Assignment 5

Measure the average execution time of each of the three codes above for multiplying matrices of Test cases 6, 7, 8

Average time for each method in milliseconds for test Case 6,7,8

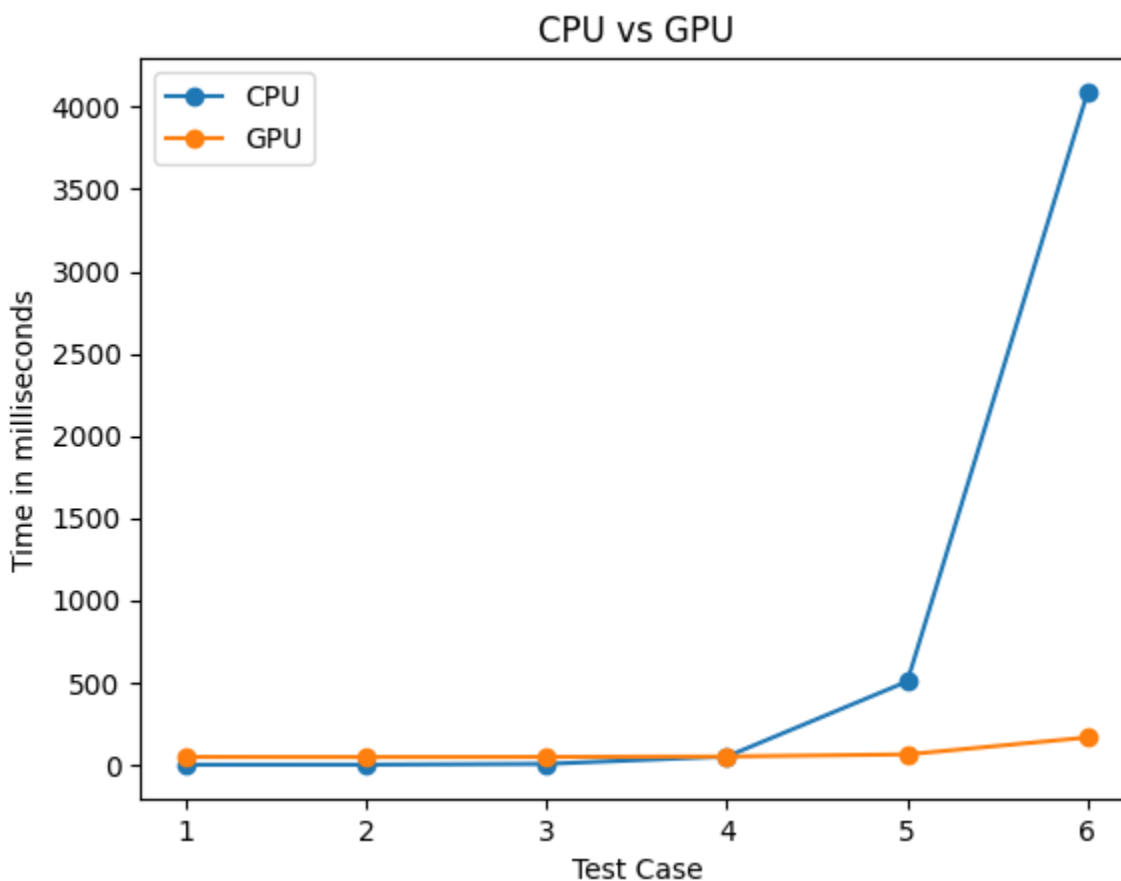|	Test Case 6	Test Case 7	Test Case 8
Buffers	169.6	1271.0	10794.6
MallocShared	165.2	1260.8	10729.2
MallocHost	164.4	1257.0	10731.6
MallocDeviceHost	164.8	1266.8	10727.6

Which one of them is performing the best? Can you think of the reason for the difference in their performance?

- All methods have almost the same performance.
- Buffers among all perform worst.
- MallocDeviceHost performs best here as device memory is used in the calculation in the kernel, so it is slightly faster, but it comes with the cost of memory management,
- MallocHost and MallocHost are slow as they are shared, and data movement happens implicitly between the host and the device.

