

**Supervising :** Sophie Achard (LJK, University Grenoble Alpes)  
Irène Gannaz (ICJ, INSA de Lyon)  
Kevin Polisano (LJK, University Grenoble Alpes)

Contact : [Irene.Gannaz@insa-lyon.fr](mailto:Irene.Gannaz@insa-lyon.fr)

Location : Grenoble.

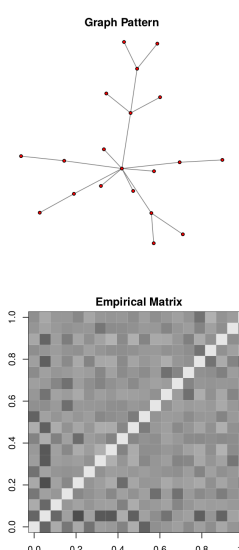
## Background

---

Graph inference is an area which encounters much attention. The objective is to represent the dependence between individuals or variables as a graph. The first advantage is visual. It is also attractive because it gives access to many tools from graph theory, *e.g.* for structure comparisons.

A graphical model is a modelling of the dependence structure based on a covariance matrix or its invers (precision matrix). Validation of inference procedures needs a simulation study. Yet, the generation of covariance matrices encounters obstacles. In particular, the values of generated correlation matrices are often low, compared with real life observations.

Recently, Córdoba et al. (2020) proposed a new procedure for generating covariance matrices. Our objective is to do an overview of existing methods in this domain, starting from this article.



An example of covariance matrix generated with the R package *huge*.

## Reference

Córdoba, I., Varando, G., Bielza, C., & Larrañaga, P. (2020). On generating random Gaussian graphical models. *International Journal of Approximate Reasoning*, 125, 240-250.

## Objective

---

The internship aims at:

- making a bibliography review of the existing procedure generating graphical models;
- evaluating numerically the quality of the methods.

Language R will be used. No prerequisite on graph theory is needed but basis in algebra is necessary (principally on eigenvalues decomposition).