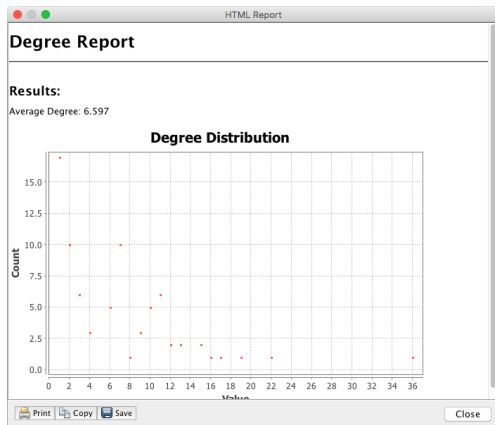
# Network metrics



# Centralities in Gephi

Degree:

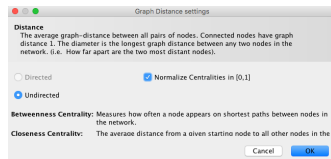
- Click the **"run"** button of Average Degree
- You should see a degree report



# Centralities in Gephi

## Betweenness, Closeness:

- Click the **"run"** button of Avg. Path Length
- Selected **"Undirected"** and **"Normalize Centralities in [0,1]"**
- You should see a graph distance report



## Graph Distance Report

### Parameters:

Network Interpretation: undirected

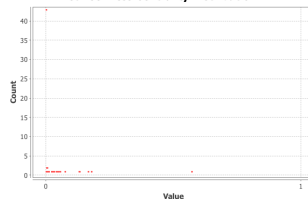
### Results:

Diameter: 5

Radius: 3

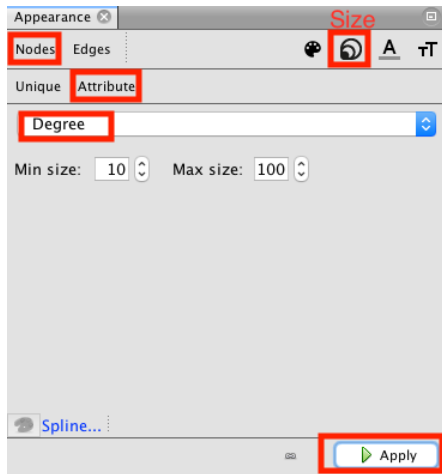
Average Path length: 2.6411483253588517

### Betweenness Centrality Distribution



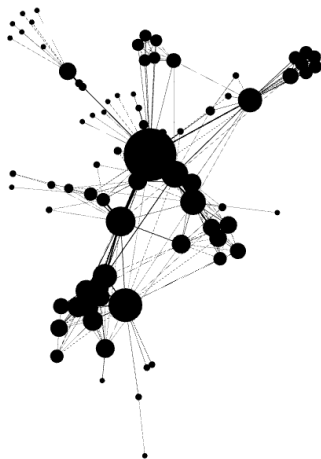
# Appearance of Nodes: Size

- Locate "**Appearance**" module and click on "**Nodes**"
- Click on "**Size**" icon
- Click on "**Attribute**" icon and select "**Degree**" as attribute
- Click on "**Apply**"



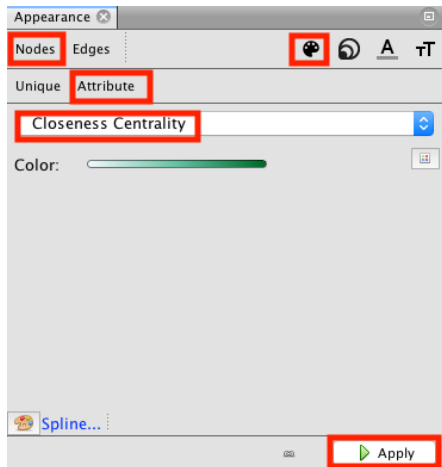
# Appearance of Nodes: Size

You should see a network with node size based on its degree.