Compare the execution time on the CPU and GPU and report which one is faster and the speedup obtained.

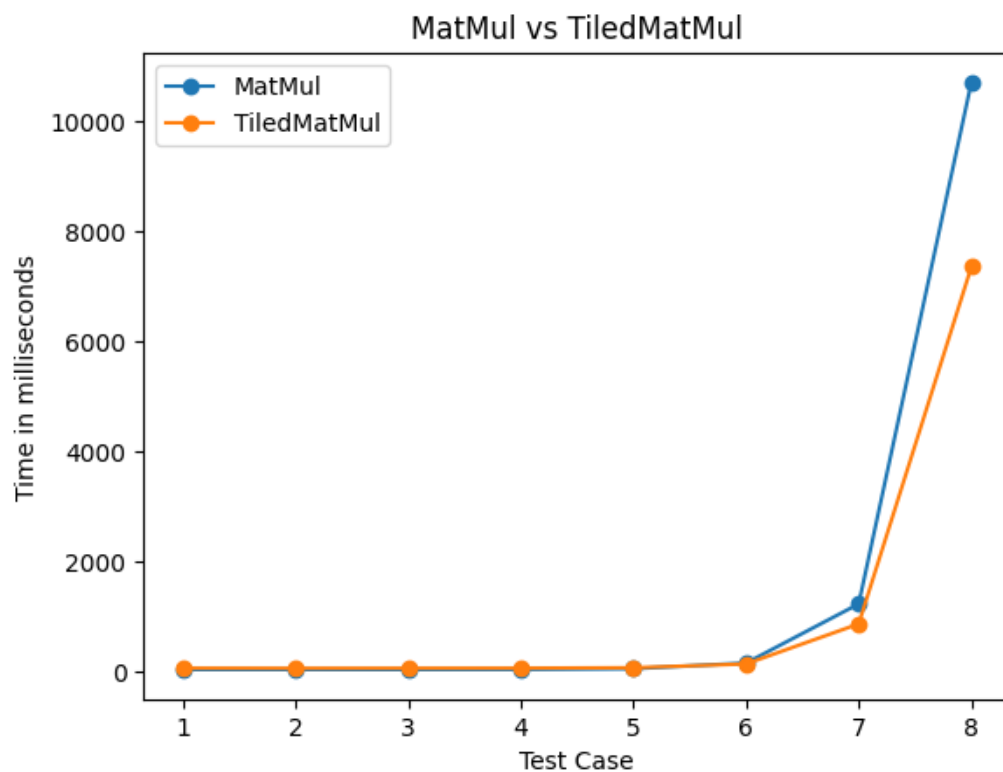| Average time for CPU and GPU for test Case 1,2,3,4,5,6						
	Test Case 1	Test Case 2	Test Case 3	Test Case 4	Test Case 5	Test Case 6
CPU	0.000000	0.000000	5.000000	49.666667	506.333333	4090.666667
GPU	47.333333	46.666667	47.333333	49.666667	62.666667	165.666667

CPU vs GPU

- CPU performs better than GPU for matrices of smaller size.
- As size increases, CPU time increases exponentially, while Time for GPU increases at a very slow rate compared to CPU.
- SpeedUp:- For TestCase5:- 8 times (approx)
  For TestCase6:- 24 times (approx)

Tiled Matrix Multiplication

Average time for MatMul and TiledMatMul for test Case 1,2,3,4,5,6,7,8

	MatMul	TiledMatMul
Test Case 1	48.0	73.0
Test Case 2	48.0	71.0
Test Case 3	48.0	72.0
Test Case 4	50.0	73.0
Test Case 5	63.0	81.0
Test Case 6	166.0	150.0
Test Case 7	1239.0	876.0
Test Case 8	10701.0	7354.0

MatMul vs TiledMatMul

- Tiling takes slightly more time (70ms) for the small matrix than non-tiled (50ms).
- As matrix size increases, performance is seen in the tiled variant, for TC8 (4096 matrices): 7354ms (tiled) where non-tiled: 10701ms.

- SpeedUp : TC8 :- 1.45