

Graphic Lasso: Clustering accuracy for precision matrix model

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1 Settings

Let $\rho = 2000$ and $r = 5$. The corresponding model is

$$\Omega^k = \Theta_0 + \sum_{l=1}^r u_{kl} \Theta_l,$$

where $\mathbf{U} = \llbracket u_{kl} \rrbracket \in \mathbb{R}^{K \times r}$ has non-overlapped columns. The following are the results after 50 iterations.

2 Convergency Performance

The algorithm did not converge after 50 iterations. The objective function keep decreasing in general, expect the first few iterations. Note that there exist some fluctuations after about 30 iterations. The objective may act like “3.8 - 3.5 - 3.7 - 3.6 - 3.4”. The objective function trajectory will be provided later.

Though there are slight fluctuations, the objective function is decreasing. Therefore, the following results may not be satisfactory. The algorithm is running with more iterations now. I will check the new results tomorrow morning.

3 Membership Results

Based on $\hat{\mathbf{U}}$, we obtain the membership result for 53 tissues. See Table 1.

4 Gene Correlation Results

See Figure 1, 2, 3, 4, 5 for the correlation estimation of $\{\Theta_l\}, l \in [r]$.

See Figure 6 for the intercept estimation of Θ_0 . We only include the top 30 correlations.

In all figures, the wider edge indicates a larger correlation.

$A_0 : u_{kl} = 0, l \in [5]$	Minor Salivary Gland, Brain - Cortex Adrenal Gland, Thyroid, Spleen, Pancreas, Colon - Sigmoid, Small Intestine - Terminal Ileum, Prostate, Testis, Nerve - Tibial Heart - Left Ventricle, Pituitary, Brain - Cerebellum, Cells - Transformed fibroblasts, Artery - Aorta, Cells - EBV-transformed lymphocytes, Liver, Kidney - Cortex, Brain - Anterior cingulate cortex (BA24), Brain - Frontal Cortex (BA9) Brain - Cerebellar Hemisphere, Brain - Hypothalamus, Brain - Amygdala, Artery - Coronary, Fallopian Tube, Bladder, Cervix - Ectocervix Cervix - Endocervix, Heart - Atrial Appendage, Ovary, Uterus
$A_1 : u_{k1} \neq 0$	Whole Blood, Breast - Mammary Tissue Adipose - Subcutaneous, Muscle - Skeletal
$A_2 : u_{k2} \neq 0$	Lung, Stomach, Artery - Tibial, Adipose - Visceral (Omentum)
$A_3 : u_{k3} \neq 0$	Skin - Not Sun Exposed (Suprapubic) Skin - Sun Exposed (Lower leg)
$A_4 : u_{k4} \neq 0$	Vagina, Esophagus - Mucosa, Colon - Transverse, Brain - Hippocampus Brain - Substantia nigra, Brain - Caudate (basal ganglia), Brain - Nucleus accumbens (basal ganglia), Brain - Putamen (basal ganglia), Brain - Spinal cord
$A_5 : u_{k5} \neq 0$	Esophagus - Muscularis, Esophagus - Gastroesophageal Junction

Table 1: Membership result for 53 tissues.



Figure 1: Non-zero correlations in Θ_1 .

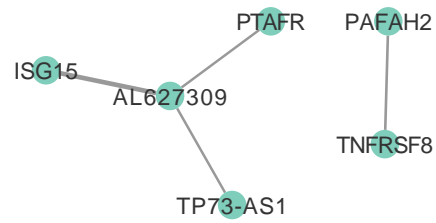


Figure 2: Non-zero correlations in Θ_2 .

