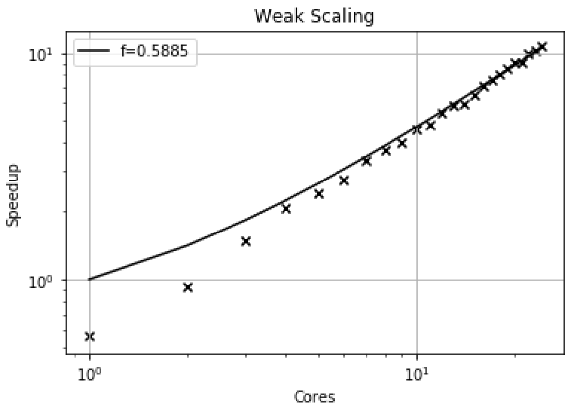
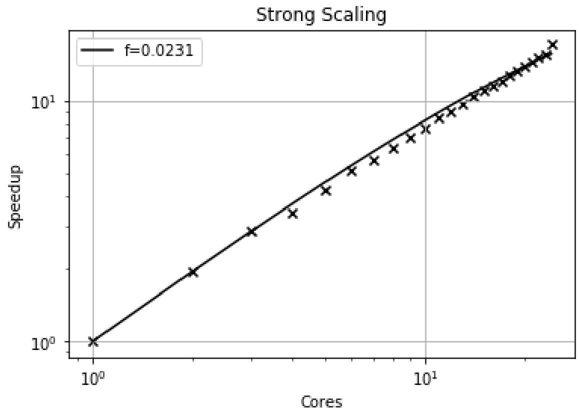
Step 5 – Report

I ran my experiments on Hamilton. I ran my experiments on up to 24 cores as more than 25 the concurrency overhead breaks the laws. This is discussed briefly at the end.

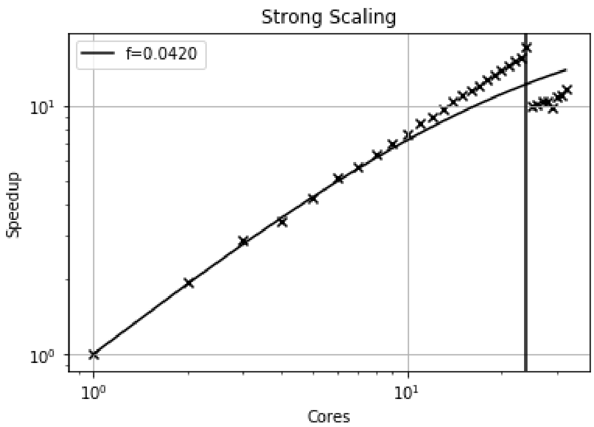
Since our simulation is $O(n^2)$ we must vary n such $p \propto \sqrt{n}$ to ensure each core does a constant amount of work when testing weak scaling. This is does practically by setting $n_p = sqrt(p) * n_{p-1}$ where n_p is the number of particles for the simulation on p cores. Testing strong scaling can be achieved by choosing a fixed $n = 2449$ and increasing p.





The values for f were derived by fitting amdals law and gustafsons law to the strong and weak scaling data respectively. Both models fit the simulation well. Weak scaling fitted surprisingly well since it was non-trivial to give each core a constant amount of work and whilst an attempt was made it could not be guaranteed. Since we cannot guarantee each core does a constant amount of work, and experimentally we see strong scaling is a greater fit, we conclude that strong scaling is a better fit.

As mentioned in the introduction for $p > 24$ the assumption that inter-core communication is negligible breaks down. This was discovered when attempting to use strong scaling for $p > 24$.



Since the code is same for both when testing strong and weak scaling the effect observed above for $p > 24$ in the strong scaling tests are guaranteed to be present in weak scaling as well.