Serial code profiling results:

```
Flat profile:

Each sample counts as 0.01 seconds.
  %   cumulative   self              self     total
 time   seconds   seconds    calls  ms/call  ms/call  name
100.48    4.57      4.57                               main
  0.22    4.58      0.01        1    10.07    10.07    initMat
  0.00    4.58      0.00        1     0.00     0.00    printMat

                    Call graph

granularity: each sample hit covers 2 byte(s) for 0.22% of 4.58 seconds

index % time    self  children    called     name
                                                 <spontaneous>
[1]    100.0    4.57    0.01                 main [1]
                0.01    0.00       1/1            initMat [2]
                0.00    0.00       1/1            printMat [3]
-----------------------------------------------
                0.01    0.00       1/1            main [1]
[2]      0.2    0.01    0.00       1         initMat [2]
-----------------------------------------------
                0.00    0.00       1/1            main [1]
[3]      0.0    0.00    0.00       1         printMat [3]
-----------------------------------------------

Index by function name

   [2] initMat              [1] main                 [3] printMat
```

```
         Flat profile:

Each sample counts as 0.01 seconds.
  %   cumulative   self              self     total
 time   seconds   seconds    calls   s/call   s/call  name
97.45     7.06      7.06        1     7.06     7.06    initMat
 0.42     7.09      0.03        1     0.03     0.03    printMat

                    Call graph

granularity: each sample hit covers 2 byte(s) for 0.14% of 7.09 seconds

index % time    self  children    called     name
                                                 <spontaneous>
[1]    100.0    0.00    7.09                 main [1]
                7.06    0.00       1/1            initMat [2]
                0.03    0.00       1/1            printMat [3]
-----------------------------------------------
```

```
                 7.06    0.00       1/1           main [1]
[2]      99.6    7.06    0.00       1             initMat [2]
-----------------------------------------------
                 0.03    0.00       1/1           main [1]
[3]       0.4    0.03    0.00       1             printMat [3]
-----------------------------------------------

Index by function name

   [2] initMat                [3] printMat
```

Flat profile:

```
Each sample counts as 0.01 seconds.
  %   cumulative   self              self     total
 time   seconds   seconds    calls  Ts/call  Ts/call  name
100.32     1.07     1.07                               main
```

```
==75484== NVPROF is profiling process 75484, command: ./a.out 2

 Time taken is 23.954443
==75484== Profiling application: ./a.out 2
==75484== Profiling result:
Time(%)      Time     Calls       Avg       Min       Max  Name
 97.70%   22.3799s        1   22.3799s   22.3799s   22.3799s  multiply(float*, float*, float*)
  1.16%   265.92ms        1   265.92ms   265.92ms   265.92ms  [CUDA memcpy DtoH]
  1.14%   261.20ms        2   130.60ms   130.58ms   130.62ms  [CUDA memcpy HtoD]

==75484== API calls:
Time(%)      Time     Calls       Avg       Min       Max  Name
 99.55%   22.9089s        3   7.63629s   130.68ms   22.6470s  cudaMemcpy
  0.44%   101.02ms        3   33.673ms   419.65us   100.17ms  cudaMalloc
  0.00%   914.48us        3   304.83us   271.89us   366.54us  cudaFree
  0.00%   659.10us       83   7.9400us      502ns   311.76us  cuDeviceGetAttribute
  0.00%   58.119us        1   58.119us   58.119us   58.119us  cudaLaunch
  0.00%   48.038us        1   48.038us   48.038us   48.038us  cuDeviceTotalMem
  0.00%   41.055us        1   41.055us   41.055us   41.055us  cuDeviceGetName
  0.00%   9.2000us        3   3.0660us      315ns   7.9910us  cudaSetupArgument
  0.00%   3.9460us        1   3.9460us   3.9460us   3.9460us  cudaConfigureCall
  0.00%   3.5950us        2   1.7970us      701ns   2.8940us  cuDeviceGetCount
  0.00%   1.7160us        2      858ns      727ns      989ns  cuDeviceGet
  0.00%      494ns        1      494ns      494ns      494ns  cudaGetLastError
```

```
==2927== Cachegrind, a cache and branch-prediction profiler
```

```
==2927== Copyright (C) 2002-2015, and GNU GPL'd, by Nicholas Nethercote et al.
