

MATH299M/CMSC389W – Visualization Through Mathematica

Spring 2019 – Ajeet Gary, Devan Tamot, Vlad Dobrin

Model H12: Parallelization Competition!

Assigned: Monday April 1st, 2019

Due: Monday April 15th, 2019 11:59PM

Note: Remember that out of the H models from Part 3, that is, anything numbered 10 or above, you must only complete 2 assignments. Any extra you complete can replace low scores from Part 1 and Part 2 of the course.

This week we learned parallelization, exciting! We can now access the full power of your computer's cores. We're going to make a competition out of it – who can write parallelized code that will run the fastest? I will be testing everything on my MacBook Pro with 4 cores. Whoever gets the best results wins!

An *arithmetic progression* is a sequence of numbers separated by a constant additive constant, that is, a recurrence relation of the form:

$$\begin{cases} a_0 \in \mathbb{Z} \\ a_n = a_{n-1} + c, \forall n \geq 1 \end{cases}$$

where c is some integer constant - we're just going to deal with integers, specifically, primes.

We would like to find the longest arithmetic progression of primes that we can! Here are some examples:

$\{3,5,7\}$ is an arithmetic progression of primes of length 3, with step size 2

$\{11,17,23,29\}$ is an arithmetic progression of primes of length 4, with step size 6

Terence Tao proved that there exist arbitrarily long arithmetic progressions of primes (<http://mathworld.wolfram.com/PrimeArithmeticProgression.html>). Your task is to find the longest one you can, utilizing 4 cores. Your notebook should have all of the needed code in initialization cells, and you must put the result in an Export block, exported as a .mx. You should export the longest prime arithmetic progression that you find.

If there is a tie for the longest found sequence, the winner will go to whoever uses the least RAM! For this reason I ask you to also add a line that Exports the MaxMemoryUsed[] command's result to a .mx called "Max Memory Used". Obviously, I expect you not to hardcode any sequences you find online, I'll check your code.

The winner gets a 125% on the assignment, may the odds be ever in your favor.