

There are multiple reasons why the parallelized program didn't give us a good speedup or efficiency. Things such as overhead from maintaining threads, imbalanced division of tasks, and scale of the data are all attributes that affect the speedup and efficiency of a parallelized program. As the number of threads increases, the amount of work needed to maintain such threads also increases, this requires more resources and time, slowing down the overall program. There can also be times when the data size is small enough such that the overhead of thread management outweighs the parallel runtime. Since the program computes the integral over given bounds, there are not a lot of steps that could be parallelized, this means that each thread effectively has to take up bigger tasks and therefore is slower in comparison to multiple threads that are given smaller tasks. This significantly slows the speed of calculations and the overall speedup. Another big variable could be the amount of data that the program works on. A bigger data size would allow the parallel program to have a better speedup as there are more calculations overall, which get split into multiple threads saving a lot more time. All of these things directly affect the speedup and efficiency of a parallelized program, causing it to not be as advantageous as it could have been.

Raising the data size would be the best course of action if we want to achieve better efficiency. We could also try to incorporate more tasks and create more compute-heavy calculations which could help us achieve better overall speedup.