Spearman Correlation & Kendall’s Tau

Spearman’s Correlation

Spearman's correlation determines the strength and direction of the **monotonic relationship**

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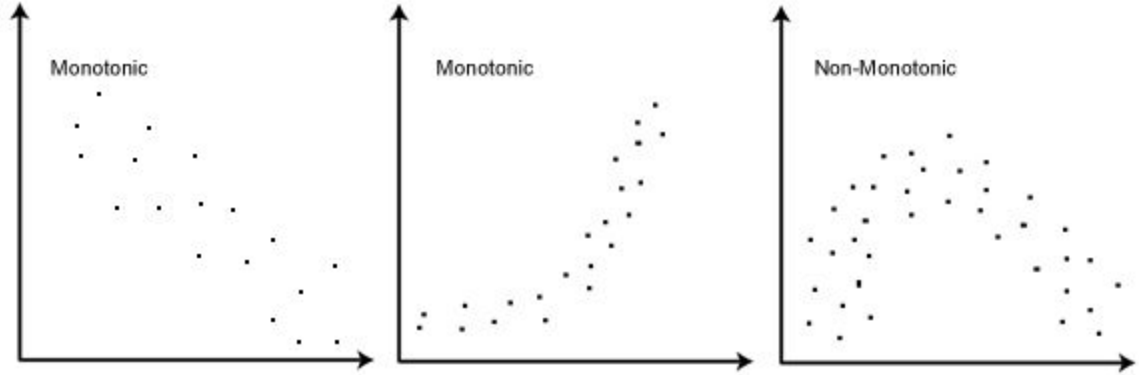
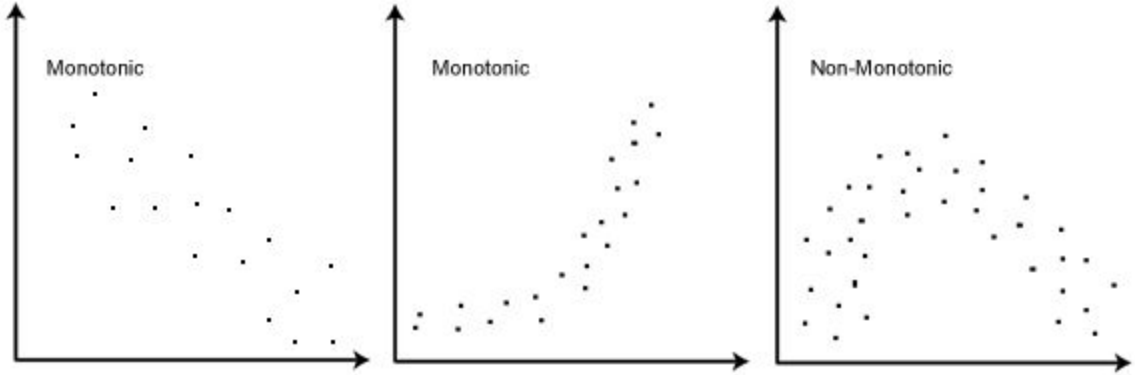


Spearman’s Correlation

Spearman's correlation determines the strength and direction of the **monotonic relationship**



It’s value is also between -1(strong negative) and 1 (strong positive)

Spearman’s Correlation

Ex: Correlation between Number of hours invested in studying and Marks obtained in the exam

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Hours	Marks
16	66
35	70
5	40
31	60
22	65
24	56
18	59
40	77
36	67
21	63

Spearman's Correlation

Ex: Correlation between Number of hours invested in studying and Marks obtained in the exam

Hours	Marks	Rank_Hours	Rank_Marks
16	66	9	4
35	70	3	2
5	40	10	10
31	60	4	7
22	65	6	5
24	56	5	9
18	59	8	8
40	77	1	1
36	67	2	3
21	63	7	6

Spearman's Correlation

Ex: Correlation between Number of hours invested in studying and Marks obtained in the exam

Hours	Marks	Rank_Hours	Rank_Marks	difference	d_squared
16	66	9	4	5	25
35	70	3	2	1	1
5	40	10	10	0	0
31	60	4	7	3	9
22	65	6	5	1	1
24	56	5	9	4	16
18	59	8	8	0	0
40	77	1	1	0	0
36	67	2	3	1	1
21	63	7	6	1	1

