LECTURE 4 09/05/2017

Review

1. LS : $Y = AX$

$$A'Y = A'AX$$

$$(A'A)^{-1}A'Y = X$$

2. Ridge

$$A'Y = (A'A + \delta I)X$$

$$(A'A + \delta I)^{-1}A'Y = X$$

3. Features

$A \rightarrow$ polynomials

4. Cross-validation

train | val | test

parameter hyper-param. method

1.) ~~Additive white noise~~ Data Generated w/ Additive White Noise

additive : $Y = f(x) + N(x)$

random var. : $N(x) \sim p(n(x))$

zeromean : $E[N(x)] = 0, \forall x$

independent & identical distributed : $p(n(x)) = p(n), \forall x$

2) Univariate Gaussian Distribution

Random variable : $x \sim p(x)$

Probability : $p(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-(x-\mu)^2/(2\sigma^2)}$

Mean : $E[x] = \int_{-\infty}^{+\infty} x p(x) dx = \mu$

Variable : $V[x] = E[(x-\mu)^2] = \int_{-\infty}^{+\infty} (x-\mu)^2 p(x) dx = \sigma^2$

Parameter : $x \sim \mathcal{N}(\mu, \sigma^2)$

Log-likelihood : $\log p(x) = -\frac{(x-\mu)^2}{2\sigma^2} - \log(\sqrt{2\pi}\sigma)$

Linear Combination : $E[aX + bY] = a\mu_x + b\mu_y$

X, Y independent : $V[aX + bY] = a^2\mu_x + b^2\mu_z$