CSE 141: Introduction to Computer Architecture Summer II 2019

Lab 2

Instructor: Devon Merrill

Group member: _____ Date: _____

. Group member: _____

Instructions

- Answer each question in the boxes provided. Any writing outside of the boxes will NOT be graded. Do not turn in responses recorded on separate sheets.
- Handwritten or typed responses are accepted. In either case, make sure all answers are in the appropriate boxes.
- Graphs must be appropriately titled and labeled. Units must be included. Axes must have appropriate minimums and maximums.
- All responses must be neat and legible. Illegible answers will result in zero points.

You will need data gathered on the reference processor to complete this lab. See the course web page for instructions.

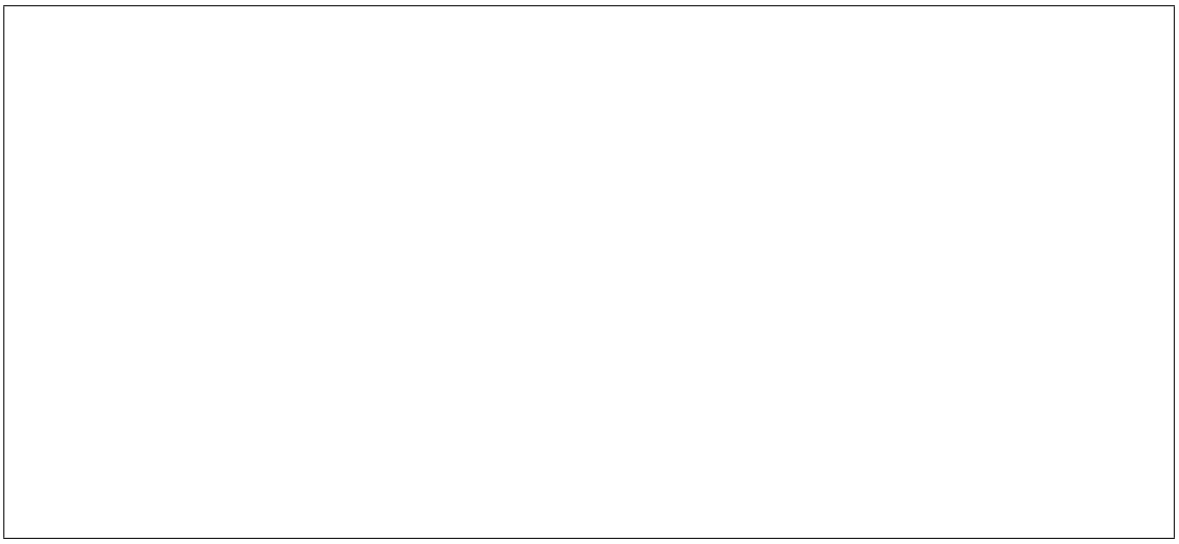
1. *Unrolling Different Loops* (2 point):

   (a) Try blocking all three loops(r, c, and i) independently using a step size of 5. Then plot the speed up of blocking r, blocking c, and blocking i over no blocking as a bar graph. Make sure to follow the graphing guidelines in the instructions for full credit.

   (b) Is there a difference in speed up when blocking different loops? Why or why not?

2. *Block Step Size* (4 point):

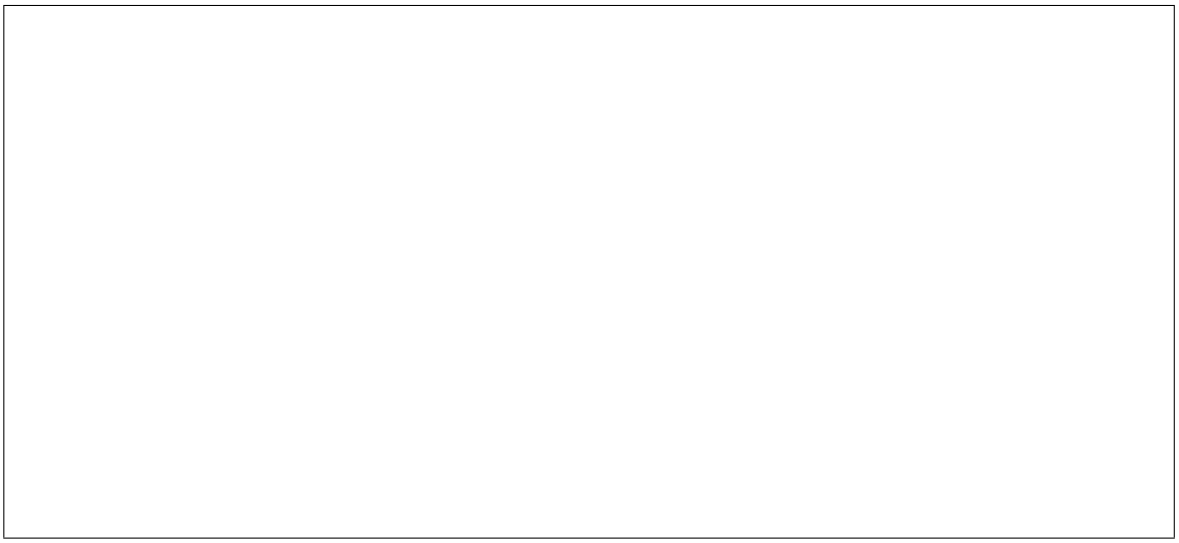
   (a) Block all loops at once. Change the blocking step to 1, 3, 5, 7, 16. Plot the step size vs. speed up over no blocking for the largest matrix. Make sure to follow the graphing guidelines in the instructions for full credit.



3. *CPI* (3 point):

   (a) Block all loops all at once with step size 6. Plot instruction count for the blocked code and the reference code vs. matrix size (use one graph).

   (b) Plot CPI for the blocked code and the reference code vs. matrix size (use one graph).



(c) Is the CPI different between the blocked code and the reference code? Why or why not?

4. *Speedup* (3 point):

(a) For your fastest solution, plot the matrix size vs. speedup compared to the reference code. Make sure to follow the graphing guidelines in the instructions for full credit.

(b) What is the trend in speedup as the matrix size increases?

5. *Miss Count* (3 point):

(a) For both the reference code and your fastest solution, plot number of L1 misses vs. matrix size. Use one graph.

(b) Explain the trend as matrix size increases.

(c) Explain the trend as matrix size increases. Remember the memory footprint of a size n matrix is $8 \times n^2$ bytes.