==2927== Using Valgrind-3.11.0 and LibVEX; rerun with -h for copyright info
==2927== Command: ./serial
==2927==
--2927-- warning: L3 cache found, using its data for the LL simulation.

 Time taken is 235.619629
==2927==
==2927== I   refs:       33,037,538,463
==2927== I1  misses:              1,819
==2927== LLi misses:              1,690
==2927== I1  miss rate:            0.00%
==2927== LLi miss rate:           0.00%
==2927==
==2927== D   refs:       14,019,014,062  (13,015,728,675 rd   + 1,003,285,387 wr)
==2927== D1  misses:         62,772,493  (    62,644,822 rd   +       127,671 wr)
==2927== LLd misses:         62,761,087  (    62,633,938 rd   +       127,149 wr)
==2927== D1  miss rate:            0.4% (         0.5%   +          0.0%  )
==2927== LLd miss rate:           0.4% (         0.5%   +          0.0%  )
==2927==
==2927== LL refs:            62,774,312  (    62,646,641 rd   +       127,671 wr)
==2927== LL misses:          62,762,777  (    62,635,628 rd   +       127,149 wr)
==2927== LL miss rate:            0.1% (         0.1%   +          0.0%  )
```

```
==3133== Cachegrind, a cache and branch-prediction profiler
==3133== Copyright (C) 2002-2015, and GNU GPL'd, by Nicholas Nethercote et al.
==3133== Using Valgrind-3.11.0 and LibVEX; rerun with -h for copyright info
==3133== Command: ./omp
==3133==
--3133-- warning: L3 cache found, using its data for the LL simulation.

 Time taken is 244.495880
==3133==
==3133== I   refs:       33,037,538,399
==3133== I1  misses:              1,816
==3133== LLi misses:              1,687
==3133== I1  miss rate:            0.00%
==3133== LLi miss rate:           0.00%
==3133==
==3133== D   refs:       14,019,014,043  (13,015,728,664 rd   + 1,003,285,379 wr)
==3133== D1  misses:         62,772,305  (    62,644,708 rd   +       127,597 wr)
==3133== LLd misses:         62,761,087  (    62,633,937 rd   +       127,150 wr)
==3133== D1  miss rate:            0.4% (         0.5%   +          0.0%  )
==3133== LLd miss rate:           0.4% (         0.5%   +          0.0%  )
==3133==
==3133== LL refs:            62,774,121  (    62,646,524 rd   +       127,597 wr)
==3133== LL misses:          62,762,774  (    62,635,624 rd   +       127,150 wr)
==3133== LL miss rate:            0.1% (         0.1%   +          0.0%  )
```

```
==3225== Cachegrind, a cache and branch-prediction profiler
==3225== Copyright (C) 2002-2015, and GNU GPL'd, by Nicholas Nethercote et al.
==3225== Using Valgrind-3.11.0 and LibVEX; rerun with -h for copyright info
==3225== Command: mpirun -np 8 ./mpi
==3225==
--3225-- warning: L3 cache found, using its data for the LL simulation.
[warn] Epoll ADD(4) on fd 1 failed.  Old events were 0; read change was 0 (none); write change was 1 (add): Operation no

 Time taken is 3.978104
==3225==
==3225== I   refs:      60,582,190
==3225== I1  misses:        83,243
==3225== LLi misses:        10,336
==3225== I1  miss rate:      0.14%
==3225== LLi miss rate:      0.02%
==3225==
==3225== D   refs:      24,637,760 (16,965,706 rd   + 7,672,054 wr)
==3225== D1  misses:       849,555 (   795,670 rd   +    53,885 wr)
==3225== LLd misses:        76,610 (    48,015 rd   +    28,595 wr)
==3225== D1  miss rate:       3.4% (      4.7%   +      0.7%  )
==3225== LLd miss rate:       0.3% (      0.3%   +      0.4%  )
==3225==
==3225== LL refs:         932,798 (   878,913 rd   +    53,885 wr)
==3225== LL misses:        86,946 (    58,351 rd   +    28,595 wr)
==3225== LL miss rate:        0.1% (      0.1%   +      0.4%  )
```

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