$\Sigma d\_squared = 54$

Spearman's Correlation

Ex: Correlation between Number of hours invested in studying and Marks obtained in the exam

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

Σd_squared = 54

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$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

$$\rho = 1 - \frac{6 \times 54}{10(10^2 - 1)}$$

$$\rho = 1 - \frac{324}{990}$$

$$\rho = 1 - 0.33$$

$$\rho = 0.67$$

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A strong positive relationship

More hours in studying → High Marks

Kendall’s Tau Correlation

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16	66
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Kendall's Tau Correlation

Ex: Correlation between Number of hours invested in studying and Marks obtained in the exam

Hours	Marks	Hours_Rank	Marks_Rank
5	40	1	1
16	66	2	7
18	59	3	3
21	63	4	5
22	65	5	6
24	56	6	2
31	60	7	4
35	70	8	9
36	67	9	8
40	77	10	10

Kendall's Tau Correlation

Ex: Correlation between Number of hours invested in studying and Marks obtained in the exam

Hours	Marks	Hours_Rank	Marks_Rank	Concordant
5	40	1	1	9
16	66	2	7	3
18	59	3	3	6
21	63	4	5	4
22	65	5	6	3
24	56	6	2	4
31	60	7	4	3
35	70	8	9	1
36	67	9	8	1
40	77	10	10	0

Kendall's Tau Correlation

Ex: Correlation between Number of hours invested in studying and Marks obtained in the exam

Hours	Marks	Hours_Rank	Marks_Rank	Concordant	Discordant
5	40	1	1	9	0
16	66	2	7	3	5
18	59	3	3	6	1
21	63	4	5	4	2
22	65	5	6	3	2
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C = Σ Concordant = 34

D = Σ Discordant = 11

Kendall's Tau Correlation

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τ = (C-D)/(C+D)

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A strong positive relationship

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- Small sample size → Kendall’s Tau
- Large sample size → Spearman’s Rho

Which correlation coefficient

Pearson Correlation Coefficient :

- Linear relationship

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- Continuous Data

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Pearson Correlation Coefficient :

- Linear relationship
- Normally Distributed
- Continuous Data
- No outliers

Which correlation coefficient

Spearman’s Rho or Kendall’s Tau :

- Monotonic relationship

Which correlation coefficient

Spearman's Rho or Kendall's Tau :

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- Outliers → Kendall's Tau

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Which correlation coefficient

Spearman's Rho or Kendall's Tau :

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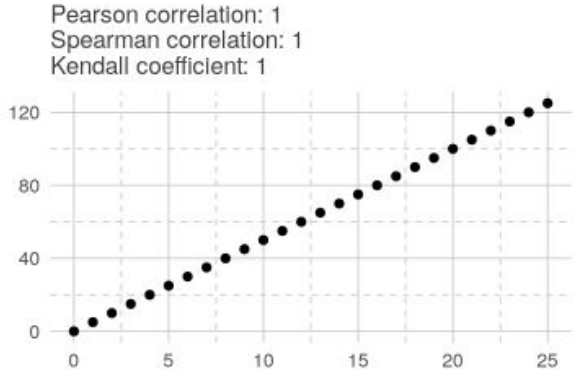
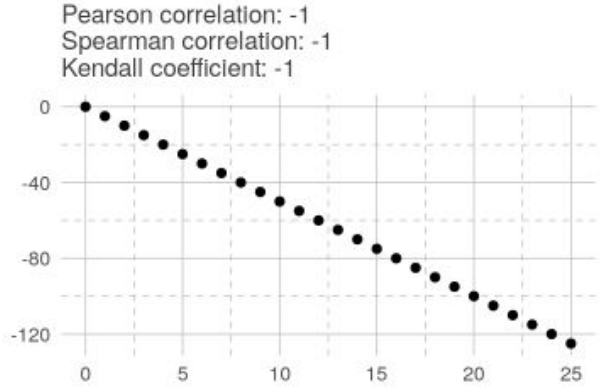
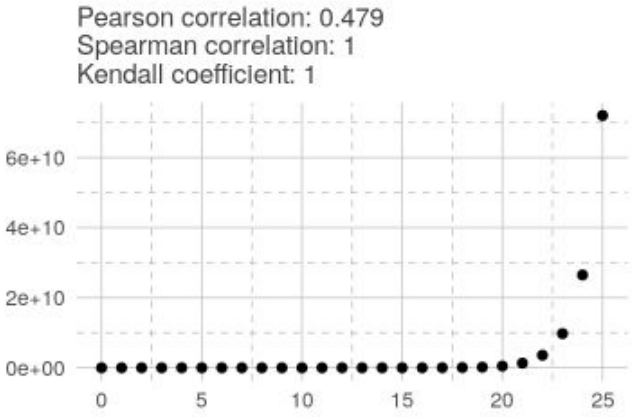
- Ordinal Data

