**Experiment:- 04**

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| **Title: Implement the Monte Carlo Method** |

# Objective:

# Student needs to understand the Concept of Monte Carlo method

# Implement the Monte Carlo Method for

# Books/ Journals/ Websites referred:

* Markov Decision Processes in Artificial Intelligence MDPs, Beyond MDPs and Applications, Edited by Olivier Sigaud, Olivier Buffet, Wiley Publications, 2010
* https://bookdown.org/s3dabeck1984/bookdown-demo-master/monte-carlo-simulations.html
* https://pbpython.com/monte-carlo.html
* https://www.analyticsvidhya.com/blog/2021/04/how-to-perform-monte-carlo-simulation/

# Resources used: R or Python

# Theory:

# Monte Carlo simulation is a computational technique used to estimate the probability of different outcomes in a complex system or process. It is named after the famous casino city in Monaco because of the element of randomness involved in the technique, similar to the unpredictability of a game of chance.

# The technique involves using random sampling and statistical analysis to model the behavior of a system under a range of possible conditions. Monte Carlo simulations are often used in fields such as finance, physics, engineering, and biology to model complex systems that are difficult to analyze mathematically or to test hypotheses.

# To perform a Monte Carlo simulation, one must first define a set of variables and parameters that influence the behavior of the system. The simulation then randomly samples these variables to generate a large number of possible outcomes. By analyzing these outcomes statistically, the simulation can estimate the likelihood of different outcomes and identify patterns or trends in the data.

# Monte Carlo simulations are useful for evaluating risk, assessing the impact of different variables on a system, and testing the robustness of models or theories. They are also used in machine learning and artificial intelligence to train models and improve predictive accuracy.

# Implementation (Code):

# Kindly find the code and output in E4\_Monte\_carlo.ipynb

# Output Screenshots with explanation:

# Conclusion (Students should write in their own words):

# A Monte Carlo simulation is a useful tool for predicting future results by calculating a formula multiple times with different random inputs

# Monte Carlo simulation is like playing a game where you don't know what will happen next. You pretend that a toy is a real thing, like a car, and you roll a dice to see how far it will go. You do this many times, each time rolling the dice differently. This helps you guess what might happen if you played the game many, many times.

# In real life, we use this game to guess what might happen in something we cannot see or touch, like how many people will buy a new toy. By rolling the dice many times, we can guess how many people will buy the toy and how much money the store might make. This helps people make good choices about what they should do.

# Applications:

# Estimating the value of PI

# Simulating Stock market predictions

# Simulating physics of light particals