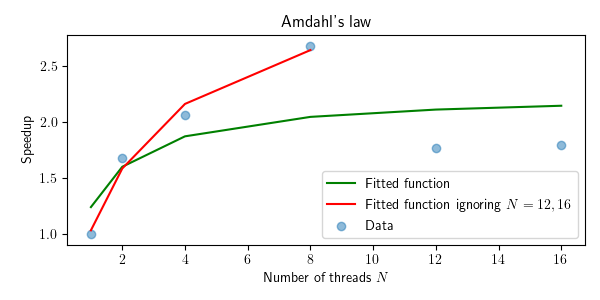
Speedup is defined as , where is the time taken by a task on core, and is the time taken on cores. Strong scaling is concerned with how the solution time varies with the number of processors for a fixed *total* problem size; weak scaling is concerned with how the solution time varies with the number of processors for a fixed problem size *per processor*. Amdahl’s law governs strong scaling. It states that where is the proportion of the execution time spent on the serial part and is the proportion spent on the parallelised part. Scalability was tested using Hamilton. Hamilton uses nodes, each with CPUs. Each CPU has cores and threads. To ensure consistency, each test booked a whole node. For both weak and strong scaling tests, and threads were used. For the strong tests, the same particle file was used; for the weak tests, the number of particles scaled with the number of threads. All I/O output was disabled.

Results for strong scaling are dispiriting, with , implying the code is *barely* parallelisable. If the data points for are ignored, a better result of is obtained. It is believed these anomalous results originate in a discrepancy between the hardware configuration of Hamilton and the SLURM scripts used.

Weak scaling is concerned with how the solution time varies with the number of processors for a fixed problem size *per processor*. Weak scaling is governed by Gustafson’s law, which states: . It is based on two approximations, that the parallel part scales linearly with the amount of resources, and that the serial part does not increase with respect to the size of the problem. Weak scaling results are similarly disappointing, with , implying the code runs more slowly in parallel then serially. It seems, therefore, that a strong scaling model is more appropriate for this code.

