Assignment 11

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Contents

Question : Ex. 8.32 , Papoulis

A computer prints out 1000 numbers consisting of the 10 integers j=0,1,...,9. The number n_j of times j appears equals

$n_j = 85\ 110\ 118\ 91\ 78\ 105\ 122\ 94\ 101\ 96$

Test the hypothesis that the numbers j are uniformly distributed between 0 and 9, with $\alpha =$0.05.

Solution

n=no. of prints=1000
p_{0i}=1/10=0.1
k_i=no. of times i appears in print
m=total no. of integers=10
α=0.05

Now,

$$
\begin{aligned}
q &= \sum_{i=0}^{m-1} \frac{(k_i - np_{0i})^2}{np_{0i}} \\
&= \sum_{i=0}^{9} \frac{(k_i - 100)^2}{100} \\
&= 17.76 \tag{1}
\end{aligned}
$$

and,

$$
\begin{aligned}
\chi_{1-\alpha}^2 (m-1) &= \chi_{.95}^2 (9) \\
&= 16.92 \tag{2}
\end{aligned}
$$

We know that if q $< \chi_{1-\alpha}^2 (m-1)$ then only numbers are uniformly distributed

but since $17.76 \nless 16.92$

So, the numbers are not uniformly distributed

```
E:\>assign_11_AI1110.py
no. of prints:1000
no. of integers:10
enter value of X:16.92
enter no. of times m integers print one by one:
85
110
118
91
78
105
122
94
101
96
q: 17.76
not uniformly distributed
```

Figure: python code output