

Network Visualization as Exploratory Approach

Looking at the structure
of social data

PhD S. Nuccio Ludovico

02/11/2018 Introducing Structure:
Bruxelles Networks in Social Psychology



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Introducing the Speech

“

PHD STUDENT

Sapienza University of Rome

Departments of Psychology of Development and
Socialization Processes

SCIENTIFIC BOARD MEMBER

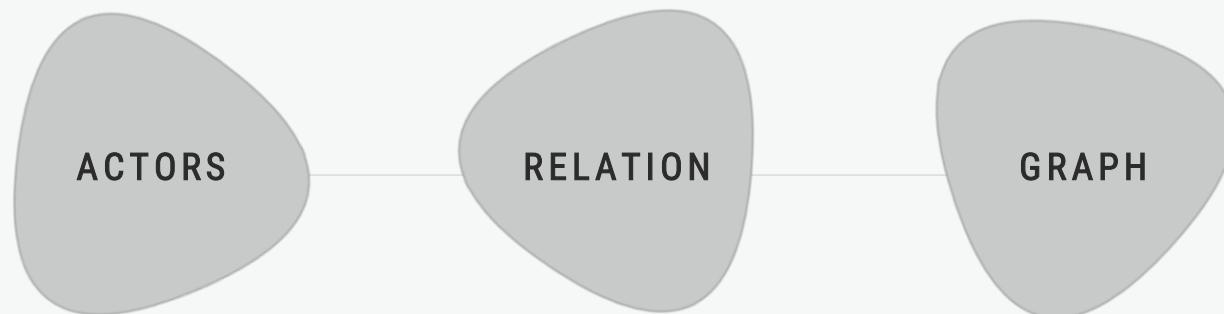
Nahima Foundation

MSC IN PSYCHOLOGY OF COM. & MARKETING

Sapienza University of Rome

SNA Basics Guidelines

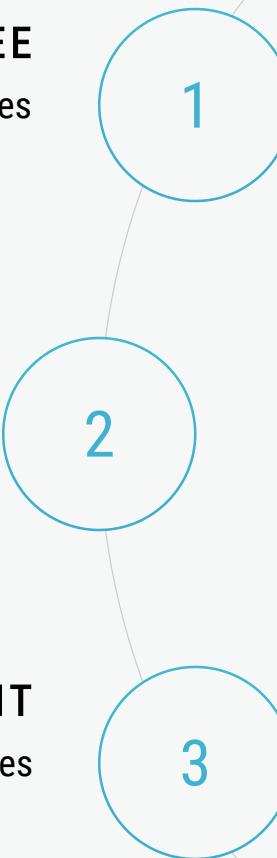
Actors and their actions are interdependent. Ties between actors are channels for flow of something... (resources, affect, information, etc.). Network ties both enable and constrain actions. Structure is viewed as “enduring patterns of relations”



About Actors

Also called a node or a vertex,
refers to an entity that can have
relationships with other entities
(people, information, resources,
emotions, etc.).

DEGREE
Number of connections with other nodes



POSITION
Number connected or relevant nodes

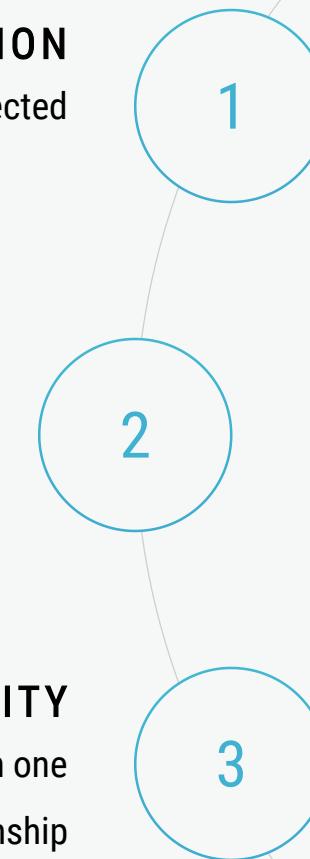
WEIGHT
Quantitative comparison with other nodes

About Relation

Also called tie or edge, describes a particular, well specified, relationship between two Actors.

