Manav Madan
Stefan Möhrle
Vanshaj Taxali

AutoML
June 5, 2019

Assignment 6

Exercise 1

$$\sigma_n^{-2}\phi_\star^T A^{-1}\Phi\mathbf{y} = \phi_\star^T\Sigma_p\Phi(\Phi^T\Sigma_p\Phi + \sigma_n^2 I)^{-1}\mathbf{y} \tag{1}$$
$$\sigma_n^{-2}A^{-1}\Phi = \Sigma_p\Phi(\Phi^T\Sigma_p\Phi + \sigma_n^2 I)^{-1} \tag{2}$$
$$\sigma_n^{-2}\Phi = A\Sigma_p\Phi(\Phi^T\Sigma_p\Phi + \sigma_n^2 I)^{-1} \tag{3}$$
$$\sigma_n^{-2}\Phi(\Phi^T\Sigma_p\Phi + \sigma_n^2 I) = A\Sigma_p\Phi \tag{4}$$
$$\sigma_n^{-2}\Phi(\Phi^T\Sigma_p\Phi + \sigma_n^2 I) = (\sigma_n^{-2}\Phi\Phi^T + \Sigma_p^{-1})\Sigma_p\Phi \tag{5}$$
$$\sigma_n^{-2}\Phi\Phi^T\Sigma_p\Phi + \sigma_n^{-2}\Phi\sigma_n^2 I = \sigma_n^{-2}\Phi\Phi^T\Sigma_p\Phi + \Sigma_p^{-1}\Sigma_p\Phi \tag{6}$$
$$\sigma_n^{-2}\Phi\Phi^T\Sigma_p\Phi + \Phi = \sigma_n^{-2}\Phi\Phi^T\Sigma_p\Phi + \Phi \tag{7}$$

1. equivalence to show
2. Devide by $\phi_\star^T$ and $\mathbf{y}$
3. Multiply A from the left
4. Multiply $\Phi^T\Sigma_p\Phi + \sigma_n^2 I$ from the right
5. Replace A
6. Remove braces by expanding
7. Simplify

Feedback