

## MA 323 (2020) Monte Carlo Simulation: LAB 12

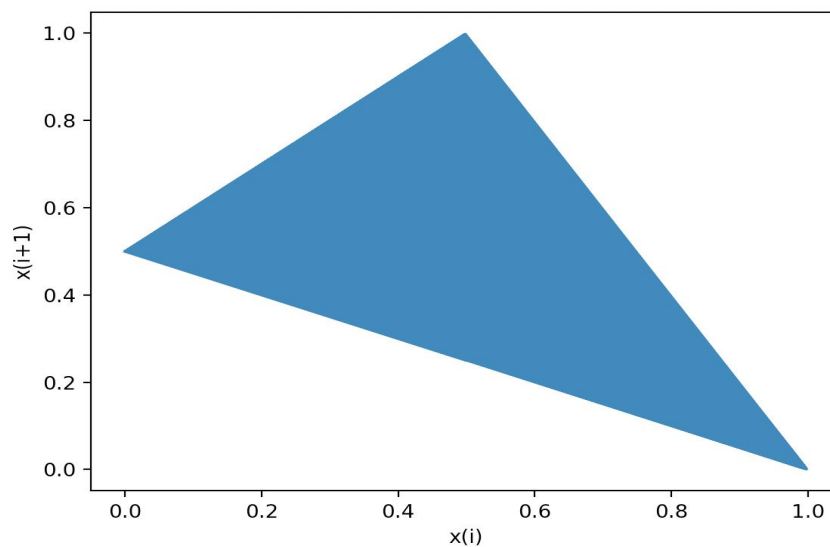
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### Problem I:

```
[The first 25 values of the Van der Corput sequence are:  
  N  Van der Corput(N)  
0   0   0.00000  
1   1   0.50000  
2   2   0.25000  
3   3   0.75000  
4   4   0.12500  
5   5   0.62500  
6   6   0.37500  
7   7   0.87500  
8   8   0.06250  
9   9   0.56250  
10  10  0.31250  
11  11  0.81250  
12  12  0.18750  
13  13  0.68750  
14  14  0.43750  
15  15  0.93750  
16  16  0.03125  
17  17  0.53125  
18  18  0.28125  
19  19  0.78125  
20  20  0.15625  
21  21  0.65625  
22  22  0.40625  
23  23  0.90625  
24  24  0.09375
```

1000 Values of Van der Corput Sequence using radical inverse function, plotted as  $(x_i, x_{i+1})$ :



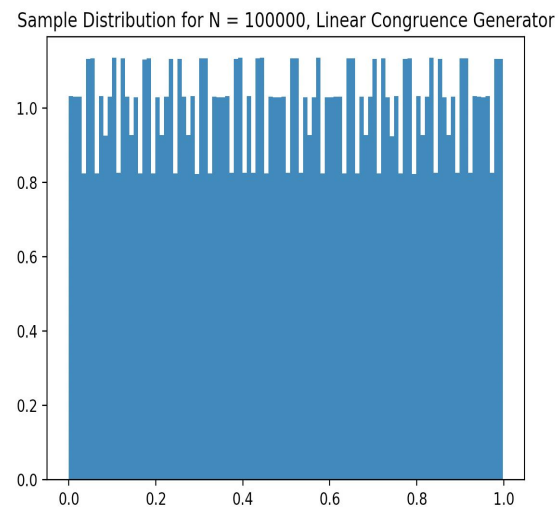
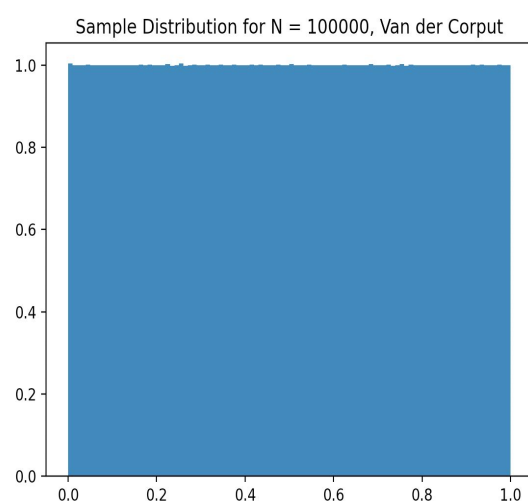
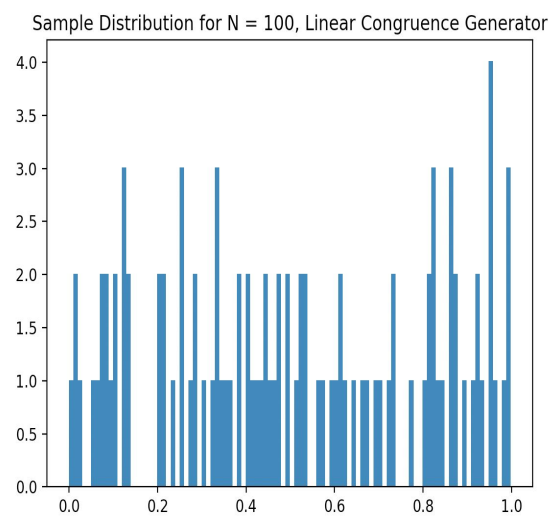
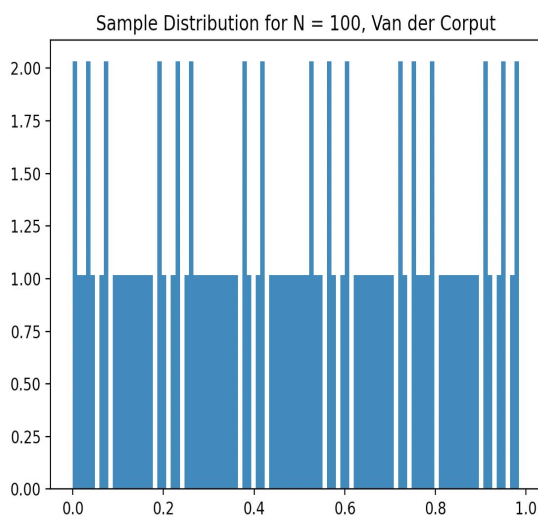
### Observations:

1. The above graph shows that,  $x(i)$  and  $x(i+1)$  are well distributed in the interval  $[0, 1]$ . They acquire a **triangular shape** which is suggestive of a **sufficient variation** in consecutive values.

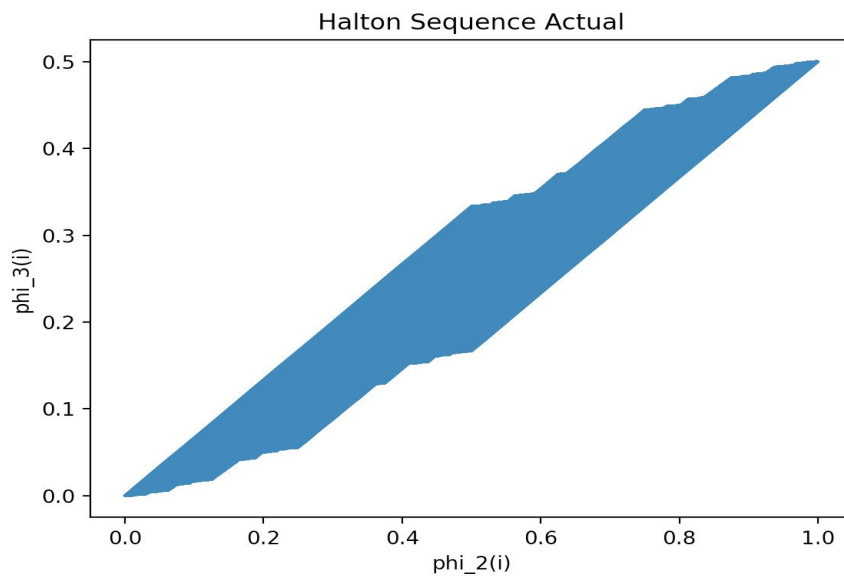
Comparison between the sampled distributions of 100 and 1,00,000 values generated by Van der Corput and Linear Congruence Generator.

### **Linear Congruence Generator Used:**

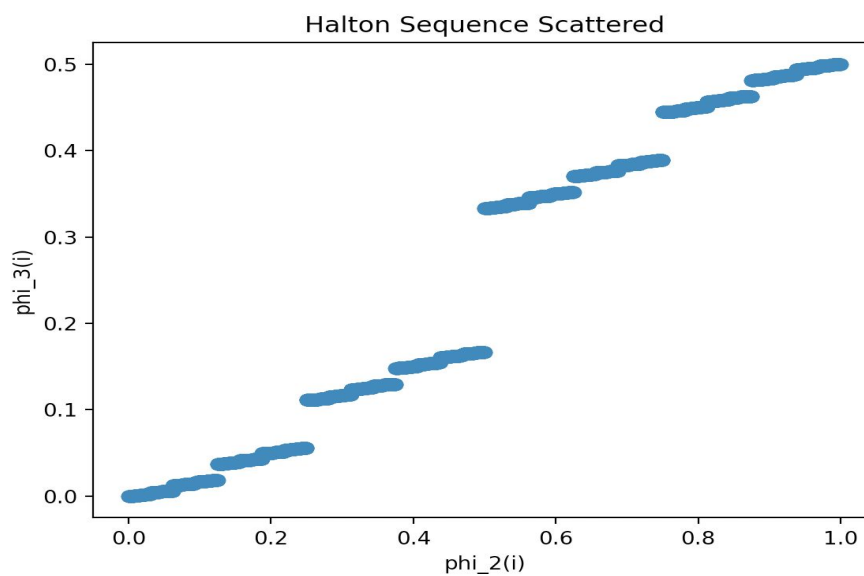
1.  $a = 51749$
2.  $b = 1352$
3.  $m = 244944$
4.  $x_0 = 3$



## **Problem II:**



(Halton Sequence Actual)



(Halton Sequence Scattered)

## **Observations:**

1. From the above graphs, we can observe that the absolute difference in the values of  $\phi_3(i)$  and  $\phi_2(i)$  increases with increasing  $i$ . With  $\phi_2(i)$  being greater than  $\phi_3(i)$  for sufficiently large  $i$ .