DIRECTION

Ties can be undirected or directed



STRENGTH

It refers to the power of the relationship

MULTIPLEXITY

Possibility to represent more than one type of relationship

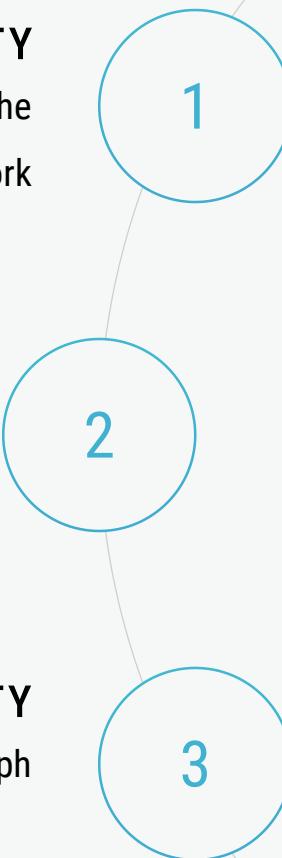
About Graph

A collection of Actors, and Edges between them, that describes a phenomenon. Its characteristics are emergent from the system.

DENSITY
Ratio of the number of links to the number of possible links in the network

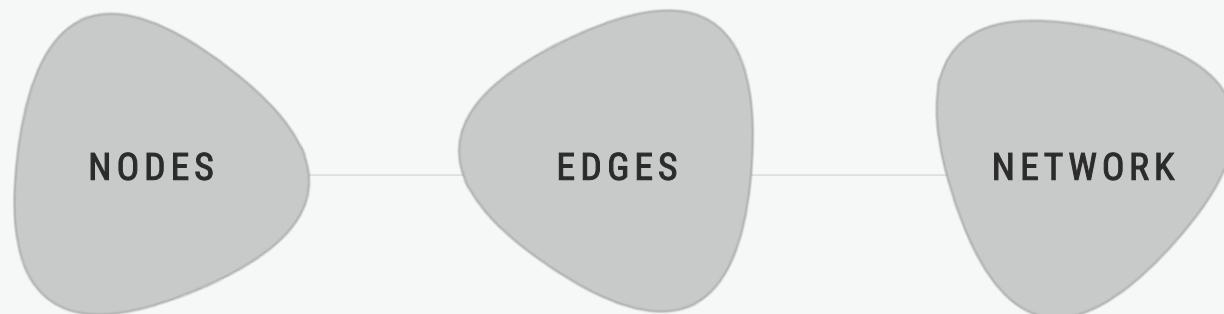
DIAMETER
Maximum Geodesic Distance in a graph

CONNECTIVITY
Cohesiveness within the graph



Visualization Guidelines

We talk about graph drawing aesthetics to pinpoint the criteria that make a graph easier to perceive. Nodes and lines can be of different sizes, can have different colors or textures, and can be rendered with two or three-dimensional cues. The analysis of large networks has to use formal or substantial strategies that illuminate processes in the overall structure. A common strategy is to apply some sort of filtering which reduces networks to the most connected nodes or most dominant lines.



Nodes Visualization

Placing the nodes according to a principle, such as grouping them together according to some criterion of regularity, and applying this principle consistently throughout the graph.

Usually manipulated to represent nodal salience, frequency



Ranged to highlight some nodal attribute or category



Changed to distinguish the nature of specific actors



Edges Visualization

Following the principle of traceability: to draw the links such that it is easy to follow paths (connected links)

COLOR
Used to highlight specific paths or to tell about the type of actors involved



THICKNESS
Frequently ranged to represent the strength of the link



TYPE
Changed to distinguish the nature of the relation between nodes



Network Visualization

Groups of nodes and edges can be formed by hand or algorithmically, based on linking strength.

The positioning strategy can be applied in a 2D or 3D space.

METHOD
Manual or algorithmical positioning nodes and edges

RESOLUTION
Deepness and extension in time and space

ACCESSIBILITY
Minimize the number of edges that cross each other



Graph

Force-directed Algorithms

These algorithms places nodes of a graph by translating links into mechanical forces that are counterbalanced by repulsive forces mimicking the repulsion of “electrical fields” to enforce a minimal distance around each of the nodes. The repulsive forces can be scaled, which leads to smaller or larger distances in the image: close neighbours are spread, while large distances are shrunk.



