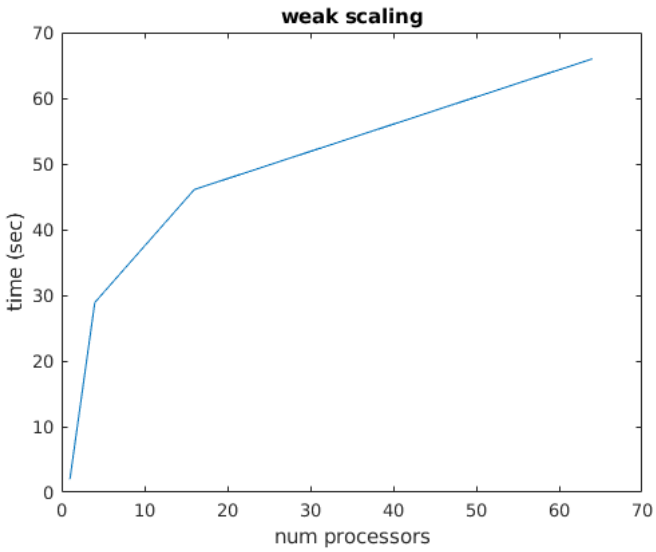
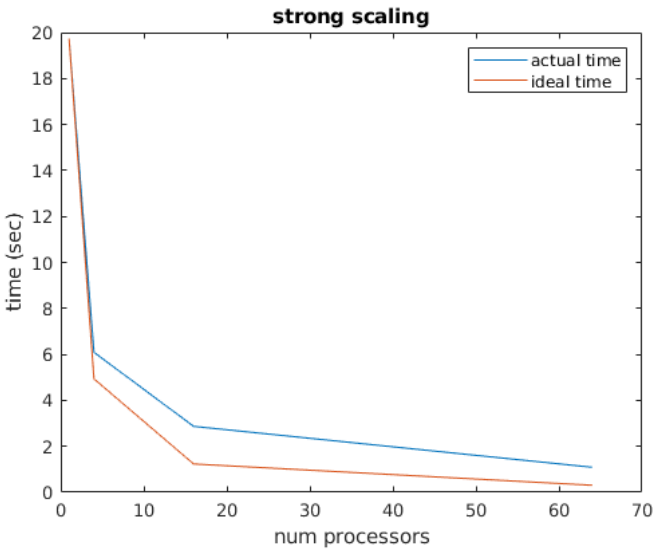
Spring 2019: Advanced Topics in Numerical Analysis: High Performance Computing Assignment 6 (due May 13, 2019)

0. **Final project update.** We have written the parallel code (MPI implementation) for the 1d grid that exchanges ghost site information between blocks after a certain number of seconds (in simulated time) of running KMC within each block in parallel. The simulation runs for a certain amount of time and then hangs, and we are trying to find the bug causing this.

1. **MPI-parallel two-dimensional Jacobi smoother.** Weak scaling - $lN = 100$, 10^5 iterations
   $p = 1$: 2.009621 seconds
   $p = 4$: 28.917799 seconds
   $p = 16$: 46.117191 seconds.
   $p = 64$: 65.964884 seconds





   Strong scaling - $N = 2^{13}$, 100 iterations
   $p = 1$: 19.742796 seconds
   $p = 4$: 6.086552 seconds
   $p = 16$: 2.867872 seconds
   $p = 64$: 1.090249 seconds.

2. **Parallel sample sort.**
   64 cores:
   $N = 10^4$: 0.733798 seconds.
   $N = 10^5$: 0.740260 seconds.
   $N = 10^6$: 1.089067 seconds.

Note that most of the runtime is taken up by memory exchanges and not by computation on each processor. This is why we do not see a factor of 10 slow down.