Stat4DS / Homework 02

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Exercise: Connect your brain

1. Take a look at basic tools to deal with graphs in R such as the igraph and ggraph packages.
2. Load the pre–processed data matrix X contained in the file hw2_data.RData. The resulting object named t, mts is a (240×81) numerical matrix. The 81 columns are related to different Brodmann cortical areas labeled with an integer plus a prefix L or R depending on the hemisphere they belong. The rows instead are the observation times (again, here we will drop the temporal dependency). Notice that, for each cortical area, the time series we are working on is obtained by averaging those associated to voxels belonging to the same Brodmann area.
3. With this data, consider any association measure you want (but partial correlation, see the last point), and implement the bootstrap procedure described in the box above entitled "simultaneous bootstrapped CI's for a generic association measure ρ".
4. Graphically represent the estimated graph but try to:

- visualize its dynamic as ϵ varies
- visualize the strengh of the dependency adopting a suitable color-scale for the edges of the graph. Draw some conclusion: what are the areas that show the highest/lowest degree of connectivity?

5. Repeat the analysis using this time the linear partial correlation coefficient as implemented in package SIN. Compare the results... even better if "visually"...