Gephi Platform Guidelines

In the next slides we will introduce Gephi, an open-source platform for visualizing and manipulating graphs. Gephi is able to push the envelope with very large networks, visualizing networks up to a million elements. The platform is easy to use and modular, the architecture can be extended with plug-ins.

It's multi-OS (Windows, Mac OS X and Linux) and multilingual (English, French, Spanish, Japanese, Russian, Brazilian Portuguese, Chinese, Czech and German)



Open your



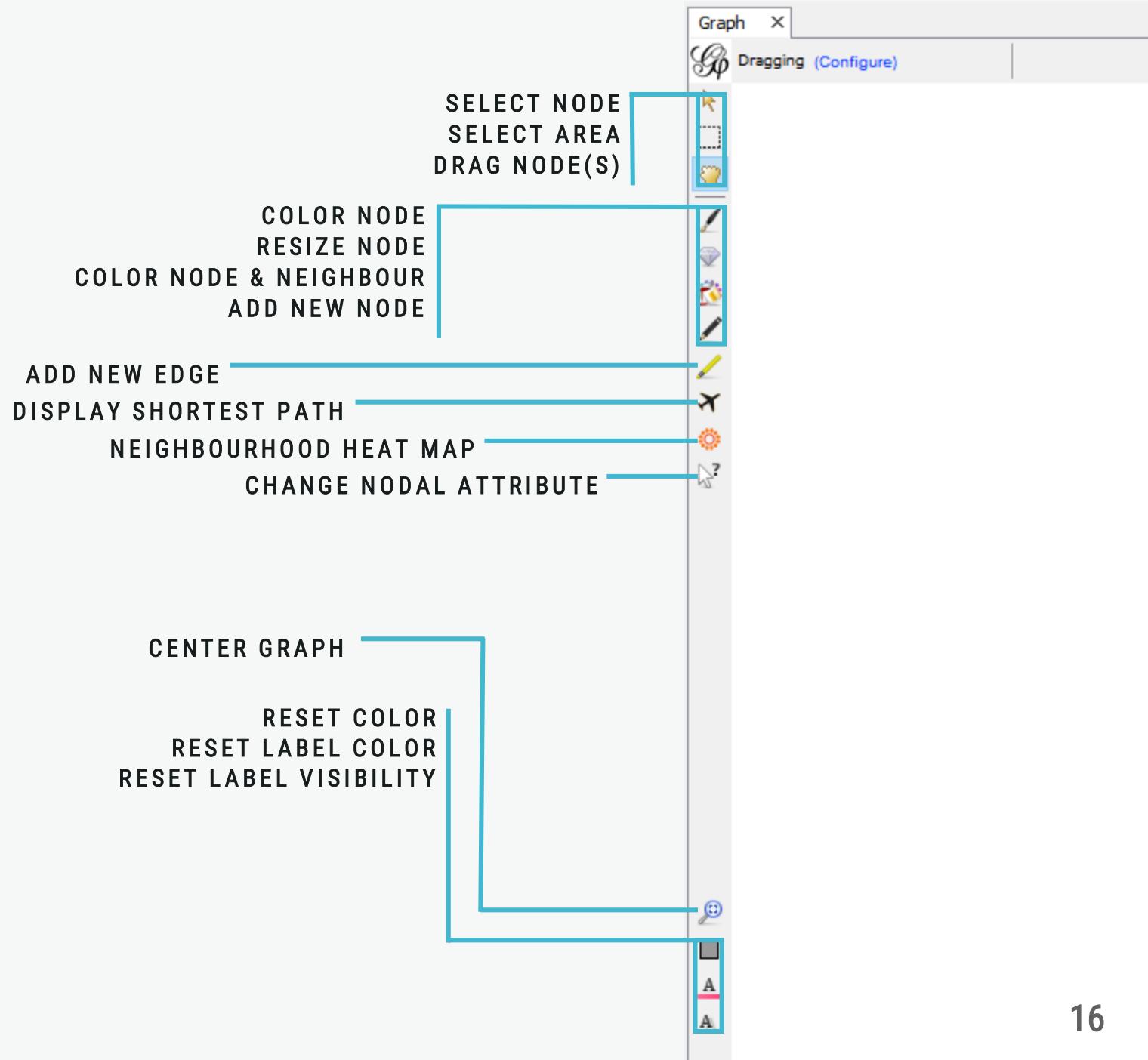
Gephi

please

PART 1/2 Overview Panel

The Graph Manipulation mode of Gephi. This tab displays a raw version of your graph.

