Graphical Visualizations of Probabilistic Models

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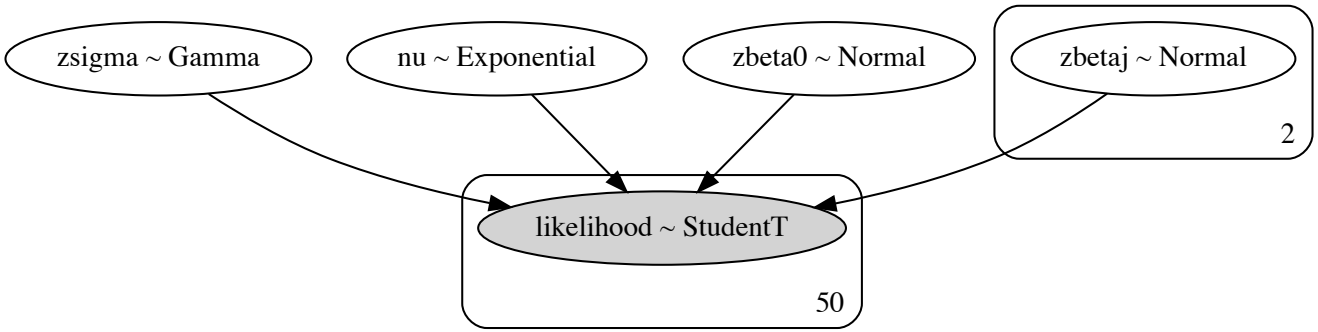
Graphical Models for Visualization

- Graphical models are very useful for visualizing a problem and its components item
- Make complex relationships easier to understand
- Automatic generators of graphical models
- Example - graphviz
  1. Specify the model
  2. Produce the graphical visualization
- Characteristics
  - Plates in the model used to represent multiple nodes
  - May not show all the variables - e.g., predictors

Regression Example

- Response variable: $y =$ total SAT score
- Predictor variables: $x_1 =$ spending and $x_2 =$ % taking the test
- Parameters: $\beta_0 \sim \mathcal{N}(\mu_0, \tau_0^{-1})$ and β_1, β_2 are each $\mathcal{N}(\mu, \tau^{-1})$
- Model error: $\eta \sim \mathrm{t\,Dist}(\nu, \mu, \sigma)$

Regression Graphical Model



Hierarchical Classification Example

- $y_{is} \in \{0, 1\}$ is the response of a subject $s \in (1, \ldots, N)$ to a drug on test $i \in (1, \ldots, M)$
- $\theta_s \in [0, 1]$ is the probability of a positive (1) response by subject s.
- Let $p(\theta_s) \sim \text{Beta}(\omega, \kappa)$ where $\alpha = \omega\kappa$ and $\beta = (1 - \omega)\kappa$
- Let $\omega \sim \text{Beta}(A_\omega, B_\omega)$ and $\kappa \sim \text{Gamma}(S_{kappa}, R_{kappa})$

Kruschke Diagram - Hierarchical Model for Binary Response