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Nombre del trabajo: Asociación estadística entre Variables.

Materia: Estadística Inferencial.

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Problema 1 - Correlación de Pearson

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

$$\bar{x} = 7.1$$

$$\bar{y} = 7.5$$

$$(x_i - \bar{x}) = -2.1, 0.9, -3.1, 2.9, -0.1, 1.9$$

$$(y_i - \bar{y}) = -0.5, 0.5, -1.5, 1.5, 0.5, 0.5$$

A medida que se

capacita más al empleado

aumenta la satisfacción

del cliente

$$(x_i - \bar{x})(y_i - \bar{y}) = 1.05, 0.45, 4.65, 4.35, 0.05, 0.95 \Rightarrow \sum = 11.5$$

$$(x_i - \bar{x})^2 = 4.41, 0.81, 9.61, 8.41, 0.01, 3.61 = 26.86$$

$$(y_i - \bar{y})^2 = 0.25, 0.25, 2.25, 2.25, 0.25, 0.25 = 5.5$$

Relación
Correlación
Fuerte
Positiva

$$\sum x = \sum y = 147.73 = 12.15$$

$$r = \frac{11.5}{\sqrt{26.86 \cdot 5.5}} = 0.941 \cdot \frac{11.5}{12.23} = 12.23 / 0.99$$

Problema 2 - Correlación de Pearson

0.99

Problema 2 - Correlación de Pearson

12.75

0.99

$$(x_i - \bar{x}) = -2.5, -0.5, -1.5, 1.5, 0.5, 2.5$$

$$(y_i - \bar{y}) = -20.83, -0.83, -5.83, 9.17, 4.17, 14.17 \quad \bar{x} = 12.5$$

$$\bar{y} = 20.83$$

$$(x_i - \bar{x})(y_i - \bar{y}) = 52.075, 0.415, 8.945, 13.755, 2.085, 35.425 = 112.55$$

$$(x_i - \bar{x})^2 = 6.25, 0.25, 2.25, 2.25, 0.25, 6.25 = 17.5$$

$$(y_i - \bar{y})^2 = 433.88, 0.6889, 33.98, 84.08, 17.38, 200.78 = 770.78$$

$$\sum x \sum y = 13.448.65 = 115.96$$

Relación positiva
Correlación fuerte

$$r = \frac{112.5}{115.96} = 0.97$$

$$\frac{112.5}{0.97} = \frac{115.96}{0.97}$$

A medida que se contratan más empleados aumenta la producción.

Problema 3 - Chi-Cuadrado

$$\chi^2 = \sum (O_i - E_i)^2$$

$E_i = \frac{\text{Total fila} \times \text{total columna}}{\text{total general}}$

V- Presencial

$$E_1 = \frac{(25)(33)}{70} = 11.78$$

V- Linea

$$E_2 = \frac{(25)(37)}{70} = 13.21$$

P- Presencial

$$E_3 = \frac{(20)(33)}{70} = 9.42$$

P- Linea

$$E_4 = \frac{(20)(37)}{70} = 10.57$$

A- Presencial

$$E_5 = \frac{(25)(33)}{70} = 11.78$$

A- Linea

$$E_6 = \frac{(25)(37)}{70} = 13.21$$

$$15 - 11.78 = 3.22^2 = 10.36 / 11.78 = 0.88$$

$$18 - 9.42 = 8.58^2 = 73.61 / 9.42 = 7.81$$

$$10 - 11.78 = (-1.78)^2 = 3.16 / 11.78 = 0.26$$

$$10 - 13.21 = (-3.21)^2 = 10.30 / 13.21 = 0.78$$

$$12 - 10.57 = 1.43^2 = 2.04 / 10.57 = 0.19$$

$$15 - 13.21 = 1.79^2 = 3.20 / 13.21 = 0.24$$

$$\chi^2 = 2.55$$

↓ Alfa
 $\alpha = 0.05$

Grados de libertad

$$\text{fila}^{-1} \quad 3 - 1 = 2 \quad \text{columna}^{-1} \quad 2 - 1 = 1 \quad 2 \times 1 = 2$$

$$\chi^2 = 5.991 = \text{Valor critico}$$

$$\chi^2 = \frac{2.55}{5.991} = 0.42$$

No hay relación entre el departamento al que pertenece el trabajador con el curso presencial o en línea.

