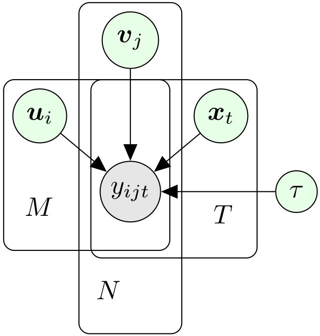
# Tensor Factorization

Bayesian treatment[1]:

Suppose that *the observation follows Gaussian distribution*:

$$y_{ijt} \sim \mathcal{N}\left(\sum_{r=1}^{R} u_{ir} v_{jr} x_{tr}, \tau^{-1}\right), (i,j,t) \in \Omega.$$

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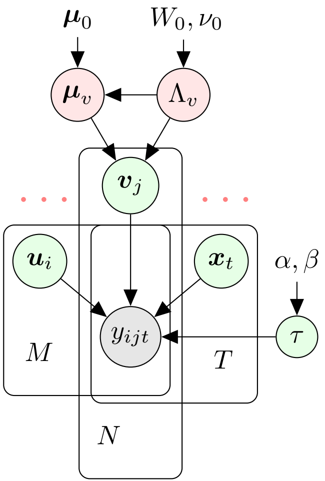
In the Bayesian setting, we place *conjugate priors* on model parameters, i.e.,

$$\begin{aligned}
\boldsymbol{u}_i &\sim \mathcal{N}\left(\boldsymbol{\mu}_u, \Lambda_u^{-1}\right), i = 1, 2, \ldots, M, \\
\boldsymbol{v}_j &\sim \mathcal{N}\left(\boldsymbol{\mu}_v, \Lambda_v^{-1}\right), j = 1, 2, \ldots, N, \\
\boldsymbol{x}_t &\sim \mathcal{N}\left(\boldsymbol{\mu}_x, \Lambda_x^{-1}\right), t = 1, 2, \ldots, T, \\
\tau &\sim \text{Gamma}(\alpha, \beta).
\end{aligned}$$

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