Q1
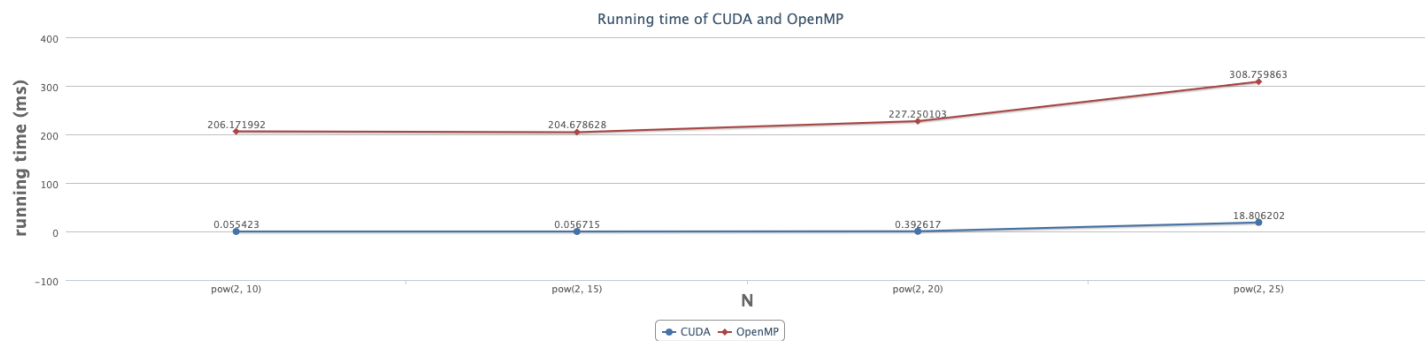
The histogram running time on CUDA with variable N. I ran the CUDA code with grid size of 8 and block size of 8. Here is the result.

N	CUDA	OpenMP
pow(2, 10)	0.055423 ms	206.171992 ms
pow(2, 15)	0.056715 ms	204.678628 ms
pow(2, 20)	0.392617 ms	227.250103 ms
pow(2, 25)	18.806202 ms	308.759863 ms

We could tell from the result that the gap between CUDA and openMP running is significant. Note that here I use both 8*8 threads on GPU and CPU. Furthermore, we could also find that there is a gap when the N between pow(2, 25).

Running time of CUDA and OpenMP

```
[zhang.yam@d1004 Question1]$ ./Q1
starting CUDA code...
The total time = 0.055423 ms
The sum of class 0 is 77579546
The sum of class 1 is 75501871
The sum of class 2 is 73520288
The sum of class 3 is 83598285
The sum of class 4 is 79889494
The sum of class 5 is 79234562
The sum of class 6 is 88229409
The sum of class 7 is 77114011
The sum of class 8 is 72786002
```

```
[zhang.yam@d1004 Question1]$ ./Q1
starting CUDA code...
The total time = 0.056715 ms
The sum of class 0 is 2584416981
The sum of class 1 is 2668402834
The sum of class 2 is 2582917516
The sum of class 3 is 2625445709
The sum of class 4 is 2535773711
The sum of class 5 is 2607137419
The sum of class 6 is 2641001142
The sum of class 7 is 2584121800
The sum of class 8 is 2633296945
```

```
[zhang.yam@d1004 Question1]$ ./Q1
starting CUDA code...
The total time = 0.392617 ms
The sum of class 0 is 82253791262
The sum of class 1 is 81873561407
The sum of class 2 is 82262785217
The sum of class 3 is 81554357522
The sum of class 4 is 81499791413
The sum of class 5 is 81525849783
The sum of class 6 is 81269927753
The sum of class 7 is 82234662510
The sum of class 8 is 81498155669
```

```
[zhang.yam@d1004 Question1]$ ./Q1
starting CUDA code...
The total time = 18.806202 ms
The sum of class 0 is 2622130719019
The sum of class 1 is 2620427517389
The sum of class 2 is 2622006978361
The sum of class 3 is 2620439590412
The sum of class 4 is 2621308382300
The sum of class 5 is 2617678371219
The sum of class 6 is 2619529821134
The sum of class 7 is 2621308118198
The sum of class 8 is 2624577350956
```

```
ThreadID = 46; Sum = 61841339
ThreadID = 59; Sum = 79889075
ThreadID = 15; Sum = 74128320
ThreadID = 62; Sum = 91619780
ThreadID = 31; Sum = 71111847
ThreadID = 47; Sum = 85163329
ThreadID = 32; Sum = 75877865
Total sum: 5023797716
Finished in 206.171992 ms
```

```
ThreadID = 55; Sum = 2532314898
ThreadID = 51; Sum = 2650334114
ThreadID = 31; Sum = 2662161293
ThreadID = 41; Sum = 2592702143
ThreadID = 59; Sum = 2588214804
ThreadID = 4; Sum = 2616722904
Total sum: 164163602847
Finished in 204.678628 ms
```

```
ThreadID = 5; Sum = 82002063499
ThreadID = 62; Sum = 81646641292
ThreadID = 61; Sum = 82101040917
ThreadID = 55; Sum = 82400029292
ThreadID = 63; Sum = 82126446731
Total sum: 5242888024523
Finished in 227.250103 ms
```

```
ThreadID = 39; Sum = 2623230790692
ThreadID = 15; Sum = 2623986223156
ThreadID = 37; Sum = 2619836114091
ThreadID = 55; Sum = 2624081789331
ThreadID = 35; Sum = 2620548777641
ThreadID = 62; Sum = 2619588397992
ThreadID = 63; Sum = 2618554262478
ThreadID = 16; Sum = 2620308163012
Total sum: 16777174970696
Finished in 308.759863 ms
```