

# Graphic Lasso: Check the algorithm

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## 1 Pick the strong correlations in the sample covariance matrix

The brain tissues are usually clustered in four groups: cortex, cerebellum, basal ganglia, and others. To emphasize the difference between each kind of brain tissues, I consider the sub-matrices of the sample covariance matrices as input. The sub-matrices include all the entires which imply a top 100 strong correlation in at least one tissue. The Figure 1 shows the sub-matrices for the three groups

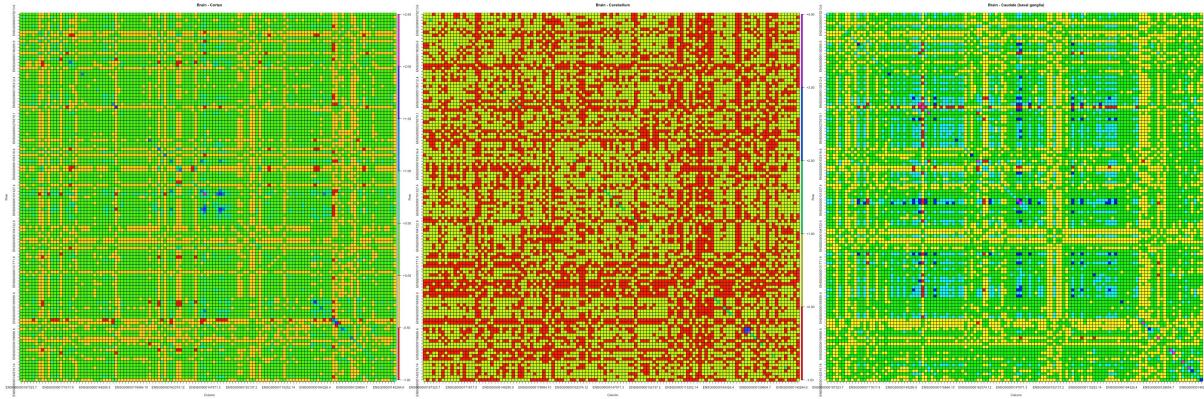


Figure 1: Sub-matrices for three brain tissues groups.

However, with this input, the clustering results are not satisfactory.

$A_0 : u_{ki} = 0$	Brain - Cortex Brain - Putamen (basal ganglia) Brain - Amygdala Brain - Cerebellum Brain - Hippocampus Brain - Substantia nigra Brain - Anterior cingulate cortex (BA24) Brain - Frontal Cortex (BA9) Brain - Cerebellar Hemisphere Brain - Caudate (basal ganglia)
$A_1 : u_{k1} \neq 0$	Brain - Spinal cord (cervical c-1)
$A_2 : u_{k2} = 0$	Brain - Hypothalamus
$A_3 : u_{k3} = 0$	Brain - Nucleus accumbens (basal ganglia)

Table 1: Membership result for 13 brain tissues.

Based on the Figure 1, it is acceptable that the cortex may be clustered with basal ganglia tissues. But it is not reasonable that cortex is clustered with cerebellum.

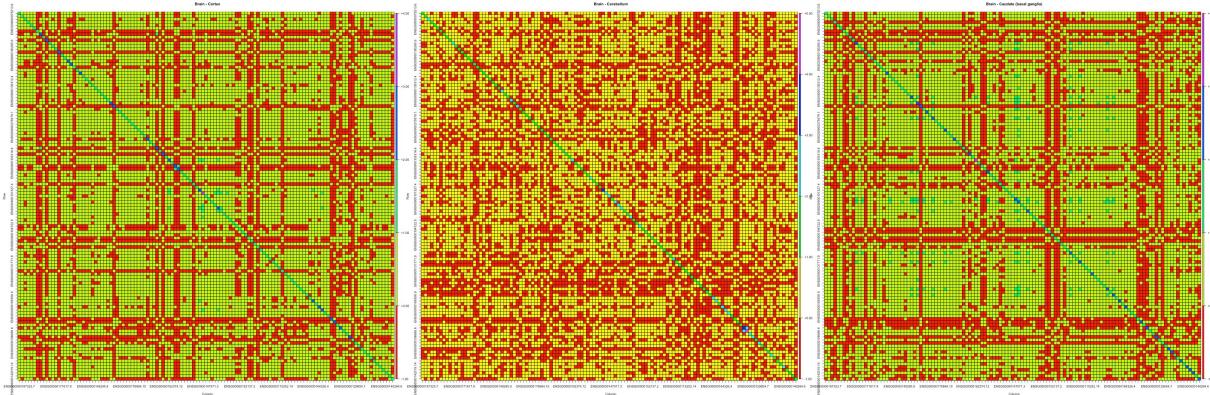


Figure 2: Fake signal for three brain tissues groups.

To strengthen the signal in each tissues, I add 0.08(-0.08) to the top 100 positive(negative) entries. Figure ?? shows the fake signal matrices in three typical tissues.

However, the membership result is the same as Table 1.