

Assignment 1 - Monte Carlo Estimation of π ! WRITEUP.pdf

dlee181

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1 Introduction

Hello this make file will go over what I have learned as well as the take-aways from this assignment. I will also be showcasing the plots I created as well as the significance of my work.

2 Plot Images

Here we have the Monte Carlo Estimation of π displaying the ratios of $1:\pi$ (Black:Yellow)

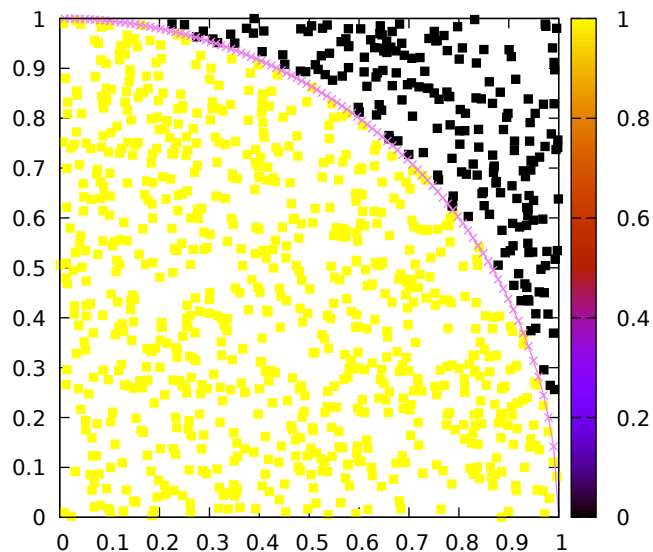


Figure 1: This is one-thousand randomly generated points within a 1 x 1 quadrant separated by a quarter of a circle

Below is a Display of the Monte Carlo estimation of π in relation to the "true" value of π . As the number of iterations increase so does the accuracy of the estimate.

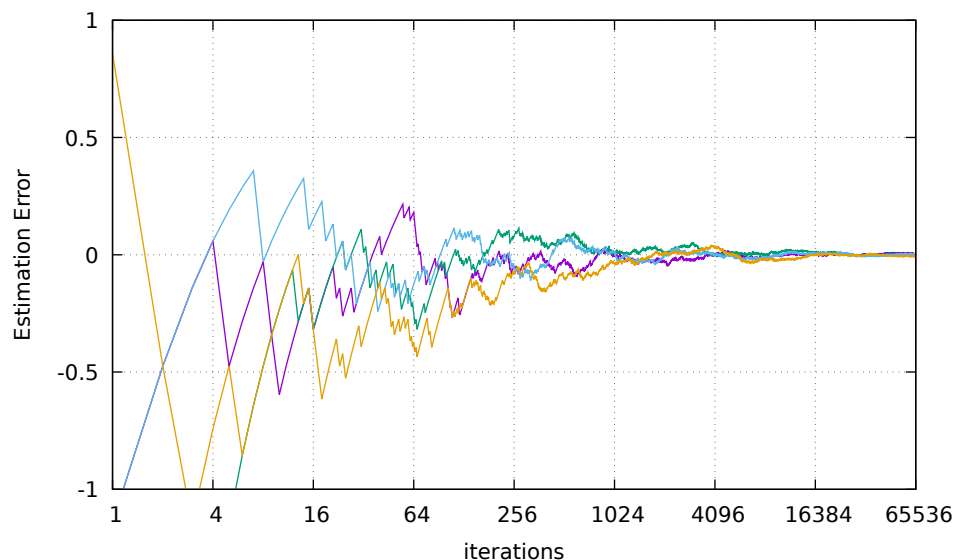


Figure 2: This is a plot of four sets of sixty-five thousand, five hundred thirty-six data points from four .dat files. Each point is subtracted to the value of π as the iterations go. Because the data set is small in the beginning the error is significantly high.

3 Lesson

I believe that this Monte Carlo assignment is obviously to learn about the Monte Carlo estimation of π which gets extremely close (yet infinitely far) to the value of π . What I learned is that surprisingly, this assignment was really interesting in that this is the first time I have ever created a file on Bash, wrote my own bash script, assigned a bunch of data to a file which I ultimately used to graph those data points, used a powerful tool like gnuplot which showed me really cool plots that I only thought smart people could make, and a bunch of other small things that I can't name right now.

4 Meaning behind the data in Figure 1: Quadrant Ratio

From the graphs provided we can clearly see that in figure one there are one thousand randomly generated dots contained within a square and separated by an arc. This line represents a quarter of the circle and allows for a relatively accurate estimate of π when there isn't such a thing as a definitive value of π . The data also shows that the more data points we have, the more accurately we are able to estimate the ratio within the square.

5 Meaning behind the data in Figure 2: Estimation Error

From the second graph, the data starts with a small number of iterations and a relatively extremely large amount of estimated error between Carlo's estimation of π and the value of π , but as the iterations gradually increase, the error decreases. Ultimately these four lines center themselves around zero which means that the value of Carlo's estimation is nearing the value of π .

6 Conclusion

But the true underlying lesson that I learn is that being a good computer scientist means more than being proficient at a language, it is debugging, learning that python is really a language that handicaps the users and sort of makes you take for granted how much simpler higher level languages are. This also taught me how to navigate around the directory really fast and almost like it was muscle memory. Because I use the ubuntu server, I do not have the OS display forcing me to basically use terminal for everything. The way I worked around this was hours and hours of web browsing. I have never worked this hard in order to create something so seemingly "simple". I didn't realize that just making these plots required learning to set up ubuntu, managing the git repositories, learning bash, understanding C, learning how to write in different formats, studying a fair amount on gnuplot, and much more. I also learned that persistence was the key to this. I spent upwards of thirty to forty hours in the past four to five days for this assignment and most of the time was me just reading random things.