Mixture Model Likelihood

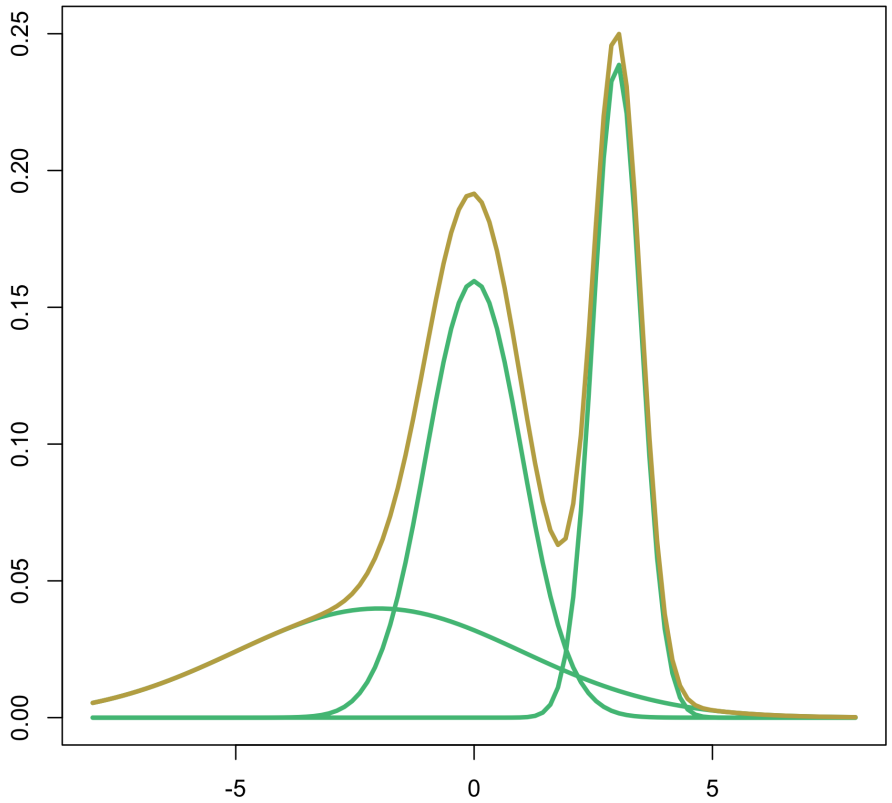
Z unobserved

$$L(\theta_0, \theta_1, \phi) \propto P(y_1 \ldots y_{100} \mid \theta_0, \theta_1, \phi) =$$

$$\propto \prod_{i=1}^{100} P(y_i \mid \theta_0, \theta_1, \phi) = \prod_{i=1}^{100} \left[\sum_{z=0}^{1} P(y_i, z_i \mid \theta_0, \theta_1, \phi) \right]$$

$$\propto \prod_{i=1}^{100} \left[\phi \binom{10}{y_i} \theta_1^{y_i} (1-\theta_1)^{10-y_i} + (1-\phi) \binom{10}{y_i} \theta_0^{y_i} (1-\theta_0)^{10-y_i} \right]$$

Finite Mixture models



Infinite Mixture Models

- In the previous example the latent variable had finitely many outcomes
- Latent varibles can have infinitely many outcomes in which case we have any infinite mixture
- Example:

$$\mu \sim N(0, \tau^2)$$
$$Y \sim N(\mu, \sigma^2)$$

$$p(Y \mid \sigma^2, \tau^2) = \int p(Y, \mu \mid \sigma^2, \tau^2) d\mu$$

What is the *marginal* distribution of Y?