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CENG 327: Introduction to Scientific Computing
Homework 1

1 Discussion for 2nd question

To find the closest estimate for Pi value, I used 4 different distributions to generate random numbers for X and Y and used these number to estimate the value of Pi using Monte Carlo method. These distributions were:

1- Uniform 2- Normal 3- Poisson 4- Power

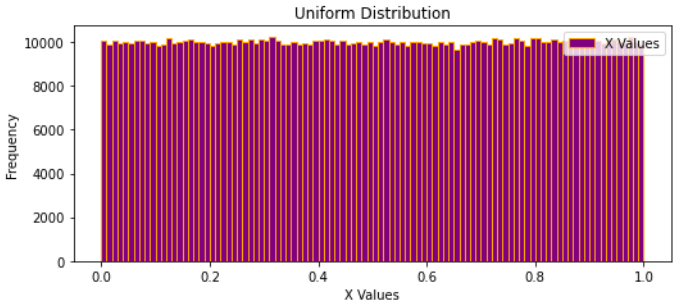
To do this, first I created a function to calculate Pi value according to Monte Carlo method and run this function for 1000 times. Then I calculated the differences between the real(which is 3.14159265) and estimated values of Pi as absolute values and found the average of these differences.

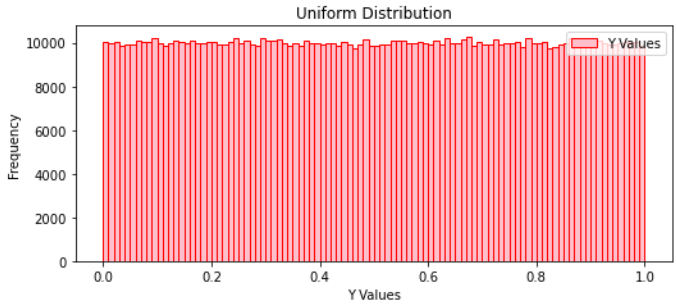
Comparing these results, I have found that Poisson and Normal distributions are not the best options to use to calculate Pi value. The average of the differences between the results and the real Pi value were around 2.6 for Poisson distribution and around 1.55 for Normal distribution.

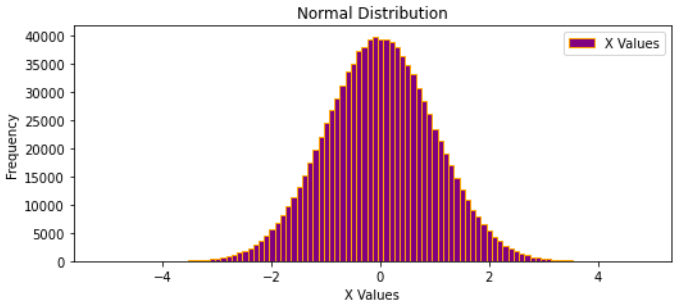
For the Uniform and Power distributions they were both around 0.4 and the results were really close but out of 10 runs, I can say that Uniform distribution is the best option out of these 4 distributions to use for estimating Pi value.

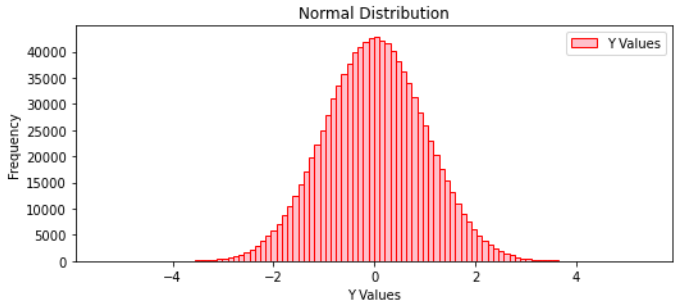
2 Plots for 3rd question

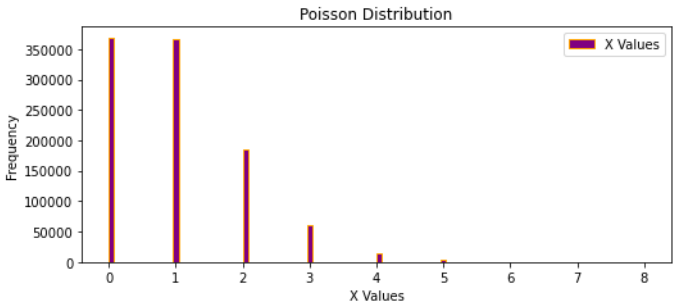
In this part, you can see the histogram charts for X and Y values that are generated using four different distributions, which are Uniform, Normal, Poisson and Power distributions, respectively.

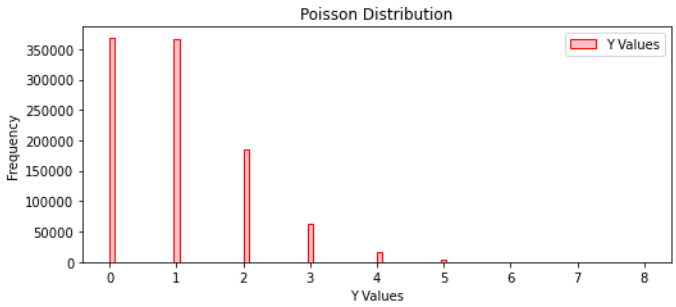


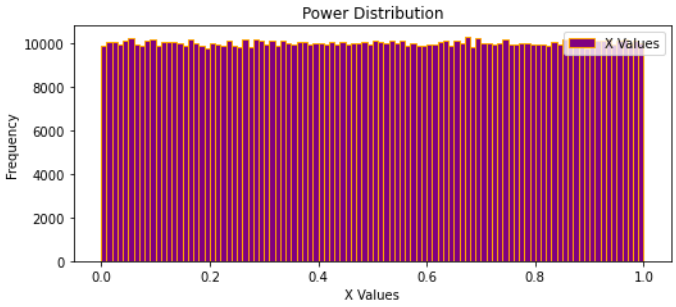


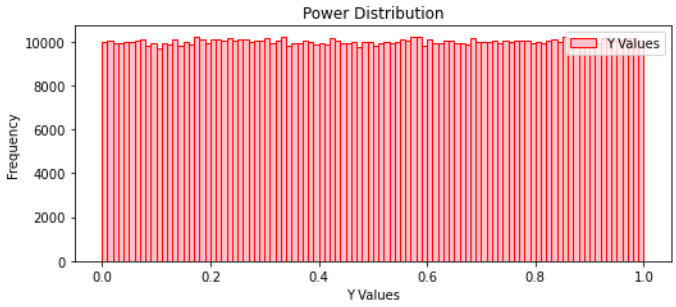












3 Discussion of the timing experiments for 4th question

To compare the timings for Numpy arrays and Python Lists, I chose the Uniform distribution.

To do this, I created two versions of the code changing the lines that I wrote to generate random numbers for X and Y.

At the end of both codes, I added a line using timeit function to save the execution times.

The results has shown that Python lists are faster than Numpy arrays. You can see the result down below.

The time it took for Numpy arrays: 0.0038451000000350177

The time it took for Python Lists: 0.0009623000000829052