GPU Programming
Academic Year: 2021 - 22

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GPU Programming Assignment Submission Guide Lines

- Mail-ID: cs481.gpu.mec@gmail.com
- Sub:TEAM_NUM
- Attach.Name and Type: (TEAM_NUM).zip
- Late Submission<=3-Days:50%.
- Write a readme file to understand your solutions.
- Submit source files only.

Programming Assignment3 (Weightage 10%)
Due Date: April 24, 2022

Develop a parallel code for the following problems using CUDA C. Report the speedup of your implementations (ref. to single threaded CPU implementation) by varying the number of threads from 32 to 1024 (i.e., 32, 64, 128, 256, 512, 1024). Launch appropriate number of blocks (i.e.,depends upon the size of the problem and number of threads).

1. Find all prime numbers between $1 \ldots 10^{20}$.

2. Multiply two matrices of order 8192 X 8192 using block matrix multiplication by varying block sizes (i.e., from 16, 32, 64, 128, 256, 512, 1024).

3. Find dot product of two vectors. Assume that length of each vector is 10^{20} and the vectors are initialized randomly from the set $\{ 1.0 \ldots 2.0 \}$.

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4. Convolution Problem: Consider that you have a 1D or 2D input data and a kernel (which is simply a small matrix of weights). This kernel "slides" over the input data, performing an element-wise multiplication with the part of the input it is currently on, and then summing up the results into a single output cell. The kernel repeats this process for every location it slides over, converting a 1D or 2D matrix of features into yet another 1D or 2D matrix of features. Solve the convolution problem by considering the following problem instances:
   a. 1D array of size 2^{28} and all elements are pre-filled with the numbers: 1 to 2^{28}, in ascending order. Assume that your friend supplied six 1D-kernels (with lengths 32, 64, 128, 256, 512, 1024) and the kernels are initialized with binary values of -31, -15, -7, -5, -3, -1, respectively.
   b. 2D array of size 8192 X 8192 and every array element is pre-filled with 1. Assume that your friend supplied 6 kernels with dimensions: 1X32, 1X64, 1X128, 16X16, 16X32, 32X32. All elements of the kernels are initialized with 1.

Thank You ☺

Any ? Please