

1 Solving Large Systems of Linear Equations

1.1 Loading and Checking for Solvability

The output of my code (method: `part1()`) shows that the sizes of the arrays given are 10, 100, 200, 1000 and 2000 and that each one is solvable.

1.2 Coding and Testing Gauss Elimination

I tested my code implementing the Gauss Elimination algorithm on the following system of equations:

$$2x_1 + 3x_2 + 4x_3 = 29.5$$

$$x_1 - x_2 + x_3 = 7.5$$

$$x_1 + 2x_2 - x_3 = -3$$

which has the solution $x_1, x_2, x_3 = 2, \frac{1}{2}, 6$. The method '`part2()`' in my code demonstrates this working. The timing bit is done more thoroughly in the last part of this worksheet.

1.3 Timing Results

As is clear from Figure 1 my own code performs poorly in comparison to NumPy and SciPy's linear systems solvers. Comparing the latter two based on the plot, I would use SciPy's `linalg.solve`. I was unable to find what algorithm these methods use as they do not mention it in the API or source code.

Note: I had to use `time.time()` instead of `time.clock()` because my OS is Ubuntu, which apparently has some issues with the latter.

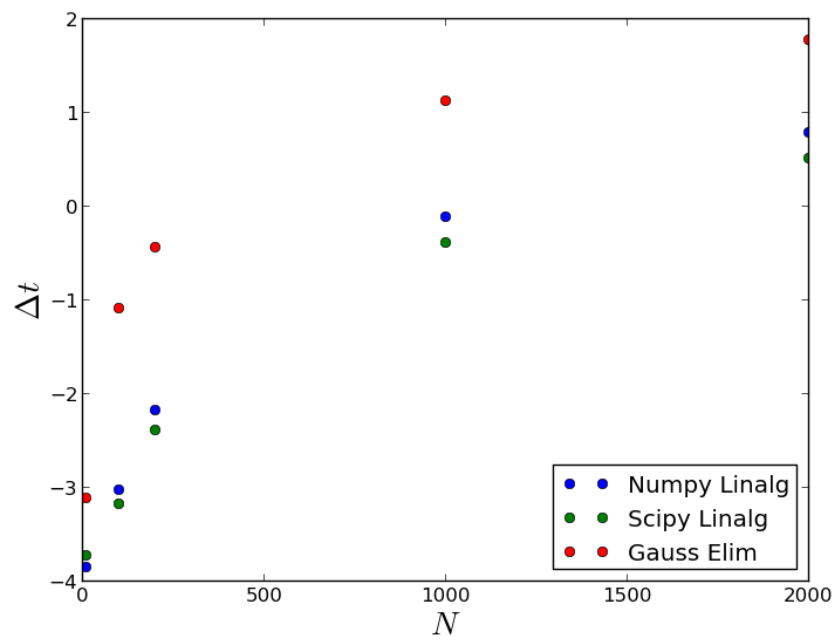


Figure 1: Timing the Linear Systems solvers (my Gauss Elimination code, NumPy's linalg.solve and SciPy's linalg.solve)