Estimation of pi

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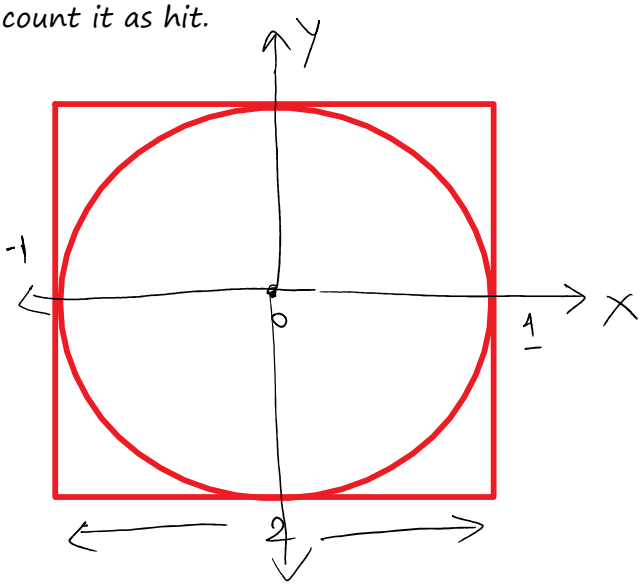
Estimation value of π using "Monte - Carlo Simulation"

In this simulation I have tried to simulate an experiment of randomly throwing a stone on a square of side length '1'.

If stone hits the position in the square inside the radius 1 unit. Then we will count it as hit.



$$P(\text{hit}) = \frac{\text{Area(Circle)}}{\text{Area(square)}}$$

$$\Rightarrow P(\text{hit}) = \frac{\pi}{4}$$

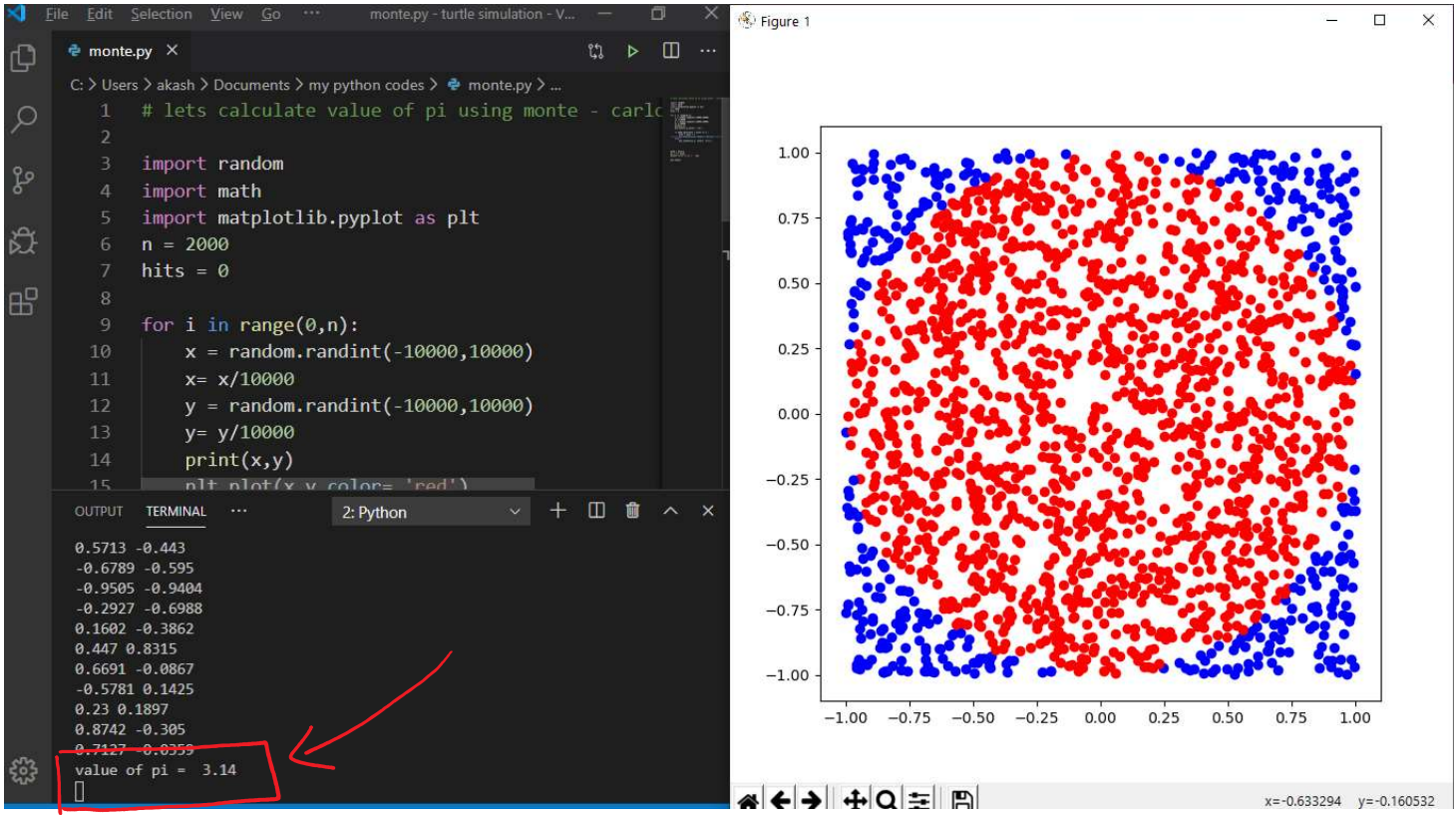
$$4\,P(\text{hit}) = \pi$$

Python code that I have written for this simulation:

```
# lets calculate value of pi using monte - carlo simulation
import random
import math
import matplotlib.pyplot as plt
n = 2000
hits = 0
for i in range(0,n):
    x = random.randint(-10000,10000)
    x= x/10000
    y = random.randint(-10000,10000)
    y= y/10000
    print(x,y)
    plt.plot(x,y,color= 'red')
    if math.sqrt(x**2 + y**2) <= 1 :
        hits = hits + 1
        plt.scatter(x,y, color= 'red')
    else :
        plt.scatter(x,y, color= 'blue')
```

```
prob = hits/n
pi = 4 * prob
print("value of pi = " ,pi)
plt.show()
```

Results:



Estimated value of π we get from this simulation is = 3.14

(if we run this program again and again we will get slightly different value each time as our approach is based on random number generation.

Also accuracy and consistency of this simulation will depends on number of trials(n) . More trials means more accurate result.