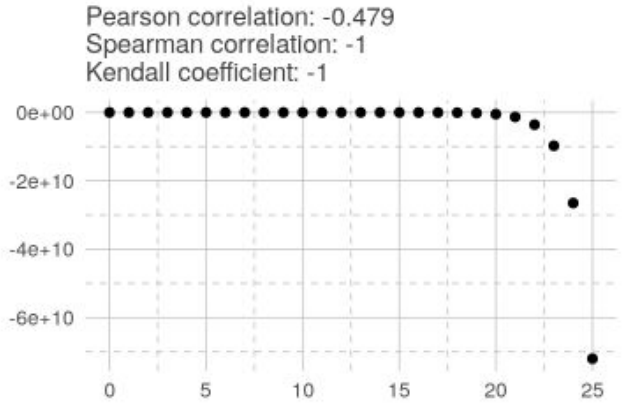
Which correlation coefficient





Which correlation coefficient





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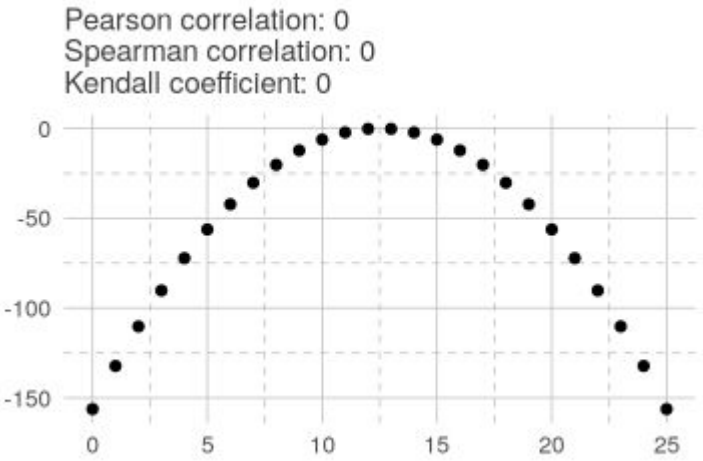

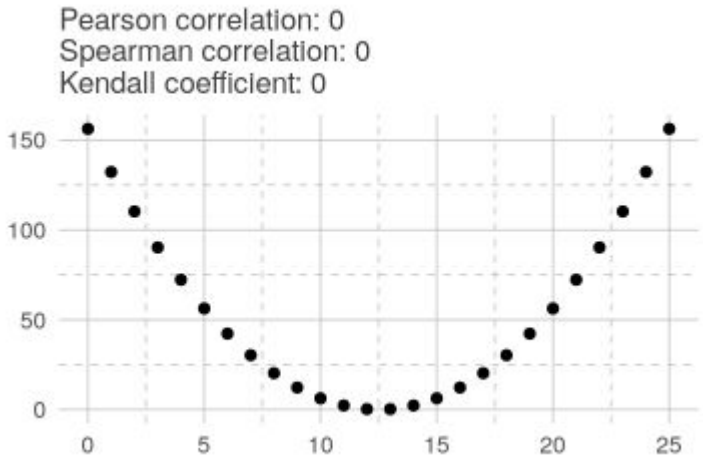

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Thank you