

GPU Performance Details: GeForce GTX 1080

- Contents:**
- [System Configuration](#)
 - Results for datatype double
 - [MTimes \(double\)](#)
 - [Backslash \(double\)](#)
 - [FFT \(double\)](#)
 - Results for datatype single
 - [MTimes \(single\)](#)
 - [Backslash \(single\)](#)
 - [FFT \(single\)](#)

System Configuration

MATLAB Release: R2016b

Host

| | |
|----------------------|--|
| Name | Intel(R) Core(TM) i7-6800K CPU @ 3.40GHz |
| Clock | 3401 MHz |
| Cache | 1536 KB |
| NumProcessors | 6 |
| OSType | Windows |
| OSVersion | Microsoft Windows 10 Home |

GPU

| | |
|--------------------------|-----------------------|
| Name | GeForce GTX 1080 |
| Clock | 1.733500e+03 MHz |
| NumProcessors | 20 |
| ComputeCapability | 6.1 |
| TotalMemory | 8.00 GB |
| CUDAVersion | 8 |
| DriverVersion | 6.14.13.8205 (382.05) |

Results for MTimes (double)

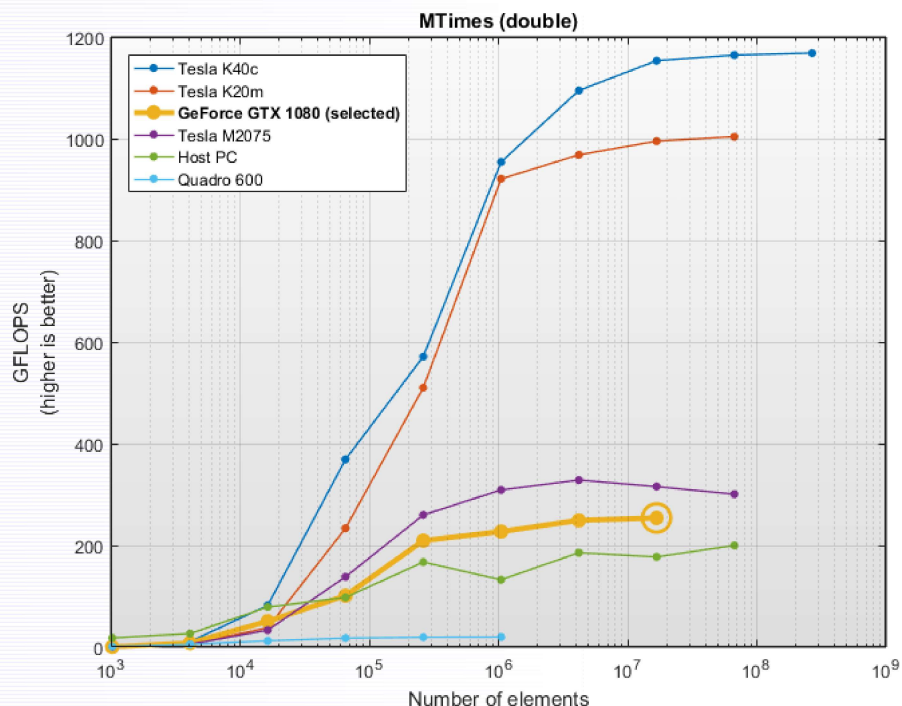
These results show the performance of the GPU or host PC when calculating a [matrix multiplication](#) of two NxN real matrices. The number of operations is assumed to be $2 \times N^3 - N^2$.

This calculation is usually compute-bound, i.e. the performance depends mainly on how fast the GPU or host PC can perform floating-point operations.

