Part B

2018ICSE0621

Q.2] a) Maximum likelihood & least squares are related by

$$t = y(x, w) + \epsilon$$

$y(x, w)$ → deterministic ; ϵ → Noise.

Thus, $p(t|x, w, \beta) = \mathcal{N}(t|y(x, w), \beta^{-1})$

b] We know, $t = y(x, w) + \epsilon$

$$\Rightarrow E[t|x] = \int t\, p(t|x)\, dt = y(x, w)$$

using weights of β,

$$\Rightarrow p(t|x, w, \beta) = \prod_{n=1}^{N} \mathcal{N}(t_n | w^T \phi(x_n), \beta^{-1})$$

$$\ln p(t|w, \beta) = \frac{N}{2} \ln \beta - \frac{N}{2} \ln(2\pi) - \beta E_D(w)$$

$$\nabla \ln(p(t|w, \beta)) = \sum_{n=1}^{N} \{t_n - w^T \phi(x_n)\} \phi(x_n)^T$$

Solving for w, we get,

$$w_{ML} = (\phi^T \phi)^{-1} \cdot \phi^T t.$$