

Appendix

Protocol

For each network, we have generated different spatial arrangements for the nodes using the Gephi layout algorithms:

- Force Atlas 2 with default settings
- Force Atlas 2 with Lin Log activated and gravity set to 0
- Fruchterman Reingold with default settings
- Random layout

Then for each network in each layout, we have computed different ways to partition the nodes in clusters:

- Modularity clustering by the Louvain method
- K-means over the spatial coordinates (x,y) of that layout, using k as the number of classes found by the Louvain algorithm
- Random classes, using k different classes (same number as the Louvain method)

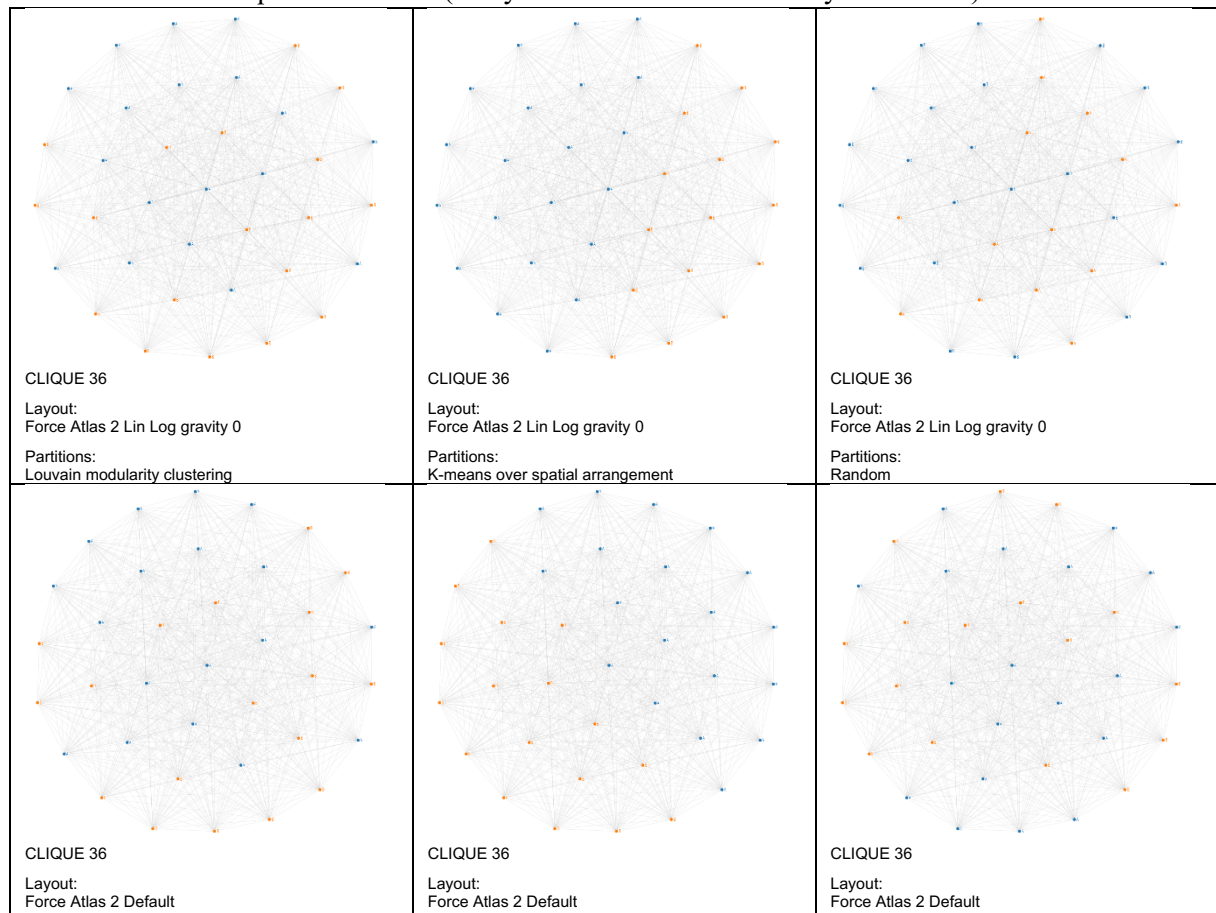
For each pairs of partitions, we compared how similar they were by computing the Jaccard index of the set of pairs of nodes that are in the same partition. This process can be unpacked this way:

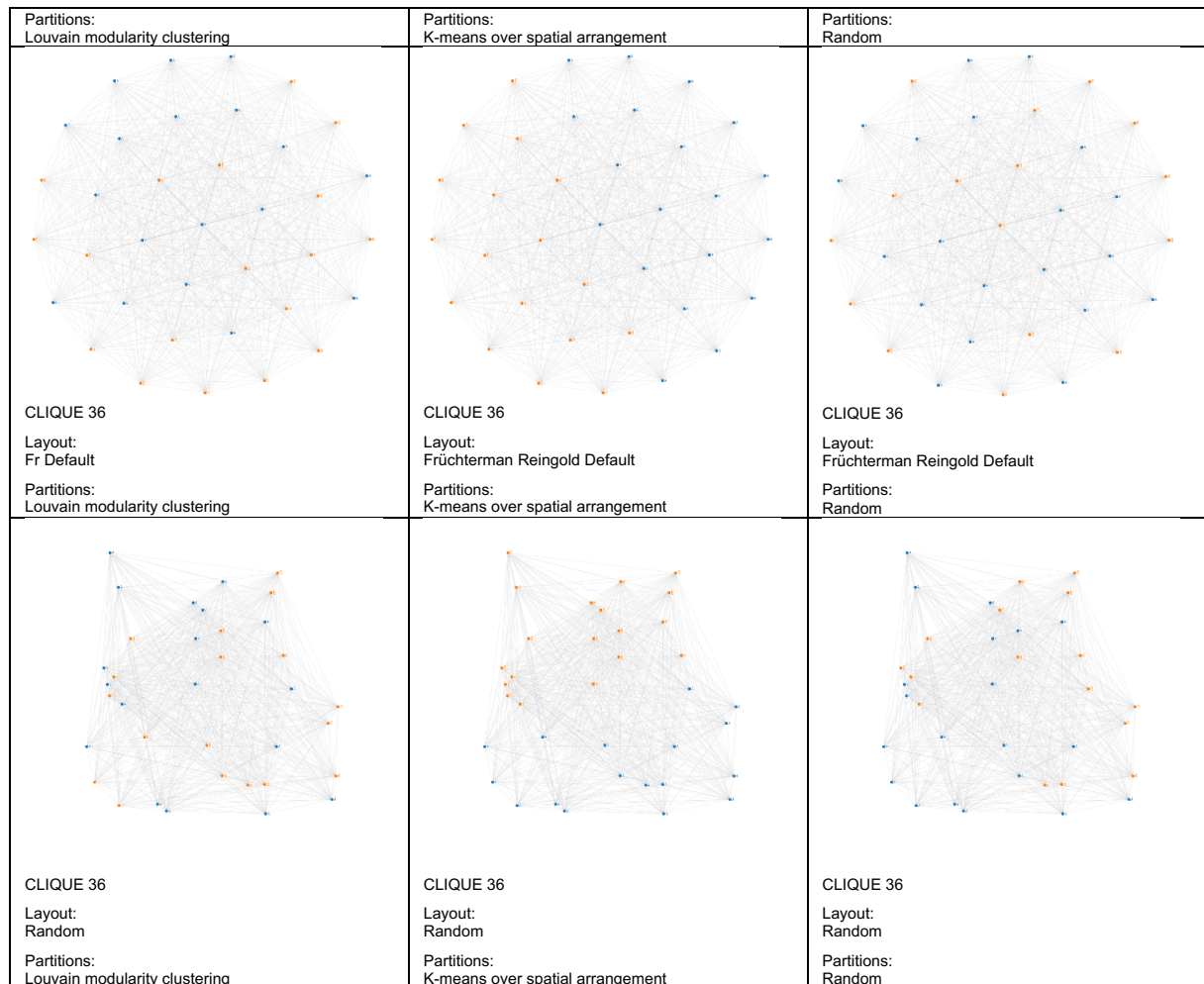
1. For a given network and a given partition of the nodes in k different classes C
2. We build the set S of all pairs of nodes (N_i, N_j) where the classes C_i and C_j are the same: $C_i = C_j$
In other terms, this is the set of the node pairs that define the clusters.
3. To compare the two partitions a and b of the same network, we compare the sets S_a and S_b with a Jaccard index: how many pairs (N_i, N_j) are in common, over how many pairs are in either or both of the sets.

