

Exercise-1

ME 228: Applied Data Science and Machine Learning (S2)

4 January 2024

1. Find the coefficients of a uni-variate quadratic polynomial 'f(x)' passing through (x,f(x)) points (-1,6), (2,9) and (1,2).

Hint: Use Vandermode matrix $V' \left(\begin{bmatrix} 1 & x_0 & x_0^2 & \dots & x_0^n \\ 1 & x_1 & x_1^2 & \dots & x_1^n \\ \dots & \dots & \dots & \dots & \dots \\ 1 & x_n & x_n^2 & \dots & x_n^n \end{bmatrix} \right)$ for coefficients $(V^{-1}[f(x)])$ of a polynomial $f(x) = \sum_{i=0}^n C_i x^i$ satisfying given data points $(x_0, f(x_0)), (x_1, f(x_1)) \dots (x_n, f(x_n))$.

2. Find Hall-Petch constants ' σ'_c ' and ' k' ' satisfying relation $\sigma = \sigma_c + k.d^{-1/2}$, using data from below table by using pseudoinverse.

d (in μ)	10	15	20	25	30	35	40	45	50	55
σ (in MPa)	65	55.5	52	48	46	43	42.5	40.5	40	38

Hint: Above relation in ' $Ax = b$ ' form is, $\begin{bmatrix} 1 & d_0^{-1/2} \\ 1 & d_1^{-1/2} \\ \dots & \dots \\ 1 & d_n^{-1/2} \end{bmatrix} \cdot \begin{bmatrix} \sigma_c \\ k \end{bmatrix} = \begin{bmatrix} \sigma_0 \\ \sigma_1 \\ \dots \\ \sigma_n \end{bmatrix}$