# Hierarchical Model

Structured Precision Matrix, **Q**

Normalized graph laplacian

$$\mathbf{Q} = \gamma \tilde{L} = \gamma(\mathbf{I} - \hat{\mathbf{D}}^{-\frac{1}{2}}\hat{\mathbf{A}}\hat{\mathbf{D}}^{-\frac{1}{2}})$$

γ

**Q**

$\mu_i$

**Q**

$w_i$

$w_{ij}$

$\lambda_q$

$q_{ij}$

Sum of over products, *j*

Sum over regions, *i*

$S_i$

$S$

$\mu_c, \sigma_c$

$\beta_c$

$\lambda_c$

$c_j$

$p_i$

$$log\ \lambda_c = \boldsymbol{x}_c'\boldsymbol{\beta}_c$$

*Temporal Features*

**Products: *1, 2, ... i***
**Regions: *1, 2, ... j***