The Overview allows to explore or even modify the network.



PART 2/2 Overview Panel

The Graph Manipulation mode of Gephi. This tab displays a raw version of your graph.
The Overview allows to explore or even modify the network.

BACKGROUND COLOR

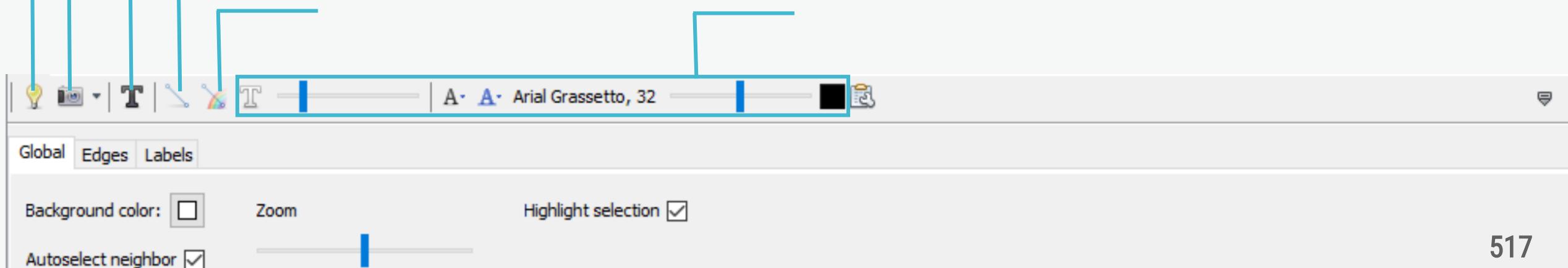
SCREENSHOT

RESET COLOR

SHOW EDGES

SET EDGES COLOR

EDIT FONT PROPERTIES

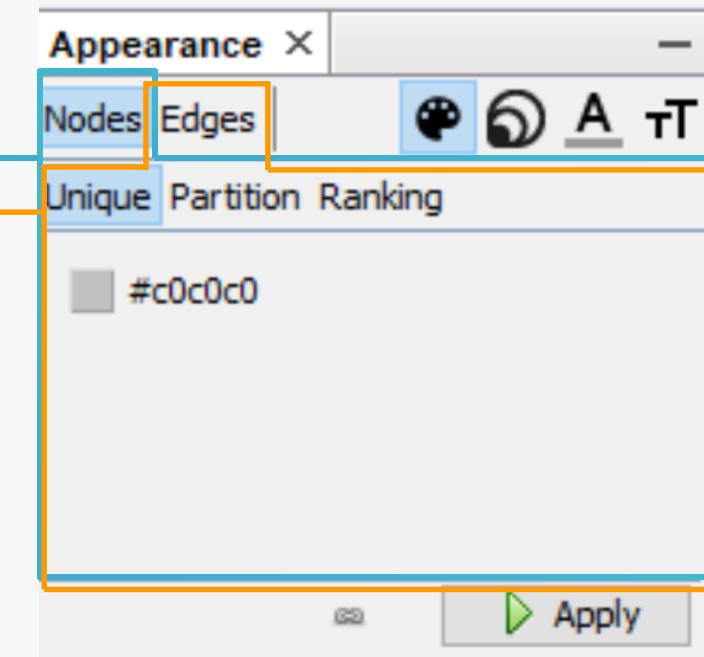


Overview

Appearance Module

This window controls the color, size of the nodes, labels, and edges. The Edit tab will let you see the attributes of the nodes, and change them.

