


Declaration and statement of authorship

Date

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I, bearing Registration Number 112119066 agree and acknowledge that:

1. The assessment was answered by me as per the instructions applicable to each assessment, and that I have not resorted to any unfair means to deliberately improve my performance.
2. I have neither impersonated anyone, nor have I been impersonated by any person for the purpose of assessments

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End Sem Exam

Sol1 Distance measures are :- sqEuclidean, cityblock

Sol5. (b) NO

Sol6 Recall = $\frac{TP}{TP+FN}$ TP - True positive count
FN - False negative count

Sol3 (a) True positive

Sol4. (d) Pearson - Correlation - Linear relationship;
Spearman - Non Linear Relationship

Sol2. Correlation values

A and B = -0.875

A and C = 0.95

A and D = 0.025

B and C = -0.46

C and D = 0.96

B and D = 0.6

| | | | | |
|---|--------|-----------------|-------|-------|
| D | 0.025 | 0.6 | 0.96 | 1 |
| C | 0.95 | -0.46 | 1 | 0.96 |
| B | -0.875 | 0.95 | -0.46 | 0.6 |
| A | 1 | -0.875 | 0.95 | 0.025 |
| | A | B | C | D |

Pearson correlation

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Soln.

| x | y | y' |
|---|---|-----|
| 1 | 9 | 8.9 |
| 2 | 3 | 2.5 |
| 3 | 6 | 5.6 |
| 4 | 7 | 6.4 |
| 5 | 2 | 1.8 |

y → actual value
y' → Predicted value

$$\text{Mean } y = \bar{y} = 5.4$$

| x | y | y' | y - \bar{y} | (y - \bar{y}) ² | y' - \bar{y} | (y' - \bar{y}) ² |
|---|---|-----|---------------|-------------------------------|----------------|---------------------------------|
| 1 | 9 | 8.9 | 3.6 | 12.96 | 2.5 | 12.25 |
| 2 | 3 | 2.5 | -2.4 | 5.76 | -2.9 | 8.41 |
| 3 | 6 | 5.6 | 0.6 | 0.36 | 0.2 | 0.04 |
| 4 | 7 | 6.4 | 1.6 | 2.56 | 1 | 1 |
| 5 | 2 | 1.8 | -3.4 | 11.56 | -3.6 | 12.96 |
| | | | | $\sum (y - \bar{y})^2 = 33.2$ | | |
| | | | | | | $\sum (y' - \bar{y})^2 = 34.66$ |

$$R^2 = \frac{\sum (y' - \bar{y})^2}{\sum (y - \bar{y})^2} = \frac{34.66}{33.2} = 1.0434$$

Given, if value of $R^2 > 1$, consider it as 1
 $\Rightarrow R^2 = 1$

The model is good (Perfectly fits).

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Sol7.

| X | Y |
|------------|-----------|
| 100 | 29 |
| 150 | 35 |
| <u>120</u> | <u>23</u> |
| 45 | 11 |
| 95 | 15 |
| 102 | 19 |

$$\frac{N}{2} - \frac{b}{2} = 3$$

Let's change the origin of x & y

$$U = X - 120$$

$$V = Y - 23$$

| X | Y | U | V | U ² | V ² | U.V |
|------------|------------|-------------|-----------|----------------|----------------|-------------|
| 100 | 29 | -20 | 6 | 400 | 36 | -120 |
| 150 | 35 | 30 | 12 | 900 | 144 | 360 |
| 120 | 23 | 0 | 0 | 0 | 0 | 0 |
| 45 | 11 | -75 | -12 | 5625 | 144 | 900 |
| 95 | 15 | -25 | -8 | 625 | 64 | 200 |
| 102 | 19 | -18 | -4 | 324 | 16 | 72 |
| <u>612</u> | <u>132</u> | <u>-108</u> | <u>-6</u> | <u>7874</u> | <u>404</u> | <u>1412</u> |

Σ of all pair
- meters

$$r_s = \frac{\sum UV - \frac{1}{N} \sum U \cdot \sum V}{\sqrt{(\sum U^2 - \frac{1}{N} (\sum U)^2) (\sum V^2 - \frac{1}{N} (\sum V)^2)}}$$

 $r_s \rightarrow$ Spearman
correlation
coefficient

$$\sqrt{(\sum U^2 - \frac{1}{N} (\sum U)^2) (\sum V^2 - \frac{1}{N} (\sum V)^2)}$$

$$= \frac{1412 - \frac{1}{6} (-108) \cdot (-6)}{\sqrt{(\sum U^2 - \frac{1}{N} (\sum U)^2) (\sum V^2 - \frac{1}{N} (\sum V)^2)}}$$

$$= \frac{1412 - 108}{\sqrt{(7874 - 1944) (404 - 1)}}$$

$$= \frac{1304}{\sqrt{2360140}}$$

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$$\approx \frac{1304}{1536.27} = 0.848 \approx 0.9$$

$$\boxed{r_s = 0.9}$$

The spearman correlation coefficient r_s can take values from $+1$ to -1 . A r_s of $+1$ indicates a perfect association of ranks, a r_s of zero indicates no association b/w ranks and r_s of -1 indicates a perfect negative association of ranks.

The closer r_s is to 1 the stronger the association between the ranks.

So, in this question association between the ranks is quite strong as $r_s = 0.9$.