

Lecture 14

On

Numerical Methods & Computer Programming



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Curve Fitting Least Squares

Fitting a straight line such as

$$Y = a_0 + a_1 X$$

$$m a_0 + a_1 \sum_{i=1}^m x_i = \sum_{i=1}^m y_i$$

$$a_0 \sum_{i=1}^m x_i + a_1 \sum_{i=1}^m x_i^2 = \sum_{i=1}^m x_i y_i$$

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Curve Fitting Least Squares

$$m a_0 + a_1 \sum_{i=1}^m x_i = \sum_{i=1}^m y_i \quad a_0 \sum_{i=1}^m x_i + a_1 \sum_{i=1}^m x_i^2 = \sum_{i=1}^m x_i y_i$$

Example 4.1 The table below gives the temperatures T (in °C) and lengths l (in mm) of a heated rod. If $l = a_0 + a_1 T$, find the best values for a_0 and a_1 .

T (in °C)	l (in mm)
20	800.3
30	800.4
40	800.6
50	800.7
60	800.9
70	801.0

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$$m a_0 + a_1 \sum_{i=1}^m x_i = \sum_{i=1}^m y_i \quad a_0 \sum_{i=1}^m x_i + a_1 \sum_{i=1}^m x_i^2 = \sum_{i=1}^m x_i y_i$$

T (in °C)	l (in mm)	T^2	Tl
20	800.3	400	16006
30	800.4	900	24012
40	800.6	1600	32024
50	800.7	2500	40035
60	800.9	3600	48054
70	801.0	4900	56070
270	4803.9	13900	216201

$$6a_0 + 270a_1 = 4803.9 \quad \text{and} \quad 270a_0 + 13900a_1 = 216201,$$

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Curve Fitting Least Squares

$$ma_0 + a_1 \sum_{i=1}^m x_i = \sum_{i=1}^m y_i \quad a_0 \sum_{i=1}^m x_i + a_1 \sum_{i=1}^m x_i^2 = \sum_{i=1}^m x_i y_i$$

Example 4.2 Certain experimental values of x and y are given below

x	y
0	-1
2	5
5	12
7	20

If $y = a_0 + a_1x$, find approximate values of a_0 and a_1 . As in the previo

Thank
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