ENGINEERING MATHEMATICS

UNIT-3 : *Statistical Techniques – I*

Lec-6

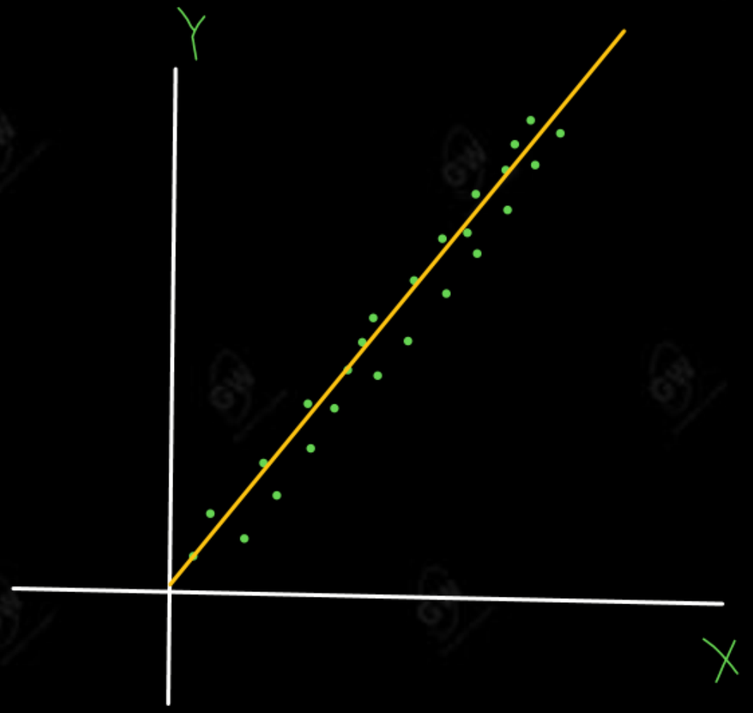
Today's Target

- Curve Fitting by the Method of Least Square : Fitting of Straight line
- PYQ
- DPP

Curve Fitting

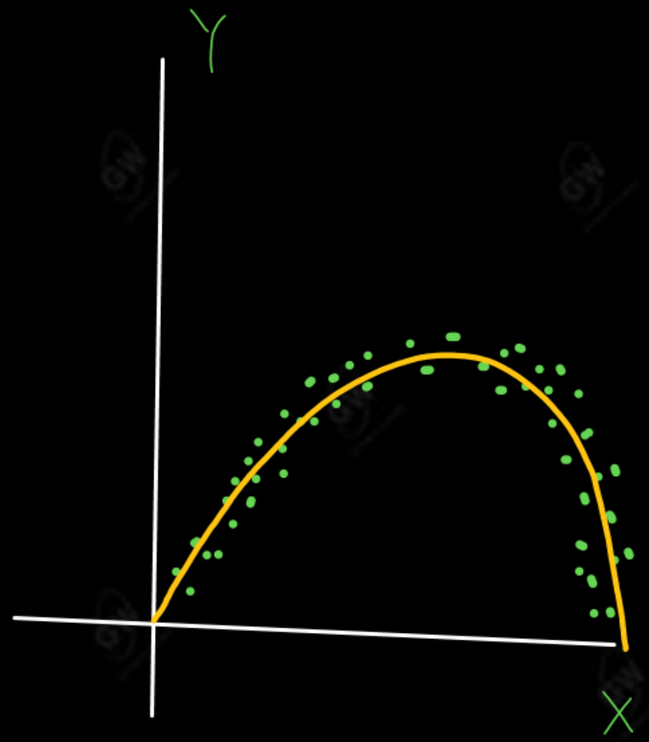
Curve Fitting means to form an equation of the curve from the given data

