United International University (UIU)

Department of CSE

Trimester: Summer 2021

Course Name: | CSI 424 | Simulation & Modeling Laboratory (Section B)

Submission Guideline:

- Please solve the problems in separate files (**One notebook/python file per task**).
- **Download the python files** as instructed in the class. (File -> Download -> Download .py)
- Create a new **folder** and put all your python files inside the folder.
- Rename the folder with your 9 digit student ID.
- Make a ZIP of the folder and **submit the .zip file**.

Please do not copy codes from others/the internet. Each of the offline assignments will be evaluated with a viva. You must be able to explain your code. Also, we will run a copy checker on the submissions. Any plagiarism will be severely penalised.

Offline assignment 2

Task 1: [5 marks]

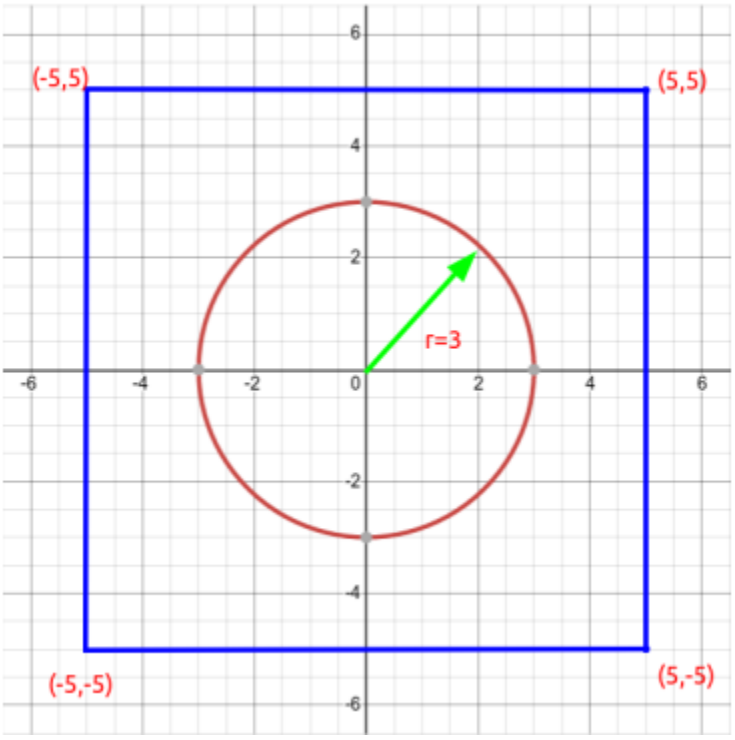
Implement Buffon's needle experiment. Take input N and run the simulation for N needles. Here, distance between the parallel lines and the needle length both can be assumed to be of unit length (i.e. d = l = 1).

At the end of the simulation,

i) [3 marks] Report the value of pi (estimated from the simulation results) and

ii) [2 marks] Plot a D vs θ graph showing hit and miss points in different colors. [Desired output format will be discussed in the class]

Task 2: [5 + 2 (bonus) marks]
See the figure below:



Using Monte Carlo simulation, find the value of PI and area of the circle using the given circle and square.
Take input N (number of sample points).
Provide the following outputs for N:

a. [2] Scatter plot of the sample points (red points inside of the circle, blue points outside of the circle),
b. [2] Estimated value of PI,
c. [1] Estimated value of the area of the circle.

Bonus [2 marks]: Repeat the experiment for N = 100, 1000, 5000, 10000. Make a bar plot of the estimated pi vs N.