Quiz 1

March 18th 2020

1 Lecture 5

$$\log \frac{Pr(G=1|X=x)}{1-Pr(G=1|X=x)} = \beta_0 + x^T\beta$$

$$\frac{Pr(G=1|X=x)}{1-Pr(G=1|X=x)} = \exp(\beta_0 + x^T\beta)$$

$$Pr(G=1|X=x) = \frac{\exp(\beta_0 + x^T\beta)}{1+\exp(\beta_0 + x^T\beta)}$$

$$Pr(G=2|X=x) = 1 - Pr(G=1|X=x) \quad = \frac{1}{1+\exp(\beta_0 + x^T\beta)}$$

2 Lecture 6

$$\begin{aligned}
\hat{\Sigma}* &= \frac{\sum_{k=1}^{K}\sum_{g_i=k}(x_i^* - \hat{\mu}_k^*)(x_i^* - \hat{\mu}_k^*)^T}{N-K} \\
&= \frac{\sum_{k=1}^{K}\sum_{g_i=k}(\hat{\Sigma}^{-\frac{1}{2}}x_i - \hat{\Sigma}^{-\frac{1}{2}}\hat{\mu}_k)(\hat{\Sigma}^{-\frac{1}{2}}x_i - \hat{\Sigma}^{-\frac{1}{2}}\hat{\mu}_k)^T}{N-K} \\
&= \frac{\sum_{k=1}^{K}\sum_{g_i=k}\hat{\Sigma}^{-\frac{1}{2}}(x_i - \hat{\mu}_k)(x_i - \hat{\mu}_k)^T\hat{\Sigma}^{-\frac{1}{2}}}{N-K} \\
&= \hat{\Sigma}^{-\frac{1}{2}}\frac{\sum_{k=1}^{K}\sum_{g_i=k}\hat{(}x_i - \hat{\mu}_k)(x_i - \hat{\mu}_k)^T}{N-K}\hat{\Sigma}^{-\frac{1}{2}} \\
&= \hat{\Sigma}^{-\frac{1}{2}}\hat{\Sigma}\hat{\Sigma}^{-\frac{1}{2}} \\
&= I
\end{aligned}$$