The Jaccard index has a value of 0 if the partitions have no node in common, and a value of 1 if they are exactly the same. Comparing the pairs of nodes has the benefit of not requiring to match each cluster of the partition a with a cluster of the partition b , which cannot always be done in a meaningful way.

Network: CLIQUE 36

This network is a clique of 36 nodes (every node is connected to every other node).





Jaccard similarities for Force Atlas 2 Lin Log gravity 0

	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.37447698744769875	0.3662551440329218
K-means (layout)			0.3623481781376518
Random			

Jaccard similarities for Force Atlas 2 Default

	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.33539094650205764	0.33539094650205764
K-means (layout)			0.3402061855670103
Random			

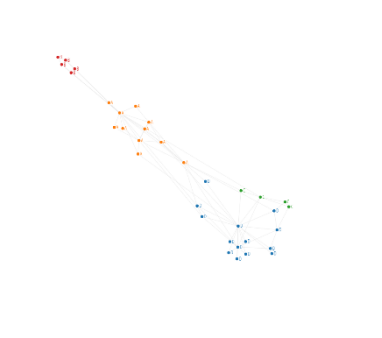
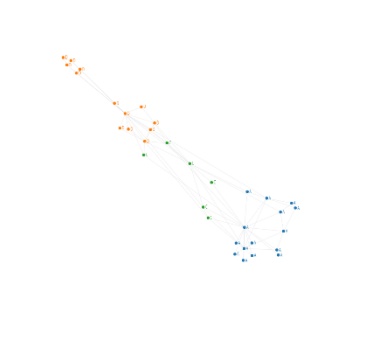
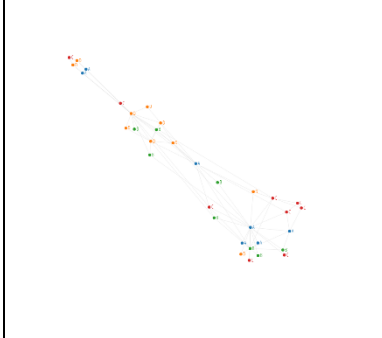
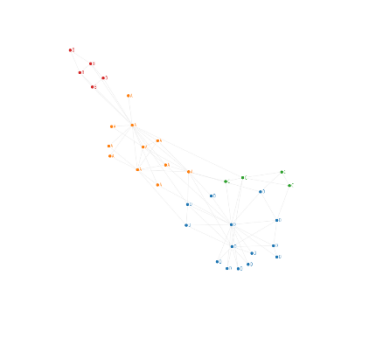
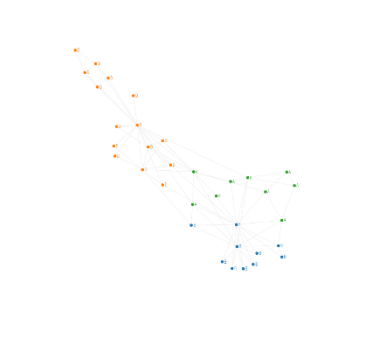
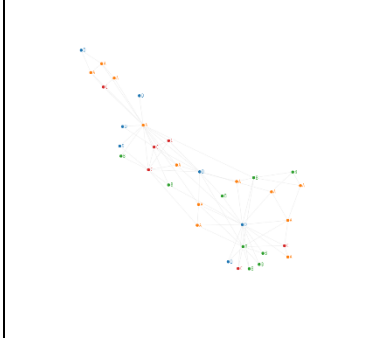
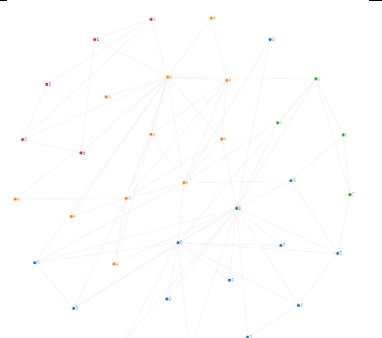
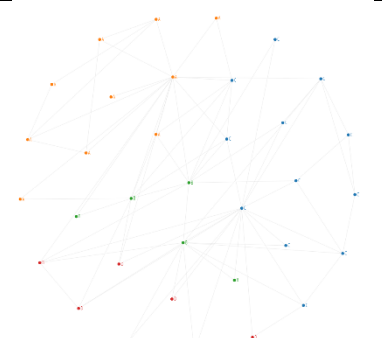
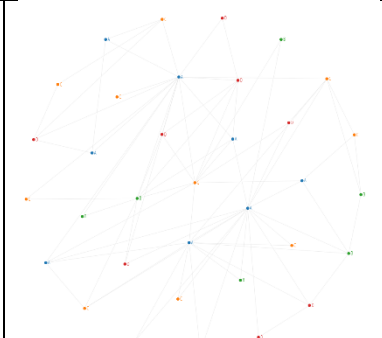
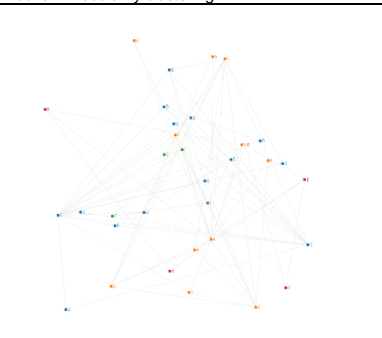
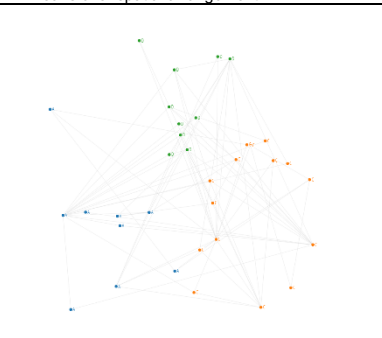
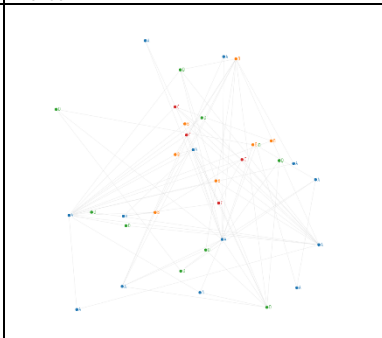
