

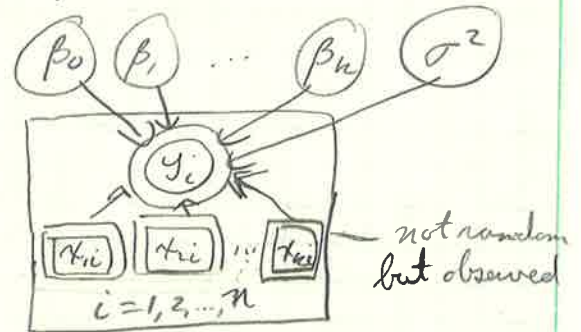
$$y_i = \underbrace{\beta_0 + \beta_1 x_{1i} + \dots + \beta_n x_{ni}}_{\text{mean}} + \underbrace{\varepsilon_i}_{\text{error}}, \quad \varepsilon_i \stackrel{\text{i.i.d.}}{\sim} N(0, \sigma^2), i=1, \dots, n$$

$$y_i | x_i, \beta, \sigma^2 \stackrel{\text{i.i.d.}}{\sim} N(\beta_0 + \beta_1 x_{1i} + \dots + \beta_n x_{ni}, \sigma^2)$$

$$\beta_0 \sim p(\beta_0), \quad \beta_i \sim p(\beta_i), \dots$$

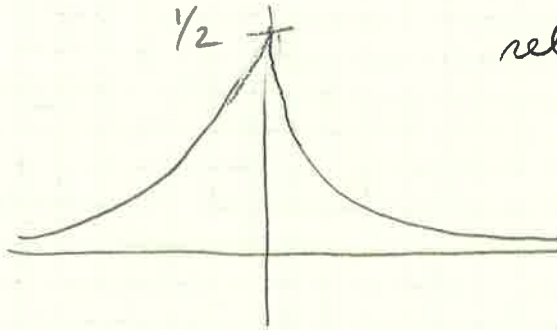
$$\sigma^2 \sim p(\sigma^2) \text{ (maybe IG)}$$

usually normal or multivariate normal



Laplace prior

$$p(\beta) = \frac{1}{2} e^{-|\beta|}$$



related to the LASSO

Factors: soundLevels: music  
no musicfont sizesmall  
medium  
large $g_i \sim$  group of subject  $i$   
 $\mu \sim$  vector of  $G$  group means

$$y_i | g_i, \mu, \sigma^2 \stackrel{\text{ind}}{\sim} N(\mu_{g_i}, \sigma^2)$$

$$g_i \in \{1, \dots, G\}, i = 1, \dots, n$$

Alternative

$$E(y_i) = \beta_0 + \beta_1 \underset{\substack{\uparrow \\ I(g_i=1)}}{X_{1,i}} + \dots + \beta_{G-1} \underset{\substack{\uparrow \\ I(g_i=G-1)}}{X_{G-1,i}}$$

 $X$ 's are indicators or dummy variables

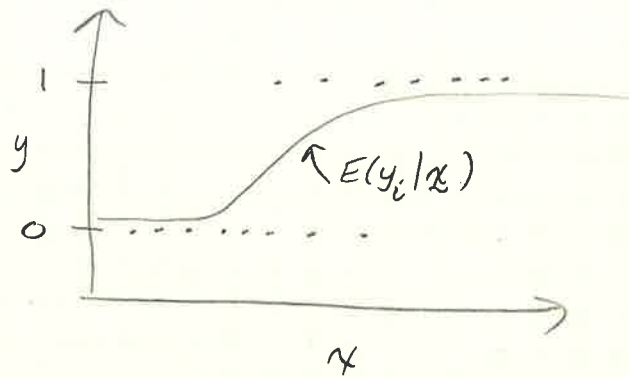
		B		
		1	2	3
A	1	$\mu_{1,1}$	$\mu_{1,2}$	$\mu_{1,3}$
	2	$\mu_{2,1}$	$\mu_{2,2}$	$\mu_{2,3}$

 $A, B \sim$  Factors

6 treatment groups

Additive model: (good for no interactions between factors)

$$E(y_i) = \mu + \alpha_2 I(a_i = 2) + \beta_2 I(b_i = 2) + \beta_3 I(b_i = 3)$$



$y_i | \phi_i \overset{\text{ind}}{\sim} \text{Bernoulli}(\phi_i)$ ,  $i=1, \dots, n$   
 In linear regression:  $E(y_i) = \beta_0 + \beta_1 x_{i1}$

$\phi$  is probability of success

$$\frac{\phi}{1-\phi} \Leftrightarrow \text{odds}$$

$$\log\left(\frac{\phi}{1-\phi}\right) \Leftrightarrow \text{logit link}$$

$$\text{logit}(\phi_i) = \log\left(\frac{\phi_i}{1-\phi_i}\right) = \beta_0 + \beta_1 x_{i1}$$

$$E(y_i) = \phi_i = \frac{\exp(\beta_0 + \beta_1 x_{i1})}{1 + \exp(\beta_0 + \beta_1 x_{i1})} = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_{i1})}}$$

$$y_i | x_i, \beta \overset{\text{ind}}{\sim} \text{Bernoulli}\left(\frac{1}{1 + \exp[-\beta_0 + \beta_1 x_{i1} + \dots + \beta_k x_{ik}]}\right)$$