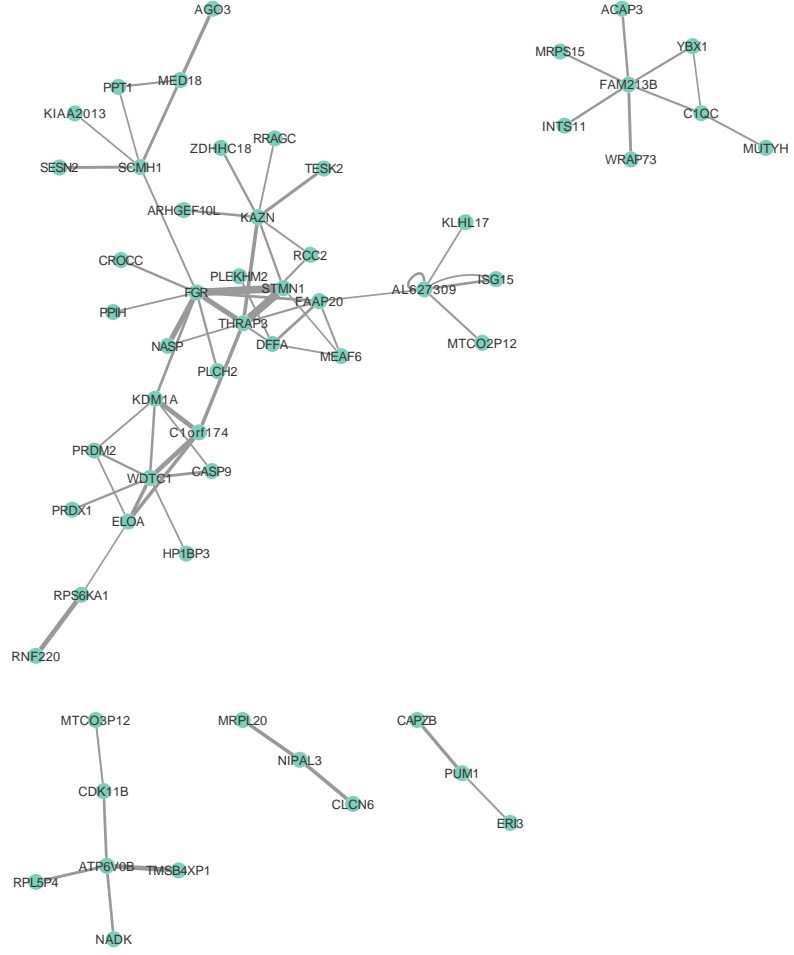


Figure 3: Non-zero correlations in Θ_3 .

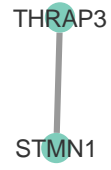


Figure 4: Non-zero correlations in Θ_4 .

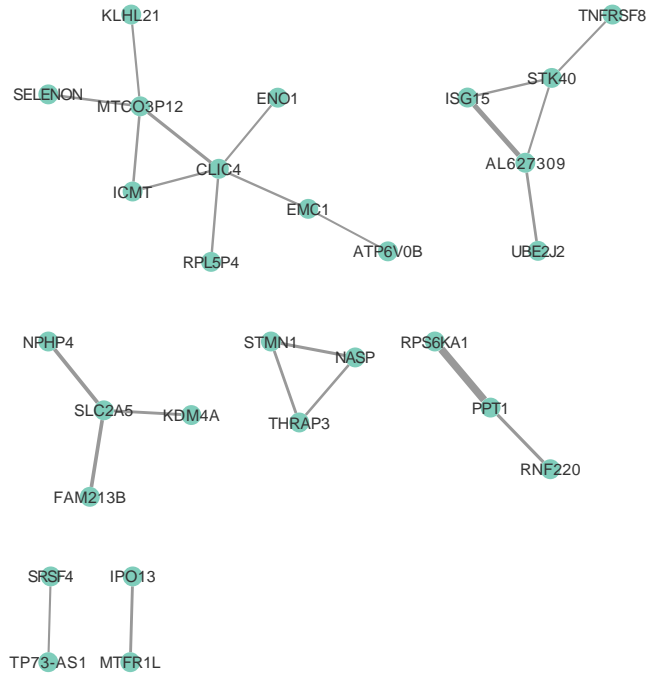


Figure 5: Non-zero correlations in Θ_5 .

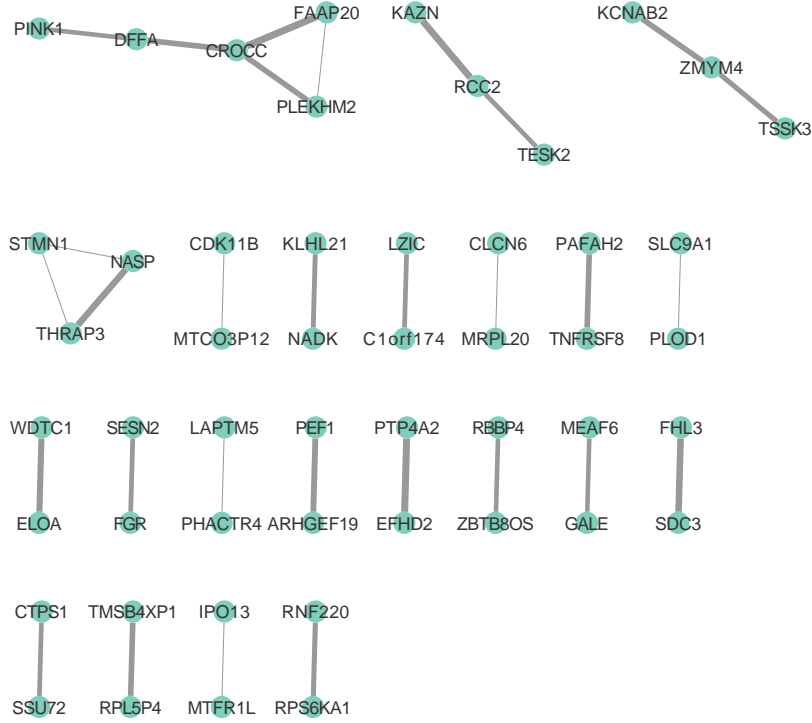


Figure 6: Non-zero correlations in Θ_0 .