Lab 5 (Calculating Pi)

Simulation and Modeling (CSCI 3010U)

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Due back Nov. 3, 11:59 pm

Introduction

π has fascinated mathematicians since the ancient times. Pick any sufficiently advanced ancient civilization and you will find a mention of π. Knowing the value of π is useful in many domains, most notably among them is astronomy. That is why perhaps the ancients were so fascinated with its value. In this assignment you are asked to calculate the value of π using random sampling. Random sampling is used in many places where exact analytical solutions are too difficult to compute. This is just one instance of such a scenario.

Use the following fact to cast the "problem of calculating π" as a monte carlo simulation:

Area of a circle is πr^2, where r is the radius of the circle.

What to do?

Complete the following method that computes the value of π through sampling:

```python
def estimate_pi(n_samples, rnd_seed=0):
    '''Returns estimated value of pi'''
    return 0
```

And use this method to complete the following table.

Number of samples	Value of π (Run 1)	Value of π (Run 2)	Value of π (Average)
100			
1000			
10000			
100000			
1000000			
10000000			
100000000 (optional)			

Figure 1: Calculating the value of π via sampling

Briefly describe a scheme to check if the value of π that your program has estimated is any good? Assume taht you do not have access to the true value of π (i.e., `math.pi`). Can you modify the above program to also return some *measure of confidence* in the correctness of the estimated value of π?

Submission

Via Blackboard.

- Python file
- 1 page report outlining your strategy for estimating π through sampling, plus the filled table shown in Figure 1.