SET VISUALIZATION OF NODES
SET VISUALIZATION OF EDGES

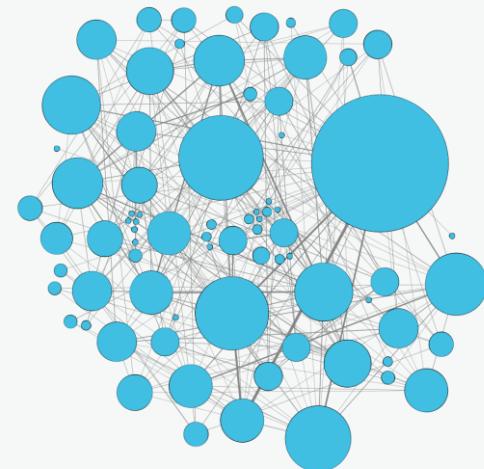
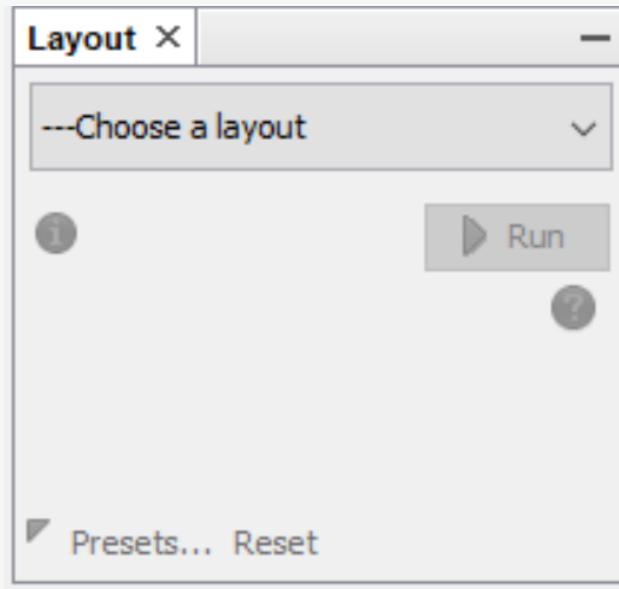


PART 1/2

Overview

Layout Module

The Layout controls the position of nodes applying algorithms on them.

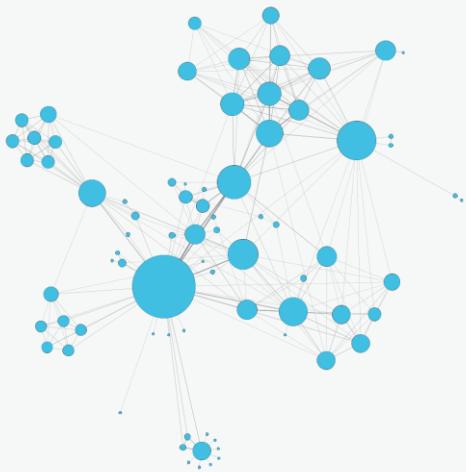


PART 2/2

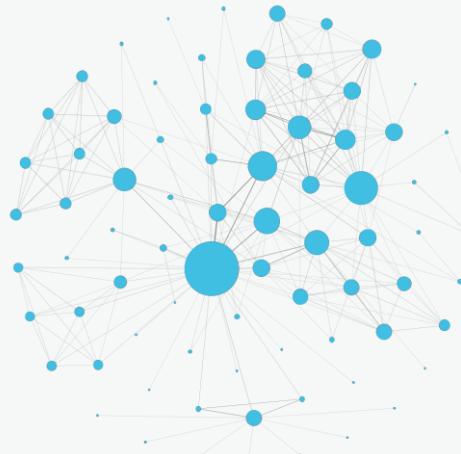
Overview

Layout Module

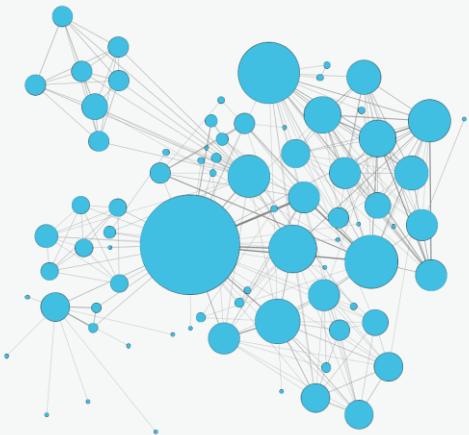
This module give you the possibility to organize nodes and ties in a 2D space to get better visualizations.



