Computing and Data Science

Simulations

Assignment no. 4 (Random generation)

3rd Year

ID: 20221449583

Name: Ali Mohamed Sayed Ahmed

Eng.Mohamed Hatem

Dr. Emad Rauf

1. **The following sequence of random numbers has been generated:**
   0.37, 0.55, 0.71, 0.97, 0.65, 0.29, 0.81, 0.78, 0.23
   Use the Kolmogorov test with a significance of 0.95 to determine whether these numbers are uniformly distributed or not

Answer:

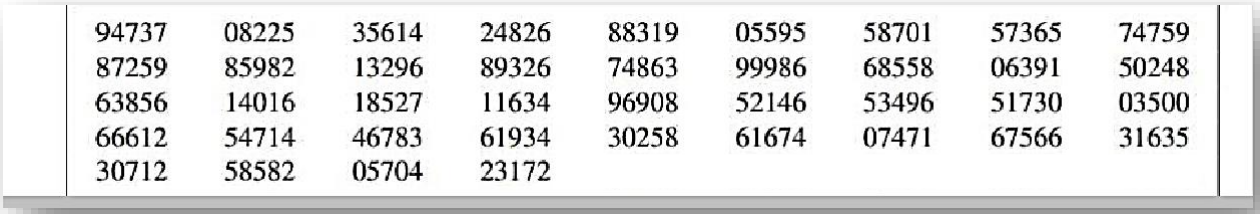
$X_i = R_i$	0.23	0.29	0.37	0.55	0.65	0.71	0.78	0.81	0.97
F(x)	0.23	0.29	0.37	0.55	0.65	0.71	0.78	0.81	0.97
$S_n(X)$	0.11	0.22	0.33	0.44	0.55	0.66	0.77	0.88	1.0
$\lvert S_n(X)-F(X) \rvert$	0.12	0.07	0.04	0.11	0.10	0.05	0.01	0.07	0.03

- **D** = max $|S_n(X)-F(X)|$ = 0.12
- $\mathbf{D_\alpha} = D_{0.95} = 0.432$
- $\because D < D_\alpha$
- We fail to reject H_0
  - It is uniform distribution

uniformity by Chi-square test at a significance of 0.99.

Answer:

Appendix_1:



94737	08225	35614	24826	88319	05595	58701	57365	74759
87259	85982	13296	89326	74863	99986	68558	06391	50248
63856	14016	18527	11634	96908	52146	53496	51730	03500
66612	54714	46783	61934	30258	61674	07471	67566	31635
30712	58582	05704	23172					

94 73 70 82 25 35 61 42 48 26 88 31 90 55 95 58 70 15 73 65 74 75 98 72 59 85 98 21 32 96 89 32 67 48 63 99 98 66 85 58 06 39 15 02 48 63 85 61 40 16 18 52 71 16 34 96 90 85 21 46 53 49 65 17 30 03 50 06 66 12 54 71 44 67 83 61 93 43 02 58 61 67 40 74 71 67 56 63 16 35 30 71 25 85 82 05 70 42 31 72

Interval Number	Interval	o_i	E_i	$O_i - E_i$	$(O_i - E_i)^2$	$\frac{(O_i - E_i)2}{E_i}$
1	[1-10[	6	10	-4	16	1.6
2	[10-20[	8	10	-2	4	0.4
3	[20-30[	5	10	-5	25	2.5
4	[30-40[	10	10	0	0	0
5	[40-50[	11	10	1	1	0.1
6	[50-60[	10	10	0	0	0
7	[60-70[	15	10	5	25	2.5
8	[70-80[	14	10	4	16	1.6
9	[80-90[	10	10	0	0	0
10	[90-100]	11	10	1	1	0.1

- $x^2_0 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i} = 8.8$
- $x^2_{0.99,9} = 14.7$
- $\because x^2_0 < x^2_{0.99,9}$
- We fail to reject H_0
- It is uniform distribution