Jaccard similarities for Fruchterman Reingold Default

	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.33539094650205764	0.34156378600823045
K-means (layout)			0.33811475409836067
Random			

Jaccard similarities for Random layout

	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.34647302904564314	0.3872340425531915
K-means (layout)			0.34917355371900827
Random			

Network: KARATE CLUB

 <p>KARATE CLUB Layout: Force Atlas 2 Lin Log gravity 0 Partitions: Louvain modularity clustering</p>	 <p>KARATE CLUB Layout: Force Atlas 2 Lin Log gravity 0 Partitions: K-means over spatial arrangement</p>	 <p>KARATE CLUB Layout: Force Atlas 2 Lin Log gravity 0 Partitions: Random</p>
 <p>KARATE CLUB Layout: Force Atlas 2 Default Partitions: Louvain modularity clustering</p>	 <p>KARATE CLUB Layout: Force Atlas 2 Default Partitions: K-means over spatial arrangement</p>	 <p>KARATE CLUB Layout: Force Atlas 2 Default Partitions: Random</p>
 <p>KARATE CLUB Layout: Fr Default Partitions: Louvain modularity clustering</p>	 <p>KARATE CLUB Layout: Fruchterman Reingold Default Partitions: K-means over spatial arrangement</p>	 <p>KARATE CLUB Layout: Fruchterman Reingold Default Partitions: Random</p>
 <p>KARATE CLUB</p>	 <p>KARATE CLUB</p>	 <p>KARATE CLUB</p>

