

## Topic 15: Graphical Network Inference

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**Key points:**

**Disclaimer:** *The note is built on Prof. [Jinchi Lv](#)'s lectures of the course at USC, DSO 607, High-Dimensional Statistics and Big Data Problems.*

## 15.1 Motivation

Consider a classic question: Suppose we have  $N$  observations of dimension  $p$  follow  $\mathcal{N}(\mu, \Sigma)$ . let  $\Theta = \Sigma^{-1}$ , and  $S$  be the empirical covariance matrix. The problem is

$$\max \log \det \Theta - \text{Tr}(S\Theta) - \rho \|\Theta\|_1 \Leftrightarrow \min -\log \det \Theta - \text{Tr}(S\Theta) - \rho \|\Theta\|_1$$