Model Order Selection. In-class Exercise 2

EL-GY 6143 Intro Machine Learning. Prof. Sundeep Rangan

Question

For each model and true function pair below: Determine if there is undermodeling (i.e. the true function is in the model class). If there is no undermodeling, find the true parameters

(a) True function: $f_0(x) = (1+2x)(3+4x)$, Model: $f(x,\beta) = \beta_0 + \beta_1 x + \beta_2 x^2$
(b) True function: $f_0(t) = 2(1 - e^{t-3})$ Model: $f(t,\beta) = a + be^{ct}, \beta = (a,b,c)$
(c) True function: $f_0(t) = 2(1 - e^{t-3})$ Model: $f(t,\beta) = a + be^{-t}, \beta = (a,b)$

Solution

(a) No under-modeling: Expanding the function, $f_0(x) = 3 + 10x + 8x^2$, so it is in the model class with $\beta = (3,10,8)$
(b) No under-modeling. Re-write the true function as, $f_0(t) = 2 - 2e^{-3}e^t$. So we can take the true parameter as $\beta = (2, -2e^{-3}, -1)$
(c) There is under-modeling. There is no way to capture the e^t term.