

$$\frac{1}{n} \sum_{i=1}^n x_i = 0 \quad \text{f.v.}$$

$$\mu_- = -\frac{n_+}{n_-} \mu_+ \quad \dots (1)$$

$$X^T y = n_+ \mu_+ - n_- \mu_- = 2n_+ \mu_+ \quad \dots (2)$$

ଅଟେ,

$$n \hat{\Sigma} = \sum_{i=1}^n x_i x_i^T - n_+ \mu_+ \mu_+^T - n_- \mu_- \mu_-^T \quad \downarrow \because (1)$$

$$= X^T X - \frac{n_+}{n_-} \cdot n \mu_+ \mu_+^T$$

ଅର୍ଥାତ୍, $\hat{\theta}$ ଉପରେ ନିମ୍ନଲିଖିତ ସମୀକରଣ ଗଠିତ ।

$$(X^T X) \hat{\theta} = X^T y \quad \text{f.v., (1), (2), (3) ଉପରେ ନିର୍ଭର କରେ ।}$$

$$n \hat{\Sigma} \hat{\theta} + \frac{n_+}{n_-} n \mu_+ \mu_+^T \hat{\theta} = 2n_+ \hat{\mu}_+$$

$$\mu_+ \mu_+^T \hat{\theta} = c \mu_+ \quad \text{ଏହାକୁ ଗୁଣନ କରିବା ଉପରେ ନିର୍ଭର କରେ ।}$$

$$n \hat{\Sigma} \hat{\theta} = \left(2n_+ - c \frac{n_+}{n_-} n \right) \hat{\mu}_+$$

$$\rightarrow \hat{\theta} = \left(\frac{2n_+}{n} - \frac{cn_+}{n_-} \right) \hat{\Sigma}^{-1} \hat{\mu}_+$$

$$= k \cdot \hat{\Sigma}^{-1} \cdot \left(\frac{n}{n_-} \hat{\mu}_+ \right)$$

$$= k \cdot \hat{\Sigma}^{-1} (\hat{\mu}_+ - \hat{\mu}_-)$$

ଅର୍ଥାତ୍, $\hat{\theta}$ ହେଉଛି $\hat{\Sigma}^{-1} (\hat{\mu}_+ - \hat{\mu}_-)$ ର ସ୍କେଲିଂ ଏବଂ ଶିଫ୍ଟ ।

$$\begin{aligned} \mu_+ - \mu_- &= \left(1 + \frac{n_+}{n_-} \right) \mu_+ \\ &= \frac{n}{n_-} \mu_+ \end{aligned}$$

Lec 5 HW-1 ~~ସମାପ୍ତ~~ 30/11/21

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