Simulation Lab(MC503)

Assignment 10

Try to solve all the problems

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1. A random variable simulator is used to generate 1000 values from for a $U[0,1]$ r.v. The values are classified into the intervals [0,0.1) , [0.1,0.2), ..., [0.9,1]. The observed frequency distribution is as follows.
Using chi-square goodness of fit test, test the hypothesis is as follows: $H_0 : F(x) = U(x) \ \forall \ x$ where $U(x)$ is a CDF of U[0,1] distribution.

Intervals	0-0.1	0.1-0.2	0.2-0.3	0.3-0.4	0.4-0.5	0.5-0.6	0.6-0.7	0.7-0.8	0.8-0.9	0.9-1.0
Frequency	112	101	94	99	108	93	94	100	104	95

2. The number of arrivals of a service counter are assumed to have a Poisson distribution (over hours). The following data is recorded on a particular day of a month is Test the hypothesis

Hours:	0	1	2	3	4	5	6	7
Frequency of arrivals	22	53	58	39	20	5	2	1

whether the arrivals follows Poisson distribution or not.

3. Using the algorithm below to generate 2000 random samples from normal distribution and apply Chi-square test to judge the goodness of fit. (Try both methods separately).
Algorithms to generate standard normal random variables is:
Method 1:
Generate U_1, $U_2 \sim$ U(0,1). Define
$X_1 = (-2\ln U_1)^{1/2}\cos(2\pi U_2)$, $X_2 = (-2\ln U_1)^{1/2}\sin(2\pi U_2)$
Then, $(X_1, X_2) \sim N(0,1)$

Method 2:

- Step 1: Generate U_1, $U_2 \sim$ U(0,1), let $V_i = 2U_i - 1$, i= 1,2; W=$V_1^2 + V_2^2$. If $W > 1$, freshly start step 1.
- Step 2: Let $Y = (-(2\ln W)/W)^{1/2}$ and $X_1 = V_1 Y$, $X_2 = V_2 Y$. Then $(X_1, X_2) \sim N(0,1)$.

Note: In order to generate random variable from N(μ,σ^2) distribution, you should transform N(0,1) generated random variable X to variable $\sigma X + \mu$. For this specific problem you can take μ= 1, σ= 2.
Note: You have to submit the solution of this assignment in a pdf format. You may do the analysis in R programming.

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