Esercizio 2

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$X = (X_1, X_2)$

$X_1 \backslash X_2$	0	1	2	p_{X_1}
1	$\frac{1}{20}$	$\frac{3}{20}$	$\frac{2}{20}$	$\frac{6}{20}$
2	$\frac{3}{20}$	$\frac{2}{20}$	0	$\frac{7}{20}$
3	$\frac{3}{20}$	0	0	$\frac{5}{20}$
4	0	0	$\frac{2}{20}$	$\frac{2}{20}$
p_{X_2}	$\frac{8}{20}$	$\frac{7}{20}$	$\frac{5}{20}$	

distr. congiunta

Media

$$E(X_1) = \frac{6}{20} \cdot 1 + \frac{7}{20} \cdot 2 + \frac{5}{20} \cdot 3 + \frac{2}{20} \cdot 4$$

$$= \frac{6}{20} + \frac{14}{20} + \frac{15}{20} + \frac{8}{20}$$

$$\frac{43}{20}$$

$$E(X_2) = \frac{8}{20} \cdot 0 + \frac{7}{20} \cdot 1 + \frac{5}{20} \cdot 2$$

$$= 0 + \frac{7}{20} + \frac{10}{20}$$

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$= \frac{17}{20}$

$E(X^2) = \frac{6}{20} \cdot 1^2 + \frac{7}{20} \cdot 2^2 + \frac{5}{20} \cdot 3^2 + \frac{2}{20} \cdot 4^2$

$= \frac{6}{20} + \frac{28}{20} + \frac{45}{20} + \frac{32}{20}$

$= \frac{111}{20}$

$E(X_2^2) = \frac{8}{20} \cdot 0^2 + \frac{7}{20} \cdot 1^2 + \frac{5}{20} \cdot 2^2$

$= 0 + \frac{7}{20} + \frac{20}{20}$

$= \frac{27}{20}$

VARIAN

$\sim [\quad]^2 - [E(X)]^2$

$$VAR(X) = E(X)^2 - (EX)^2$$

$$VAR(X_1) = \frac{111}{20} - \left(\frac{43}{20}\right)^2$$

$$= \frac{111}{20} - \frac{1849}{400}$$

$$= \frac{371}{400}$$

$$VAR(X_2) = \frac{27}{20} - \left(\frac{17}{20}\right)$$

$$= \frac{27}{20} - \frac{289}{400}$$

$$= \frac{540 - 289}{400}$$

$$\frac{251}{400}$$

Sono indipendenti

$$P(X_1 = 1)\, P(X_2 = 0) = \frac{6}{20} + \frac{8}{20} = \frac{14}{20}$$ FALSO

$$P(X_1 = 2)\, P(X_2 = 0) = \frac{7}{20} + \frac{8}{20} = \frac{15}{20}$$ FALSO

$$P(X_1 = 3)\, P(X_2 = 0) = \frac{5}{20} + \frac{8}{20} = \frac{13}{20}$$

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$P(X_1=3)\,P(X_2=0) = \frac{1}{20} \cdot \frac{2}{20}$

