

GPU Assignment 01

CSE 560 - GPU Computing

Winter 2019

Maximum Marks: 50

1 Tasks

The task for the assignment is to perform convolution over an image on the GPU. You are provided with the serial implementation for the image convolution operation. You may refer [here](#) and [here](#) to understand more about the convolution operation. The task of this assignment is to perform image convolution on the GPU using shared memory, and compare it with corresponding CPU code for performance.

2 Deliverables

You are provided with images of the size 2048×2048 , 1024×1024 , 512×512 , 256×256 , 128×128 , 64×64 . As part of this assignment, you are required to perform the following:

1. Implement a CUDA kernel with shared memory. [25 marks]
2. Profile your code for CPU and GPU implementations. by performing convolution operation on these images for kernel sizes of 3, 5, 7, 9, and 11. Calculate the speedups obtained in each case. [15 marks]
3. Write a report containing:
 - (a) Sections on: Introduction, strategy, and results.
 - (b) A single graph in the Results section containing line plots of image size vs speedups for various kernel sizes.

A report is mandatory is mandatory to receive any credits. [10 marks]

3 Upload Instructions

Upload all the files as a .zip file with the following naming convention - assignment01_{roll_no}.zip

1. Code for the assignment along with a Makefile
2. A report in PDF format written with Latex/MS Word. Use the acmlarge option (single column) (see sample-acmlarge.tex if writing with Latex) [refer here](#)

4 Bonus

Apply sobel kernel of size 3x3 for edge detection. Refer [here](#) to know more about sobel operator. (10 marks) (bonus marks to a maximum of 10 will be awarded. This part is completely optional)

Note: Your code should be written by you and be easy to read. You are NOT permitted to use any code that is not written by you. (Any code provided by the TA can be used with proper credits within your program)