FORCE ATLAS 2



FRUCHTERMAN
REINGOLD



OPEN ORD

Data Table Panel

The tab where you can see a spreadsheet of all the data in your project. It is clumsy and limited. There is a limit on the number of columns it will display.



UNFRIENDLY SPREADSHEET

Made all data cleaning procedures before importing the dataset in Gephi



NO MASS DATA EDITING FUNCTIONS

Do mass changes with search/replace function



IMPORTING ISSUES

Control how relevant variables are codified



NO COLUMN EDITING FUNCTIONS

Convert a variable by duplicating it

Preview Panel

The Preview tab is where you prepare your final image for export. It takes information from the Overview tab then produces a high quality render of the results.

MODE

Presets

Default

Nodes

Border Width	1.0
Border Color	custom [0,0,0] <input type="button" value="..."/>
opacity	100.0

Node Labels

Show Labels	<input checked="" type="checkbox"/>
Font	Abcde... <input type="button" value="..."/>
Proportional size	<input checked="" type="checkbox"/>
Color	custom [0,0,0] <input type="button" value="..."/>
Shorten label	<input type="checkbox"/>
Max characters	30
Outline size	0.0
Outline color	custom [255,255,255] <input type="button" value="..."/>
Outline opacity	80.0
Box	<input type="checkbox"/>
Box color	parent <input type="button" value="..."/>
Box opacity	100.0

GRAPH EXPORTER

Preview ratio: 100%

Export: **SVG/PDF/PNG**

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Statistics & Filters Modules

It runs some basic network analyses on the whole network, on nodes and on edges.

The screenshot shows a software interface for network analysis. On the left, there are three main sections: **Network Overview**, **Node Overview**, and **Edge Overview**. Each section contains several analysis modules with a "Run" button to their right. In the **Network Overview** section, the modules are: Average Degree, Avg. Weighted Degree, Network Diameter, Graph Density, HITS, Modularity, PageRank, Connected Components, and Girvan-Newman Clustering. In the **Node Overview** section, the modules are: Avg. Clustering Coefficient, SW Type Statistics, and Eigenvector Centrality. In the **Edge Overview** section, the module is: Avg. Path Length. On the right side of the interface, there is a sidebar titled "Library" which includes categories like Attributes, Dynamic, Edges, Operator, SemanticWeb, Topology, and Saved queries. Below the library is a "Queries" section with a placeholder "Drag filter here". At the bottom right, there are buttons for "Select" and "Filter".

Module	Action
Average Degree	Run
Avg. Weighted Degree	Run
Network Diameter	Run
Graph Density	Run
HITS	Run
Modularity	Run
PageRank	Run
Connected Components	Run
Girvan-Newman Clustering	Run
Avg. Clustering Coefficient	Run
SW Type Statistics	Run
Eigenvector Centrality	Run
Avg. Path Length	Run
# Nodes	Run
# Edges	Run
Degree	Run
Clustering Coefficient	Run

Other useful Modules

Gephi enables to install a big number of internal and third part add-ons. Some of them largely extend the analytical



OSN/WEB IMPORTER

It connects Gephi Engine with various API for information scraping



POLYGON SHAPED NODES

It gives control on nodal shape



NEWMAN-GIRVAN CLUSTERING

It allows compute clusters from the well known algorithm



Semantic Graph Exercise

THE EROSION OF MORAL CAPITAL DURING THE UBER CRISIS

We reconstruct the constellation of meanings produced by tweeters about Uber sharing company.

Starting by 230K tweets, collected from January 2015 to January 2016, we have selected most relevant contents (1% based on betweenness centrality) to highlight topics and issues involved in Uber related discussions. The 100 most frequent terms, connected each others by co-occurrence ties, have been included in dynamic network.

