

# Homework 3

CAAM 520, Spring 2019

Posted February 27, 2019. Due March 6, 2019 by 5pm.

1. Your solutions to the homework must be committed to your Github repository in a sub-directory HW03.
2. You are required to include a Makefile that creates an executable called “hw03” in that directory. All source code, header files,  $\LaTeX$ files, Makefiles, etc. should be committed to your repository in the same sub-directory.
3. You may base your code off of the solution code for [Homework 1](#) or use your own code.
4. Use  $\LaTeX$  to write and typeset your report (saved as “report.pdf” in your repository sub-directory). Document all your steps, including code snippets within your report.
5. You may only consult the instructor for assistance, but are encouraged to use textbooks and internet resources. Cite all external resources used via footnotes or a bibliography.

**Assignment:** Your task is to create an OpenMP parallel C/C++ code to compute the solution  $\mathbf{u}$  to the system  $\mathbf{A}\mathbf{u} = \mathbf{b}$  arising from the finite difference discretization of Poisson’s equation. You may use any of the iterative solvers from Homework 1.

**Documentation:** Your report should also include the following:

1. descriptions of your partition of parallel work and algorithm. Use diagrams and pseudocode if appropriate.
2. discussion of OpenMP directives and compiler options used in your code
3. documented verification of your code’s correctness (e.g. reported errors, comparisons with serial code, etc).

Test the strong scaling of your program by running for three different problem sizes with 1, 2, 4,  $\dots$ , threads on NOTS. Your code should achieve the same answer and maximum error as your serial code for any number of threads. Plot the result in a graph showing the speedup as a function of number of threads, and discuss the observed behavior.