Layout: Random	Layout: Random	Layout: Random
Partitions: Louvain modularity clustering	Partitions: K-means over spatial arrangement	Partitions: Random

Jaccard similarities for Force Atlas 2 Lin Log gravity 0

	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.4485294117647059	0.2354948805460751
K-means (layout)			0.23484848484848486
Random			

Jaccard similarities for Force Atlas 2 Default

	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.5098814229249012	0.1971326164874552
K-means (layout)			0.20945945945945946
Random			

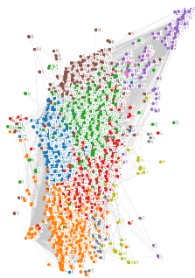
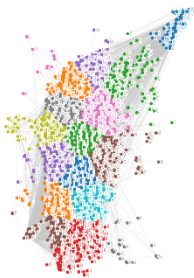

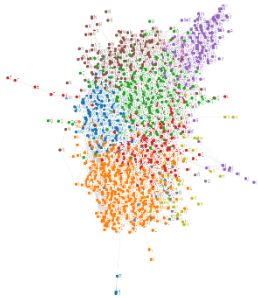
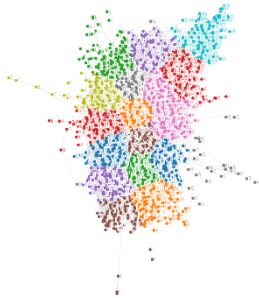
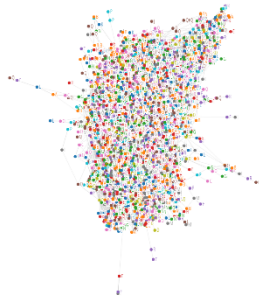
Jaccard similarities for Fruchterman Reingold Default

