

Homework 5: Monte Carlo on GPUs

Due June 7th.

1. Write a (non-GPU) program to calculate π by integrating the area of a circle of radius 1 with the Monte-Carlo method. You may use a system-provided random number generator. The Python `random` module says it uses the Mersenne Twister which I mentioned in class as a quality generator. Plot how the error in the estimated value of π changes with the number of points used to evaluate the integral; does this follow the expected error for a Monte Carlo method?
2. Implement the same Monte-Carlo method using CUDA on a CUDA capable machine, such as the hyak gpu nodes. For those familiar with Python, this may be easier using PyCUDA. I (will) have installed this on the hyak machines in `/usr/lusers/trq/python/lib`. You can interactively grap a GPU node on hyak with

```
qsub -I -q gpu -W group_list=hyak-hpc
```

Verify that you get an accurate estimate of π , and compare the time taken with the CUDA implementation with the time taken by the non-CUDA implementation.