x	y
x_1	y_1
x_2	y_2
x_3	y_3
x_4	y_4
x_5	y_5
x_6	y_5
Σx	Σy



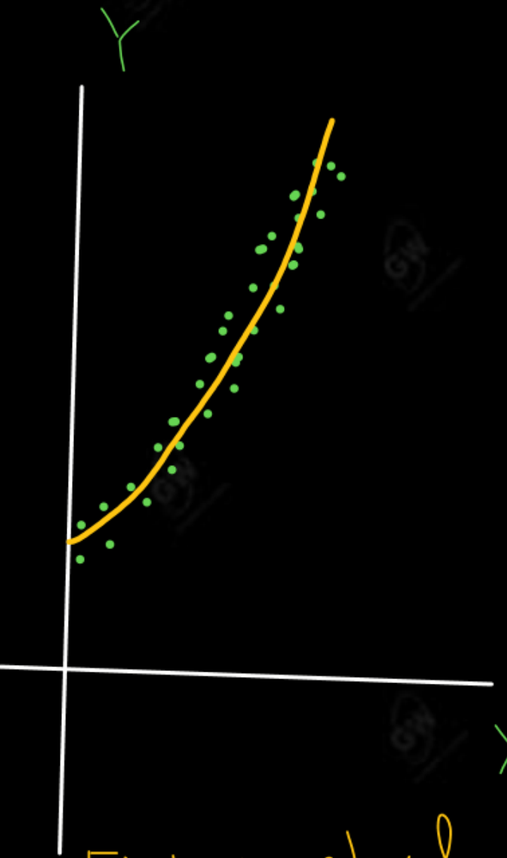
Straight line

$y = a + bx$



Parabola

$y = a + bx + cx^2$



Exponential curve

$y = ae^{bx}$

Curve Fitting by the Method of Least Square

1. Fitting of Straight line
2. Fitting of second degree parabola
3. Fitting of Exponential curve

$$\Sigma y = \Sigma a + \Sigma bx$$

$$\Sigma y = a\Sigma 1 + b\Sigma x$$

$$\Sigma 1 = 1 + 1 + 1 + 1 + \dots + 1 \ (n \text{ times})$$

Fitting of Straight line

Equation of line

$$y = a + bx \quad \text{— (1)}$$

Normal Equations

$$\Sigma y = na + b\Sigma x \quad \text{— (2)}$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 \quad \text{— (3)}$$

Q.1 *Fit a straight line to the following data by least square method:* (U.K.T.U.2011)

x:	0	1	2	3	4
y:	1	1.8	3.3	4.5	6.3

Equation of line

$$y = a + bx \quad \text{—} (1)$$

Normal Equations

$$\Sigma y = na + b\Sigma x \quad \text{—} (2)$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 \quad \text{—} (3)$$

$$n = 5$$

x	y	xy	x^2
0	1	0	0
1	1.8	1.8	1
2	3.3	6.6	4
3	4.5	13.5	9
4	6.3	25.2	16
$\Sigma x = 10$	$\Sigma y = 16.9$	$\Sigma xy = 47.1$	$\Sigma x^2 = 30$

Put Σx, Σy and n in (2)

$$16.9 = 5a + 10b$$

$$5a + 10b = 16.9 \quad \text{—} \quad (4)$$

Put Σxy, Σx, and Σx^2 in (3)

$$47.1 = 10a + 30b$$

$$10a + 30b = 47.1 \quad \text{—} \quad (5)$$

Solve eqn (4) and (5)

$$a = 0.72$$

$$b = 1.33$$

Put a and b in (1)

$$\boxed{y = 0.72 + 1.33x}$$

Required Straight line

Q.2 *What straight line best fits the following data ?*

x	1	2	3	4
y	3	7	13	21

Equation of line

$$y = a + bx \quad \text{—} \ (1)$$

Normal Equations

$$\Sigma y = na + b\Sigma x \quad \text{—} \ (2)$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 \quad \text{—} \ (3)$$

$$n = 4$$

x	y	xy	x^2
1	3	3	1
2	7	14	4
3	13	39	9
4	21	84	16
$\Sigma x = 10$	$\Sigma y = 44$	$\Sigma xy = 140$	$\Sigma x^2 = 30$

Put Σx, Σy and n in (2)

$$44 = 4a + 10b$$

$$4a + 10b = 44 \quad \text{—} \quad (4)$$

Put Σxy, Σx and Σx^2 in (3)

$$140 = 10a + 30b$$

$$10a + 30b = 140 \quad \text{—} \quad (5)$$

solve eqn (4) and (5)

$$a = -4$$

$$b = 6$$

Put a and b in (1)

$$\boxed{y = -4 + 6x}$$

Required straight line

Q.1 *By the method of least squares, find the straight line that best fits the following data:*

x:	1	2	3	4	5
y:	14	27	40	55	68

Q.2 *Using the method of least square, fit a straight line to the following data:*

x	1	2	3	4	5
y	2	4	6	8	10

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