# Appearance of Nodes: Colour

- Locate "**Appearance**" module and click on "**Nodes**"
- Click on "**Colour**" icon
- Click on "**Attribute**" icon and select "**Closeness Centrality**" as attribute
- Click on "**Apply**"





# Appearance of Nodes: Colour

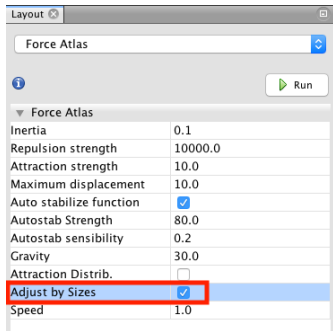
You should see a network with node colour based on its closeness centrality.



# Layout again

The layout is not completely satisfying, as big nodes can overlap smaller ones.

The **"Force Atlas"** algorithm has an option to take node size in account when layouting. You can see nodes are not overlapping anymore.



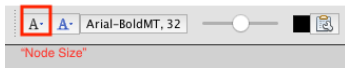
# Show node labels

Let's add labels to the nodes.

- Display node labels



- Set label size proportional to node size



- Set label size with the scale slider



# Show node labels

What the network looks like now:



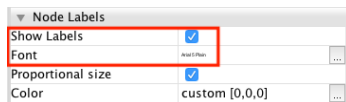
That ends the manipulation. We will now preview the rendering and prepare to export.

# Preview

- Before exporting your graph as a SVG or PDF file, go to the **"Preview"**.
- Select the **"Preview"** tab in the banner:



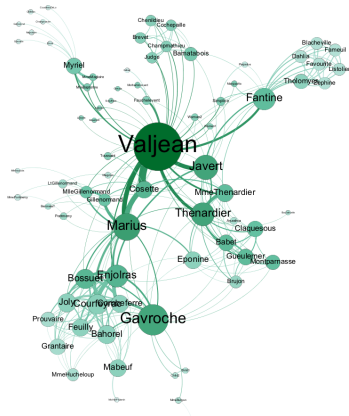
- Click on preview settings, select **"Show Labels"** and set font size to 5



- Click on **"Refresh"** to see the preview



## The previewed network



From "**Preview**", click on "**SVG/PDF/PNG**" near "**Export**" and select one format you would like to use:

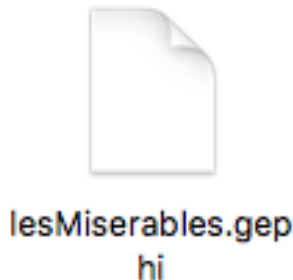
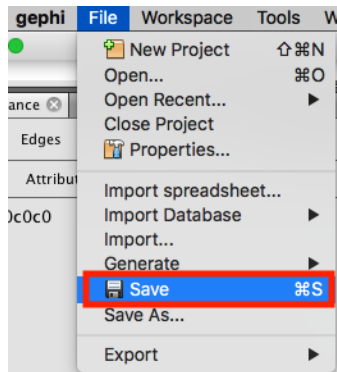


## SVG

SVG Files are vectorial graphics, like PDF. Images scale smoothly to different sizes and can therefore be printed or integrated in high-resolution presentation. Transform and manipulate SVG files in Inkscape or Adobe Illustrator.

# Save your project

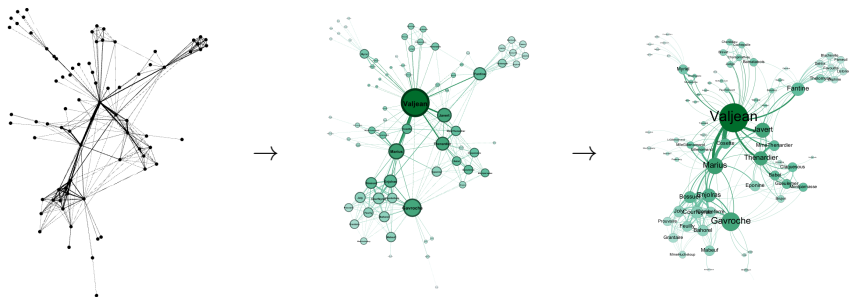
Saving your project encapsulates all data and results in a single session file.





# Conclusion

In this tutorial you learned the basic process to open, visualize, manipulate and render a network file with Gephi.



If you are interested and would like go further:

- Learn how to use Gephi: <https://gephi.org/users/>
- Gephi datasets: <https://github.com/gephi/gephi/wiki/Datasets>
- Import data from csv:  
<https://github.com/gephi/gephi/wiki/Import-CSV-Data>

# Thank you