



Graphical Visualizations of Probabilistic Models

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Graphical Models for Visualization

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3/8

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Motivation

Examples

- Graphical models are very useful for visualizing a problem and its components
- 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 parameters or variables



Regression Example

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5/8

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Motivation

Examples

- Response variable: $y = \text{total SAT score}$,
 $y \sim \text{t Dist}(\nu, \mu, \sigma)$
- Let $\nu \sim \text{Exp}(\lambda)$, $\mu \sim \text{N}(\mu_0, \kappa^{-1})$, $\sigma \sim \text{Gamma}(S, R)$
- Predictor variables: $x_1 = \text{spending}$ and $x_2 = \text{\% taking the test}$
- Parameters: $\beta_0 \sim \text{N}(\omega_0, \tau_0^{-1})$ and β_1, β_2 are each $\text{N}(\omega, \tau^{-1})$



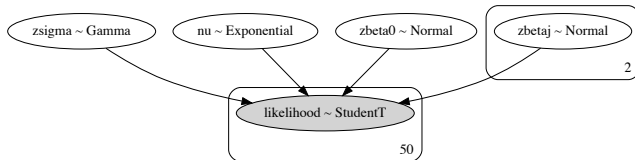
Regression Graphical Model

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Motivation

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Hierarchical Classification Example

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7/8

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Motivation

Examples

- $y_{is} \in \{0, 1\}$ is the response of a subject $s \in (1, \dots, N)$ to a drug on test $i \in (1, \dots, M)$
- $\theta_s \in [0, 1]$ 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

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