<https://github.com/nucciodinome/gephi.git>



DATA IMPORT



STATISTICS



VISUALIZATION



ADJUST



EXPORT

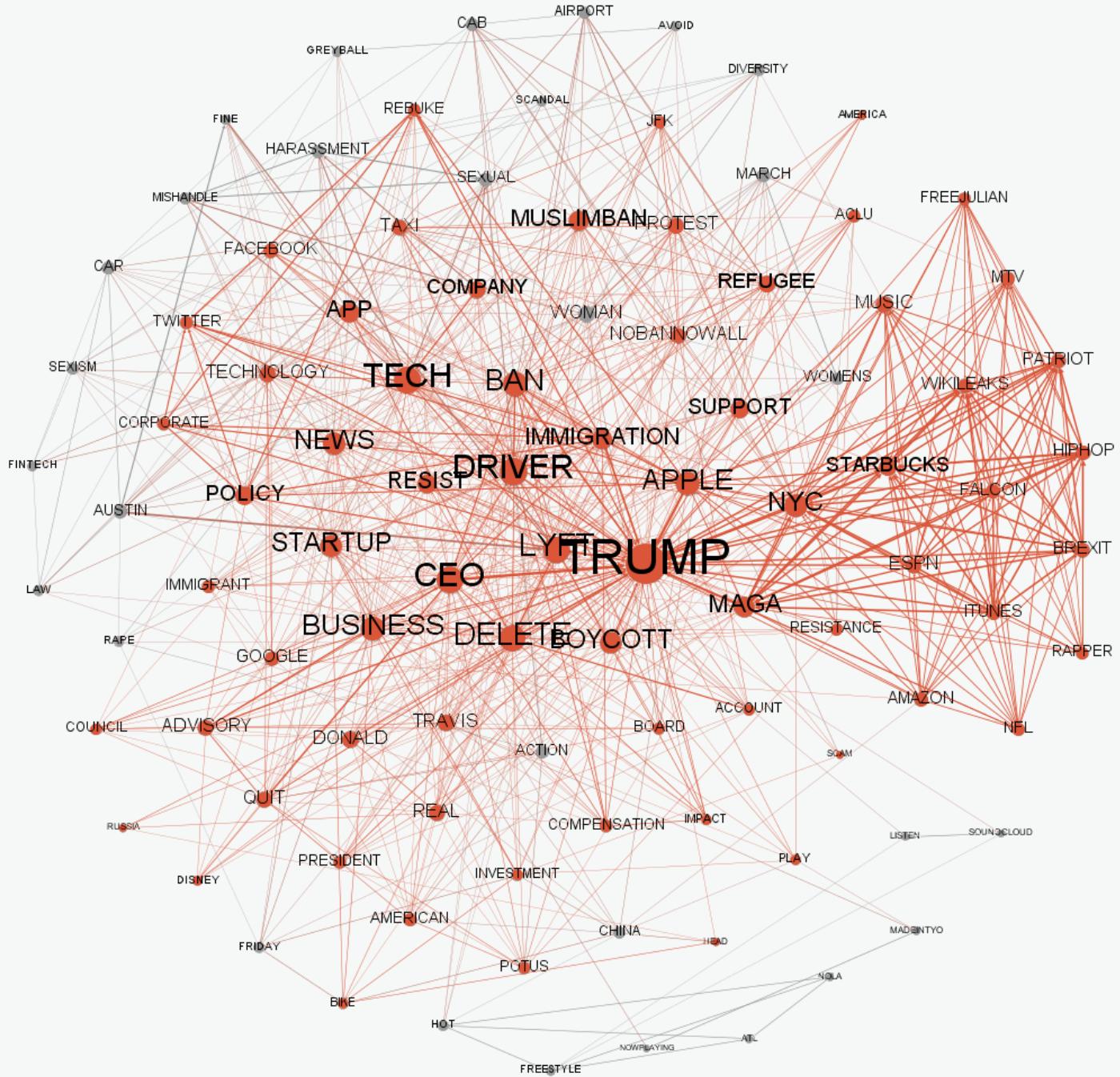
1

2

3

4







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- Krempel, L. (2011). Network visualization. *The SAGE handbook of social network analysis*, 558-577.

A complex network graph composed of numerous small white dots connected by thin white lines, forming a dense web of triangles. The background is a dark blue gradient.

Thank You!

NUCCIO LUDOVICO



+39 3807543515



nuccio.ludovico@uniroma1.it