Simulation

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Reason of Simulation with Predictive Modelling

The data obtained may be very small in volume at times. But for better performance, we require it to be bigger. Hence a fictitious data with real world characteristics can be generated with simulation techniques like Monte-Carlo.

10. A metal pistons manufacturer conducts a marketing research and finds that for every 10 pistons made, an average of 12% of its pistons are rejected because they are not correctly sized. Generate 20 random variates for the number of pistons that would be rejected to estimate the minimum and maximum number that might be expected.

Generate a random number set for 200 batches of pistons

6. The exponential distribution of the amount of time a car battery lasts has a mean of 4 years. Generate 20 random variates from this distribution as whole numbers.

Generate data for 200 batteries

3. The weekly demand of a slow-moving product has the following probability mass function:

Demand, *x*	Probability, *f(x)*
0	0.1
1	0.3
2	0.2
3	0.4
4 or more	0

X	Prob	Cumulative Probabilities	Range of Random Numbers
0	0.1	P(X<=0)=0.1	0 - <0.1
1	0.3	P(X<=1)=0.4	0.1 - <0.4
2	0.2	P(X<=2)=0.6	0.4 - <0.6
3	0.4	P(X<=3)=1	0.6 - <1

E(X) = 1.9

0.24074492	0.86864199	0.54745293	0.7191533	Mean
1	3	2	3	2.25

Steps for Monte-Carlo Simulation Method:

1. For the probability distribution, calculate cumulative probabilities
2. Form the range of random numbers based on cumulative probabilities
3. Generate the random numbers from uniform distribution
4. Identify the range of random number and assign the corresponding value to it
5. The values generated in step 4 would be the simulated data

Sick drivers problem

- At a bus terminal every bus should leave with the driver. At the terminus they keep 2 drivers as reserved if any one on scheduled duty is sick and could not come. Following is the probability distribution that driver becomes sick:

No. of Absent Drivers	0	1	2	3	4	5
Probability	0.30	0.20	0.15	0.10	0.13	0.12

Simulate the data for a month and find utilization of reserved drivers. Also find how many days and how many buses cannot run because of non-availability of drivers.

x	cp	range	
0	0.3	0 - <0.3	
1	0.5	0.3 - <0.5	

[0.65626419 0.95490138 0.97087603 0.09783218 0.24074492 0.86864199 0.54745293]

0	0.3	0 - <0.3	
1	0.5	0.3 -<0.5	
2	0.65	0.5 -<0.65	
3	0.75	0.65 -<0.75	
4	0.88	0.75-<0.88	
5	1	0.88 -<1	

[0.65626419 0.95490138 0.97087603 0.09783218
0.24074492 0.86864199 0.54745293]

Sim:
3, 5, 5, 0, 0, 4, 2