Course Code 009959 (Spring 2018)

Probability and Statistics with Programming

Problem Solving: Discrete RV

Prof. S. M. Riazul Islam, Dept. of Computer Engineering, Sejong University, Korea

E-mail: riaz@sejong.ac.kr

Problem Solving: Discrete RV

- Problem Solving on CDF
- Problem Solving on Binomial Distribution
- Problem Solving on Poisson Distribution
- Problem Solving on Expected Value and Variance

Problem Solving: Discrete RV

P-1: Binomial Distribution

A random variable X has the distribution B(12, p).

(a) Given that $p = 0.25$ find

(i) $P(X < 5)$

(ii) $P(X \geqslant 7)$

(b) Given that $P(X = 0) = 0.05$, find the value of p to 3 decimal places.

(c) Given that the variance of X is 1.92, find the possible values of p.

Reference: Probability Distribution Tables

Problem Solving: Discrete RV

P-2: Binomial Distribution

The probability of a telesales representative making a sale on a customer call is 0.15

Find the probability that

(a) no sales are made in 10 calls,

(b) more than 3 sales are made in 20 calls.

Representatives are required to achieve a mean of at least 5 sales each day.

(c) Find the least number of calls each day a representative should make to achieve this requirement.

(d) Calculate the least number of calls that need to be made by a representative for the probability of at least 1 sale to exceed 0.95

Problem Solving: Discrete RV

P-3: Poisson Distribution

Patients arrive at a hospital accident and emergency department at random at a rate of 6 per hour.

(a) Find the probability that, during any 90 minute period, the number of patients arriving at the hospital accident and emergency department is

(i) exactly 7

(ii) at least 10

A patient arrives at 11.30 a.m.

(b) Find the probability that the next patient arrives before 11.45 a.m.

Problem Solving: Discrete RV

P-4: D RV and pmf

The discrete random variable X has probability distribution given by

x	-1	0	1	2	3
$\mathrm{P}(X=x)$	$\frac{1}{5}$	a	$\frac{1}{10}$	a	$\frac{1}{5}$

where a is a constant.

(a) Find the value of a.

(b) Write down $\mathrm{E}(X)$.

(c) Find $\mathrm{Var}(X)$.

The random variable $Y = 6 - 2X$

(d) Find $\mathrm{Var}(Y)$.

(e) Calculate $\mathrm{P}(X \geqslant Y)$.

Problem Solving: Discrete RV

P-5: CDF

The discrete random variable X has the probability function

$$\mathrm{P}(X = x) = \begin{cases} kx & x = 2, 4, 6 \\ k(x-2) & x = 8 \\ 0 & \text{otherwise} \end{cases}$$

where k is a constant.

(a) Show that $k = \frac{1}{18}$

(b) Find the exact value of $\mathrm{F}(5)$.

(c) Find the exact value of $\mathrm{E}(X)$.

(d) Find the exact value of $\mathrm{E}(X^2)$.

(e) Calculate $\mathrm{Var}(3 - 4X)$ giving your answer to 3 significant figures.

Q&A