

Homework based on Chapter 10

Computational Probability and Statistics

CIS 2033, Section 002

Due: 9:00 AM, Friday, Mar. 27, 2015

Question 1 The probability distribution of a discrete random variable X is given by $P(X = -1) = 1/4$, $P(X = 0) = 2/4$, $P(X = 1) = 1/4$. $Y = X^2$.

- a. Draw the joint distribution table, add their marginal distribution to the table.
- b. Calculate the $Cov(X, Y)$.
- c. Calculate the $\rho(X, Y)$. Are they positively correlated, negatively correlated or un-correlated?
- d. Does X and Y independent or not?

Question 2 Let $P(X = a, Y = b)$ is given by the following table.

b	a		
	-1	0	1
4	$\lambda - \frac{1}{16}$	λ	0
5	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{4}$
6	λ	$\frac{1}{8}$	$\frac{1}{4} - \lambda$

- a. What value can λ take such that the joint distribution is valid?
- b. Calculate the marginal distribution $p(x)$ and $p(y)$.
- c. Calculate $E[X]$, $E[Y]$, $Var[X]$, $Var[Y]$.
- d. Calculate $E[XY]$ and $E[X]E[Y]$. Check whether $E[XY] = E[X]E[Y]$.
- e. Calculate $E[X + Y]$. Check whether $E[X + Y] = E[X] + E[Y]$.

f. Calculate $Cov(X, Y)$ and $\rho(X, Y)$. Are they positively correlated, negatively correlated or un-correlated?

g. Does X and Y independent or dependent?

Extra credits (1). Calculate $Var[XY]$. Check whether $Var[XY] = Var[X]Var[Y]$.

Extra credits (1). Calculate $Var[X + Y]$. Check whether $Var[X + Y] = Var[X] + Var[Y]$.