

## Bayesian Estimation

- To choose the parameters which maximizes the likelihood function  $L(\pi(\theta), \theta)$ :

$$L(\pi(\theta), \theta) = \pi(\theta) f(x_1, x_2, \dots, x_n | \theta)$$

- Where  $\pi(\theta)$  is the prior probability density of  $\theta$  before sampling.

- The Bayesian estimation  $\hat{\theta} = (\hat{\theta}_1, \hat{\theta}_2, \dots, \hat{\theta}_k)$  is the set of estimated values that satisfies the equations

$$\frac{\partial L(\theta)}{\partial \theta_i} = 0, \quad i = 1, \dots, k.$$

- The Bayesian estimation  $\hat{\theta}$  of parameter  $\theta$  is the expected value of the parameter taken with respect to the posterior distribution of  $\theta$  given the outcome of the random sample  $x$ , i.e.,

$$\hat{\theta} = E[\theta | x]$$