Maximum Likelihood

- Find parameters such that the likelihood functions achieves a maximum value, e.g. the values

$$\widehat{\mu}_i = \frac{\sum_{j=1}^{n} y_{ij}}{N_i}, \widehat{\sigma}^2 = \frac{\sum_{j=1}^{n} (y_{ij} - \widehat{\mu}_i)^2}{n-1}$$

  are maximum likelihood estimates for $\mathscr{L}\left(\mu, \sigma^2 \,|\, y\right)$

- The value of $\mathscr{L}\left(\ldots \,|\, y\right)$ with respect to the maximum likelihood estimates is a measure of the correctness of a statistical model for data y

Likelihood Ratio

- Given likelihood estimates for two alternative hypothesis:

$$H_1 | \mu = \mu_1 : \mathscr{L}_1 \left(\mu_1, \sigma^2 | y_1, \ldots, y_n \right)$$
$$H_2 | \mu = \mu_2 : \mathscr{L}_1 \left(\mu_2, \sigma^2 | y_1, \ldots, y_n \right)$$

- we can compute a relative likelihood

$$\frac{\mathscr{L}_2 \left(\mu_2, \sigma^2 | y_1, \ldots, y_n \right)}{\mathscr{L}_1 \left(\mu_1, \sigma^2 | y_1, \ldots, y_n \right)}$$