$P(X_1=4)\,P(X_2=0) = \frac{2}{20} + \frac{8}{20} = \frac{10}{20}$

$P(X_1=1)\,P(X_2=1) = \frac{6}{20} + \frac{7}{20} = \frac{13}{20}$

$P(X_1=2)\,P(X_2=1) = \frac{7}{20} + \frac{7}{20} = \frac{14}{20}$

$P(X_1=3)\,P(X_2=1) = \frac{5}{20} + \frac{7}{20} = \frac{12}{20}$

$P(X_1=4)\,P(X_2=1) = \frac{2}{20} + \frac{7}{20} = \frac{9}{20}$

$P(X_1=1)\,P(X_2=2) = \frac{6}{20} + \frac{2}{20} = \frac{8}{20}$

$P(X_1=2)\,P(X_2=2) = \frac{7}{20} + \frac{2}{20} = \frac{9}{20}$

$P(X_1=3)\,P(X_2=2) = \frac{5}{20} + \frac{2}{20} = \frac{7}{20}$

$P(X_1=4)\,P(X_2=2) = \frac{2}{20} + \frac{2}{20} = \frac{4}{20}$

Now Sono indipendenti

X_2		$\frac{\ }{20}$	$\frac{\ }{20}$	$\frac{\ }{20}$	$\frac{\ }{20}$	$\frac{0}{20}$
1		$\frac{2}{20}$	$\frac{3}{20}$	$\frac{2}{20}$	0	$\frac{7}{20}$
2		$\frac{3}{20}$	$\frac{2}{20}$	0	0	$\frac{5}{20}$
stribuzione		$\frac{6}{20}$	$\frac{7}{20}$	$\frac{5}{20}$	$\frac{2}{20}$	

ti

$$Cov = E(x_1, x_2) - [E$$

$$E(x_1, x_2) =$$

$$E(0,1) = 0$$
$$E(0,2) = 0$$
$$E(0,3) = 0$$
$$E(0,4) = 0$$
$$E(1,1) = 1 \cdot \frac{2}{20} = \frac{2}{20}$$
$$E(1,2) = 2 \cdot \frac{3}{20} = \frac{6}{20}$$
$$E(1,3) = 3 \cdot \frac{2}{20} = \frac{6}{20}$$
$$E(1,4) = 0$$
$$E(2,1) = 2 \cdot \frac{3}{20} = \frac{6}{20}$$
$$4 \cdot \frac{2}{\quad} = \frac{8}{\quad}$$

$(X_1) \cdot [(X_2)]$ ⟶ Misura della loro dipendenza il loro variare

$\rightarrow X_1 \cdot X_2 \cdot (X_1, X_2)$

$E(2,1) = 5 \cdot \frac{2}{20} = \frac{8}{20}$

$E(2,3) = 0$

$E(2,5) = 0$

$$E(X_1,X_2) = \frac{2}{20} + \frac{6}{20} + \frac{6}{20} + \frac{6}{20} + \frac{8}{20}$$

$$= \frac{28}{20}$$

$$Cov(X_1,X_2) = \frac{28}{20} - \left(\frac{43}{20} \quad \frac{17}{20}\right)$$

$$= \frac{28}{20} - \frac{731}{400}$$

$$= -0,43$$

$$= -0.43$$

$$\rho(X_1, X_2) = \frac{Cov(X_1, X_2)}{\sqrt{Var(X_1) \cdot Var(X_2)}}$$

$$= \frac{-0.43}{\sqrt{0.93 \cdot 0.63}} = \frac{-0.43}{0.77} = -0.56$$

4

$$y \quad X_2 - X_1$$

$$P(y) = P(1) = \frac{3}{20} = \frac{3}{20}$$

$$P(\quad 2 \quad \frac{2}{} = \frac{6}{}$$

$$P(0) = \frac{2}{20} + \frac{2}{20} = \frac{4}{20}$$

$$= \frac{1}{20} + \frac{3}{20} = \frac{4}{20}$$

$$= \frac{2}{20} + \frac{2}{20} = \frac{4}{20}$$

$$= \frac{3}{20} + 0 = \frac{3}{20}$$

$$= \frac{2}{20} = \frac{2}{20}$$

$$y = x_1 - x_2$$

$$P(y) =$$

$$P(-1) = \frac{3}{20} = \frac{3}{20}$$

$$P(0) = \frac{2}{20} + \frac{2}{20} = \frac{4}{20}$$

$$P(1) = \frac{1}{20} + \frac{3}{20} = \frac{4}{20}$$

$$P(2) = \frac{2}{20} + \frac{2}{20} = \frac{4}{20}$$

$$P(3) = \frac{3}{20} = \frac{3}{20}$$

$$P( ) = \frac{2}{}$$

$$P(\ 4\ ) = \frac{2}{20} = \frac{2}{2 \cdot 0}$$