CS5740 **Parallel and Distributed Computing**
Assignment # 2 Due Date: October 06, 2010

Important: Please do all assignments on `stovokor`

Using MPI

The goal of this homework is to compute the value of π.

Problem: Consider a circle of diameter $(2r = 1)$ embedded inside a square of side $(w = 1)$. The area of circle A_c is given by πr^2, or $\frac{\pi}{4}$. The area of the square A_s is given by $w^2 = 1$. From this, we have

$$\frac{A_c}{A_s} = \frac{\pi}{4} \Rightarrow \pi = 4\frac{A_c}{A_s}$$

We can compute π if we know A_c and A_s. We will compute that by randomly throwing a number of darts on our square and counting how many of them land inside the circle.

Each dart is generated by a pair of random numbers between 0 and 1, called (x, y) to indicate its anding point within the square. A_s is the total number of darts. The dart lands inside the circle if [the square of] its Euclidean distance from the center of the circle, considered to be at (0,0), and given by

$$x^2 + y^2$$

is less than or equal to 1. Notice that you do not have to compute the square root to find the actual distance.

Create a number of tasks to run on different nodes of the cluster, up to a number of iterations specified on command line, with a default of 10,000 iterations. Use the reduction operator to collect the area of circle and square as computed from different nodes. Make sure that he random number seed on different nodes is indeed different; relying on `time` function may not achieve that as the function may execute at the same time. One way to achieve this will be to combine time (`time()`) with process id (`getpid()`).

What to handin

Create your programs in a directory called *username*.2 where *username* is your user name on admiral. Once you are done with everything, *remove the executables and object files*, copy the directory to admiral, and issue the following commands:

```
% cd
% ~bhatias/bin/handin cs5740 2
```

Do not forget `Makefile` (with suffix rules) and `README` for the assignment.

You do not have to hand in a hard copy of the project. Assignment will be due at 11:59pm on the due date.