Biostatistics BT2023

Lecture 13
Statistical significance : test of hypothesis

Himanshu Joshi
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World Scientific
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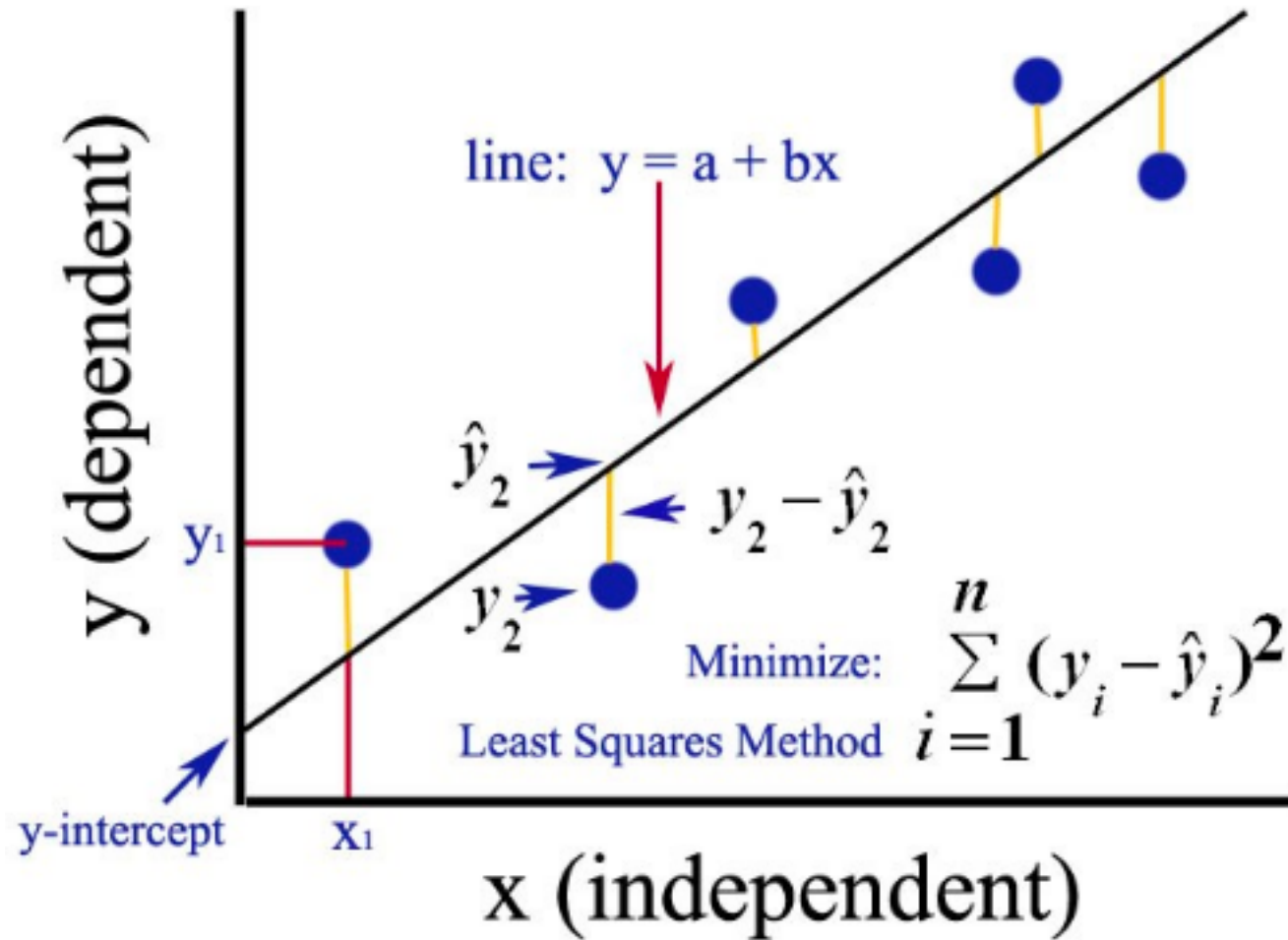# TALENT VERSUS LUCK: THE ROLE OF RANDOMNESS IN SUCCESS AND FAILURE