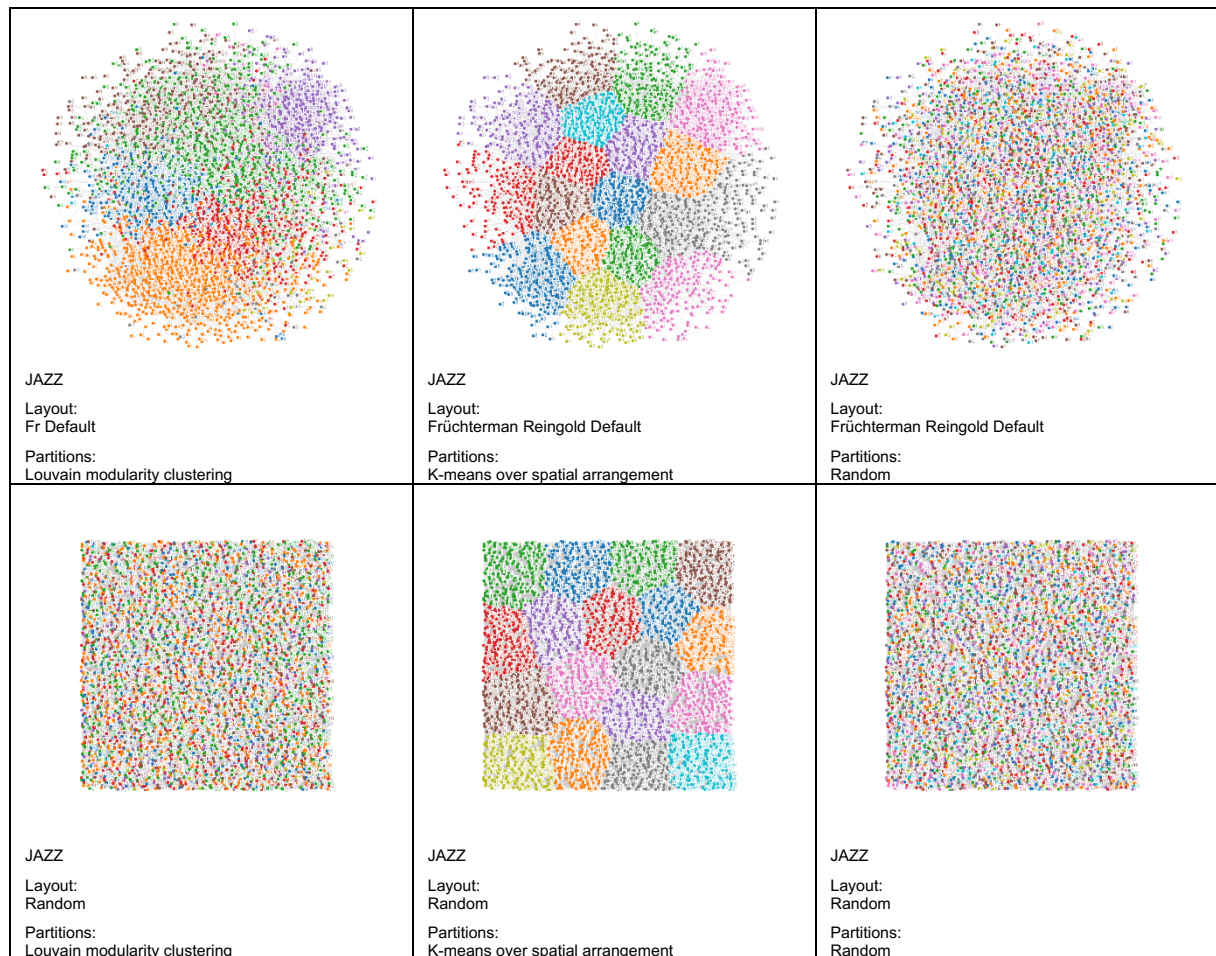
	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.3	0.18613138686131386
K-means (layout)			0.1821705426356589
Random			

Jaccard similarities for Random layout

	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.22044728434504793	0.18900343642611683
K-means (layout)			0.2012987012987013
Random			

Network: JAZZ

 <p>JAZZ Layout: Force Atlas 2 Lin Log gravity 0 Partitions: Louvain modularity clustering</p>	 <p>JAZZ Layout: Force Atlas 2 Lin Log gravity 0 Partitions: K-means over spatial arrangement</p>	 <p>JAZZ Layout: Force Atlas 2 Lin Log gravity 0 Partitions: Random</p>
 <p>JAZZ Layout: Force Atlas 2 Default Partitions: Louvain modularity clustering</p>	 <p>JAZZ Layout: Force Atlas 2 Default Partitions: K-means over spatial arrangement</p>	 <p>JAZZ Layout: Force Atlas 2 Default Partitions: Random</p>



Jaccard similarities for Force Atlas 2 Lin Log gravity 0

	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.2330560156396071	0.04438799104420556
K-means (layout)			0.03184521017858108
Random			

Jaccard similarities for Force Atlas 2 Default

	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.18454292538682374	0.044322270387411274
K-means (layout)			0.031099973208335418
Random			

Jaccard similarities for Fruchterman Reingold Default

	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.1550417994545389	0.044257343748517815
K-means (layout)			0.03167980884226725
Random			

Jaccard similarities for Random layout

	Louvain modularity	K-means (layout)	Random
Louvain modularity		0.04468270322090115	0.030219755529323974
K-means (layout)			0.04438436553619126
Random			

Similarities between Louvain modularity and k-means on layout

Three remarks:

- The network CLIQUE 36 is for controlling the results. By nature, it cannot be projected on the plane in a satisfying way, and it cannot be clustered either: all nodes are strictly equivalent.
- The random layout is also presented for control. We expect that the similarity with the k-means based on it is low.
- The random partitions are for control as well. We expect that they have no meaningful similarity with either the k-means or the Louvain modularity.