Problema 4 - Chi - Cuadrado

INC.	Satis.	Ins.
Económico	20 ⁼¹⁵	5 ⁼¹⁰ = 25
Tiempo L.	10 ⁼¹⁵	15 ⁼¹⁰ = 25
	30	20 50

E. Satisfecho

$$\frac{(25)(30)}{50} = 15$$

T. Satisfecho

$$\frac{(25)(30)}{50} = 15$$

$$20 - 15 = 5^2 = 25 / 15 = 1.6$$

$$5 - 10 = (-5)^2 = 25 / 15 = 1.6$$

$$10 - 15 = (-5)^2 = 25 / 15 = 1.6$$

$$15 - 10 = 5^2 = 25 / 15 = 1.6$$

E. Insatisfecho

$$\frac{(25)(20)}{50} = 10$$

T. Insatisfecho

$$\frac{(25)(20)}{50} = 10$$

$$\chi^2 = 8.2$$

$$\alpha = 0.05$$

Grados de libertad

$$2 - 1 = 1 \quad 2 - 1 = 1 \quad 1 \times 1 = 1$$

$$\chi^2 = 3.841 \neq \text{V. Critico}$$

$$\chi^2 = 8.2 = 2.13 / 3.841$$

Hay mucha relación entre el incentivo y la Satisfacción laboral de los empleados.

Problema 5 - Regresión Lineal

$$\hat{y} = \beta_0 + \beta_1 x$$

$$\beta_1 = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})^2}$$

$$\bar{x} = 7.1$$

$$\bar{y} = 7.5$$

$$\beta_0 = \bar{y} - \beta_1 \bar{x}$$

x	y	$x_i - \bar{x}$	$y_i - \bar{y}$	$(x_i - \bar{x})(y_i - \bar{y})$	$(x_i - \bar{x})^2$	$(y_i - \bar{y})^2$
5	7	-2.1	-0.5	1.05	4.41	0.25
8	8	0.9	0.5	0.45	0.81	0.25
4	6	-3.1	-1.5	4.65	9.61	2.25
10	9	2.9	1.5	4.35	8.41	2.25
7	7	-0.1	-0.5	0.05	0.01	0.25
9	8	1.9	0.5	0.95	3.61	0.25
				11.5	26.86	5.5

$$\beta_1 = \frac{11.5}{26.86} = 0.4281$$

$$26.86$$

$$\beta_0 = 7.5 - (0.4281)(7.1)$$

$$\beta_0 = 7.5 - 3.03 = 4.47$$

$$\hat{y} = 4.47 + 0.4281x$$

x	y	\hat{y}_i	$y_i - \hat{y}_i$	$(y_i - \hat{y}_i)^2$
5	7	6.61	0.39	0.15
8	8	7.89	0.11	0.01
4	6	6.18	-0.18	0.03
10	9	8.75	0.25	0.06
7	7	7.46	-0.46	0.21
9	8	8.31	-0.32	0.10
				$\sum 0.56$

$$R^2 = 1 - \frac{0.56}{5.5}$$

$$R^2 = 1 - 0.10$$

$$R^2 = 0.9$$

Relación positiva

A medida que capacitan más a los empleados es mayor la satisfacción del cliente.

Problema 6 - Regresión lineal

X	y	$x_i - \bar{x}$	$y_i - \bar{y}$	$(x_i - \bar{x})(y_i - \bar{y})$	$(x_i - \bar{x})^2$	$(y_i - \bar{y})^2$
10	200	-2.5	-20.83	52.075	6.25	433.88
12	220	-0.5	-0.83	0.415	0.25	0.6889
11	215	-1.5	-5.83	8.745	2.25	33.98
14	230	1.5	9.17	13.755	2.25	84.08
13	225	0.5	4.17	2.085	0.25	17.38
15	235	2.5	14.17	35.425	6.25	200.78
				$\sum 112.55$	17.5	770.78

$$\bar{x} = 12.5$$

$$\bar{y} = 220.83$$

$$B_1 = \frac{112.55}{17.5} = 6.4314$$

$$B_0 = 220.83 - (6.4314)(12.5)$$

$$B_0 = 220.83 - 80.3925 = 140.4375$$

$$\hat{y} = 140.4375 + 6.4314x$$

x	y	\hat{y}_i	$y_i - \hat{y}_i$	$(y_i - \hat{y}_i)^2$
10	200	204.7515	-4.7515	22.57
12	220	217.6413	2.3587	5.61
11	215	211.8229	3.8111	14.57
14	230	230.4771	-0.4771	0.22
13	225	224.0457	0.9543	0.91
15	235	236.9085	-1.9085	3.64
				$\sum 47.6$

$$R^2 = 1 - \frac{47.6}{770.78}$$

$$R^2 = 1 - 0.06$$

$$R^2 = 0.94$$

Relación positiva

A medida que contratan a más empleados aumenta la producción.