CSE 6220: Assignment 1

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I have implemented a parallel algorithm to estimate the value of π with the unit circle. The deliverable contains a driver file with the algorithm implementation (`main.cpp`), a `Makefile` to compile the program, and a `README` file. The algorithm generates n random points within the unit square and estimates the value of π as:

$$\pi \approx 4 \times \frac{\text{points in unit circle}}{n}$$

In my simulations, $n = 10^6$. Additionally, I tested the algorithm's performance across a range of processor sizes $(p) \in [1; 25]$ on the PACE-ICE cluster, where we allocated 1 node and 25 CPU cores per node.

Figure 1 shows the runtime of our program as a function of the number of processors. For example, I observed that the runtime roughly decreases by a factor of $\frac{1}{2}$ as the number of processors doubles. Generally, the observed runtime scales as $\frac{1}{p}$, where p is the number of processors. The speedup is thus directly proportional to the number of processors; doubling the number of processors gives a speedup of 2, quadrupling the number of processors gives a speedup of 4, etc.

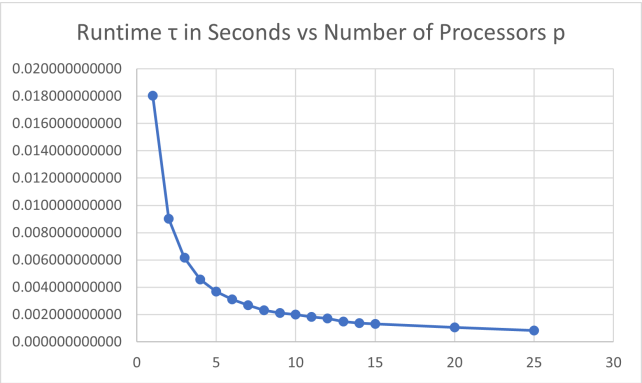

Figure 1: Run-time (τ in seconds) vs. Number of Processors (p)