CECS 451
Assignment 8
Total: 20 Points

General Instruction

- Submit uncompressed file(s) in the Dropbox folder via BeachBoard (Not email).

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1. Implement a program to estimate π using the simulation method.
   (a) The program should generate n random points of (x, y) where $0 \leq x < 1$ and $0 \leq y < 1$ for $n \in \{10^3, 10^4, 10^5, 10^6\}$.
   (b) You can use `math.pi` to compute error rates.
   (c) (10 points) Please follow the output format. Note that the estimated π and the error rates may be different. (Fix precision using `"0:.nf".format`)

```
n = 10 ^ 3  pi =  3.096000  error =  1.4513 %
n = 10 ^ 4  pi =  3.136800  error =  0.1526 %
n = 10 ^ 5  pi =  3.145280  error =  0.1174 %
n = 10 ^ 6  pi =  3.140568  error =  0.0326 %
```

   You can use the formula

$$error(\%) = |\frac{\pi - \pi'}{\pi}| \times 100,$$

   where π' is the estimation.
   (d) (10 points) For $n = 10^4$, draw a scatter plot as Figure 1, i.e., blue color for dots whose distances from the origin $(0, 0)$ are less than 1, otherwise red color.
   (e) Submit `pi.ipynb`.

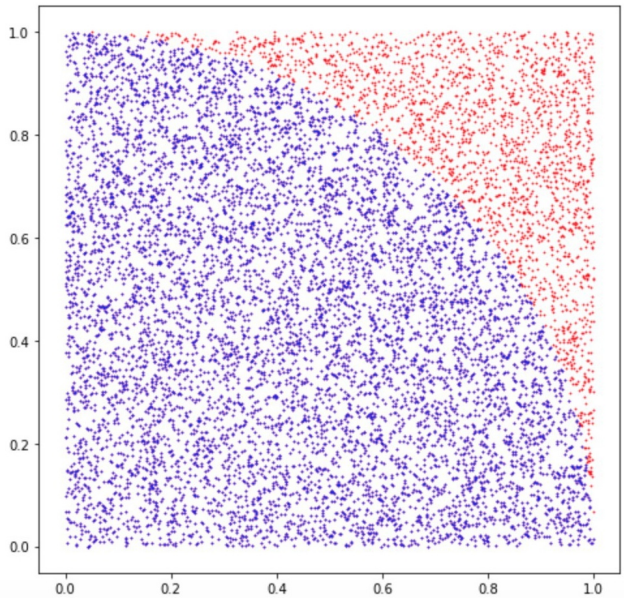

Figure 1: Estimating π using simulation