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Linear regression by least square method

line: $y = a + bx$

$\hat{y}_2$

$y_2 - \hat{y}_2$

y_1

y_2

Minimize: $\sum\limits_{i=1}^{n} (y_i - \hat{y}_i)^2$

Least Squares Method
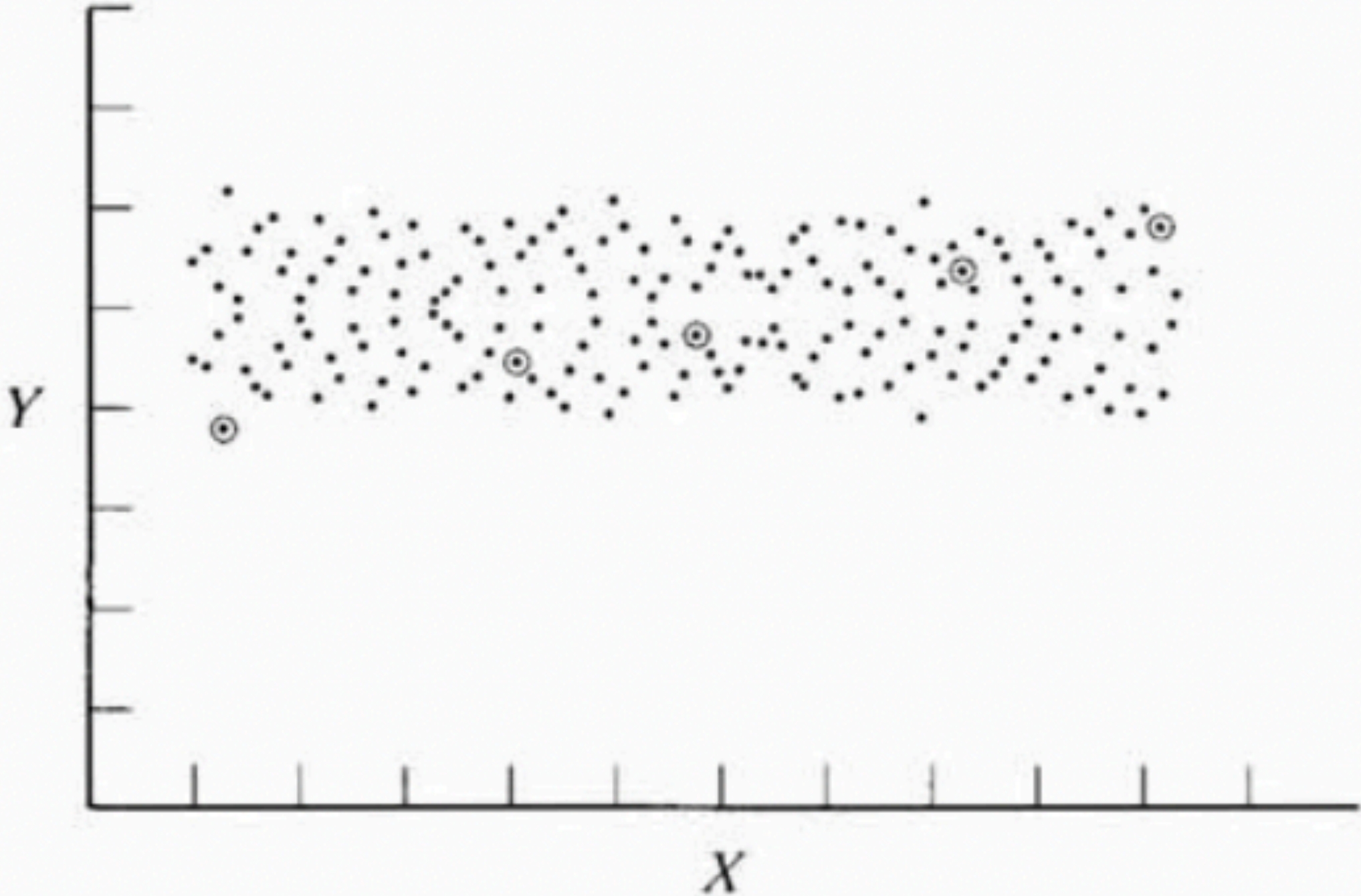
y-intercept x_1

y (dependent)

x (independent)

