

## Covariance filtering using neural networks

The goal of this project is to use an AI based method to estimate the true covariance matrix of a  $d$  dimensional stochastic process. This task is often referred to as “covariance shrinkage” and a lot of literature has been written on this topic, whose mathematical foundations lie in random matrix theory (RMT). The problem is the following : having a set of  $d$  time series, and  $N$  observations, if the ratio  $T/d$  is not very large compared to 1, the classical covariance estimator does not perform well.

The goal here is to train a neural network (NN) to actually recover the true covariance from the empirical covariance.

- (1) Generate a training set of correlation matrices
- (2) Generate a training set of individual variances processes (Garch like)
- (3) Simulate the multivariate process
- (4) Compute the empirical correlation/covariance (might be good to first compute the individual variances to normalize and then compute the approximate correlation.)
- (5) obtain a data set of pairs  $(p; e)$  where  $p$  (resp.  $e$ ) is the vector of the population (resp. empirical) correlation matrix.
- (6) train a neural network on this data set
- (7) use this to compute a global mean variance ptf on simulated / empirical data, and compare with other methods.

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**Session Classification:** supprimé