ME685: Programming quiz 4

Report

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Given :

$\theta(t)$:	63.3	52.2	38.1	27.9	19.2	11.4	6.3	2.9
t :	10	30	60	90	130	180	250	300

We have to fit the func^n of form :

$$\boxed{\theta(t) = a\, e^{-bt}}$$

Initial guess : Let $b = 0.03$

→ for $\theta(10) = 63.3 = a\, e^{-(0.03)\times 10}$

$$\therefore a_{guessed} = \frac{63.3}{e^{-0.3}} = 85.44$$

$\therefore$ take $a_{guessed} = 85$.

For $Z\ (8\times 2)$: $Z_{i1} = e^{-bt}$

$Z_{i2} = -at \times e^{-bt}$

for the corresponding values of t

$\Rightarrow (Z^T Z).\Delta = Z^T.B$ { where $B_{8\times 1} = \theta - a e^{-bt}$ }

$\therefore B_i = \theta_i - a e^{-bt_i}$

$\Rightarrow \Delta = (Z^T Z)^{-1}.(Z^T B)$ { Δ is 2×1 }

Using Δ, we can update the values of a and b until convergence.

$\because r^2 = \frac{S_t - S_r}{S_t}$ $\Rightarrow$ $\boxed{\text{Regression coeff } (r) = \sqrt{\frac{S_t - S_r}{S_t}} \times 100\ \%}$

Date ___ / ___ / _____

Saathi

After convergence : ($da < 10^{-5}$ and $db < 10^{-5}$)

$a = 70.123057$

$b = 0.010077$

$$S_t = \sum_{i=1}^{8} (\theta_i - \theta_{avg})^2 = 3386.7387$$

$$S_r = \sum_{i=1}^{8} (\theta_i - ae^{-bt_i})^2 = 1.1297$$

$$\therefore r = \sqrt{\frac{S_t - S_r}{S_t}} = 99.983320\ \%$$