$$\sum y = na + b \sum x$$

$$\sum xy = a \sum x + b \sum x^2$$

$$b_{yx} = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2}$$
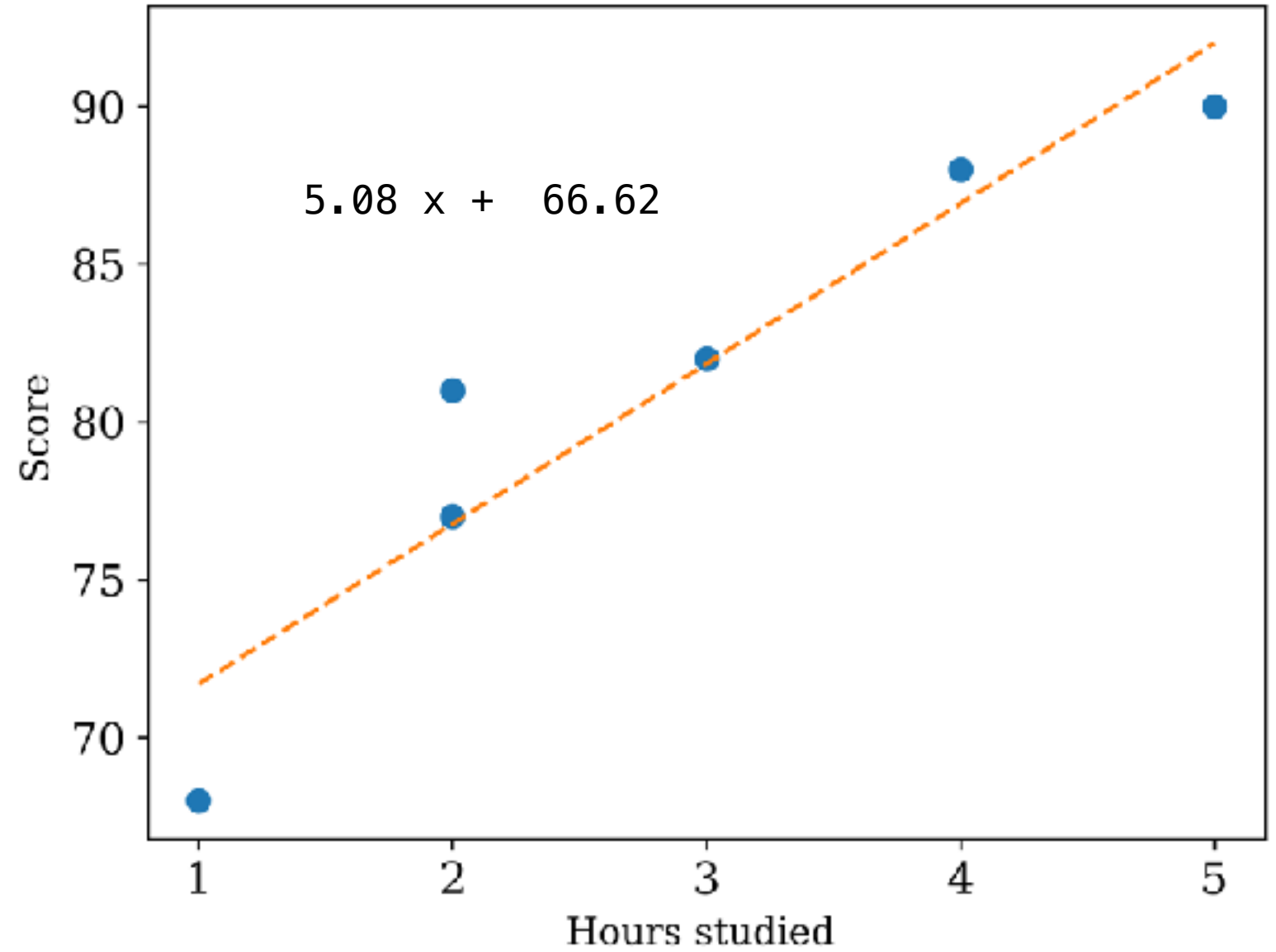
Caution with regression

Sum of squares

Total SS (SST)

$$\sum \left(y_i - \bar{y} \right)^2$$

Regression SS (SSR)

$$\sum \left(\hat{y} - \bar{y} \right)^2$$

Residual SS (SSE)

$$\sum \left(\hat{y} - y_i \right)^2$$

SST - SSR =SSE

Coefficient of determination

SSE/SST

Hours Studied	Exam Score
1	68
2	77
2	81
3	82
4	88
5	90

5.08 x + 66.62

The null hypothesis

A test of significance

$$H_0 : \mu_1 = \mu_2$$

There no statistically difference between two samples

The alternative hypothesis

$$H_0 : \mu_1 \neq \mu_2$$

Example :   Newton's laws of motion

Einstein's theory of gravity

Student's t-Test

Introduced in William Sealy Gosset devised this test to find that quality of barley field depending on the number of sample points

When the sample is small n<30, how do find that the statistics is significant or not

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Next Class

2:30 PM Friday, 23 September 2022