Raw data for GeForce GTX 1080 - MTimes (double)

| Array size (elements) | Num Operations | Time (ms) | GigaFLOPS |
|-----------------------|-----------------|-----------|-----------|
| 1,024 | 64,512 | 0.22 | 0.29 |
| 4,096 | 520,192 | 0.07 | 7.75 |
| 16,384 | 4,177,920 | 0.08 | 50.80 |
| 65,536 | 33,488,896 | 0.33 | 101.08 |
| 262,144 | 268,173,312 | 1.28 | 209.37 |
| 1,048,576 | 2,146,435,072 | 9.45 | 227.18 |
| 4,194,304 | 17,175,674,880 | 68.91 | 249.26 |
| 16,777,216 | 137,422,176,256 | 540.94 | 254.05 |

(N gigaflops = $N \times 10^9$ operations per second)



Results for Backslash (double)

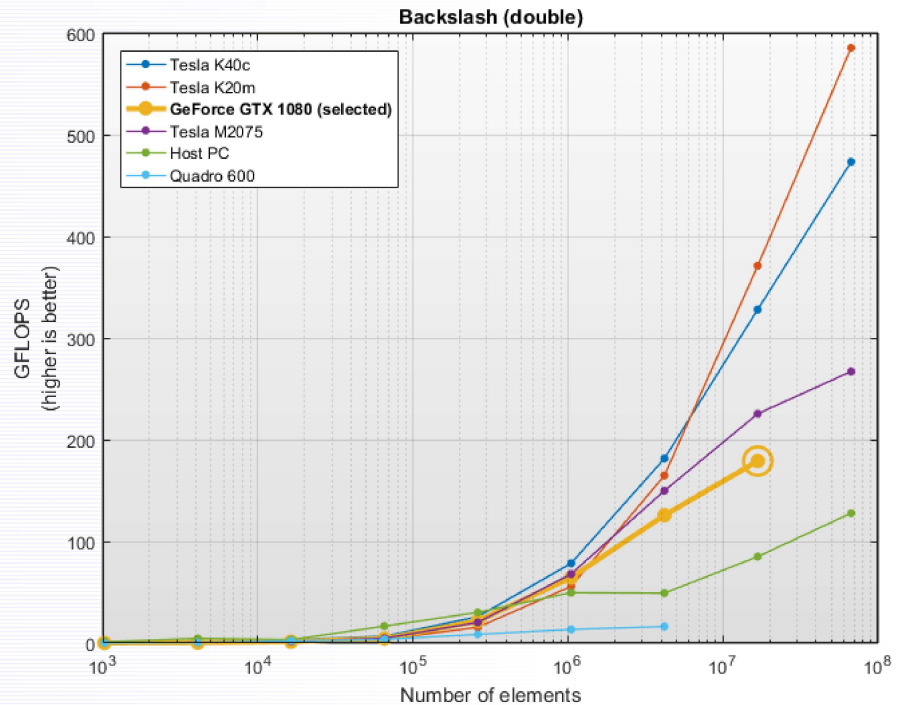
These results show the performance of the GPU or host PC when calculating the **matrix left division** of an $N \times N$ matrix with an $N \times 1$ vector. The number of operations is assumed to be $\frac{2}{3}N^3 + \frac{3}{2}N^2$.

This calculation is usually compute-bound, i.e. the performance depends mainly on how fast the GPU or host PC can perform floating-point operations.

Raw data for GeForce GTX 1080 - Backslash (double)

| Array size (elements) | Num Operations | Time (ms) | GigaFLOPS |
|-----------------------|----------------|-----------|-----------|
| 1,024 | 23,381 | 1.03 | 0.02 |
| 4,096 | 180,907 | 0.65 | 0.28 |
| 16,384 | 1,422,677 | 1.08 | 1.31 |
| 65,536 | 11,283,115 | 2.63 | 4.28 |
| 262,144 | 89,871,701 | 4.14 | 21.70 |
| 1,048,576 | 717,400,747 | 11.15 | 64.34 |
| 4,194,304 | 5,732,914,517 | 45.61 | 125.70 |
| 16,777,216 | 45,838,150,315 | 256.06 | 179.01 |

(N gigaflops = $N \times 10^9$ operations per second)



Results for FFT (double)

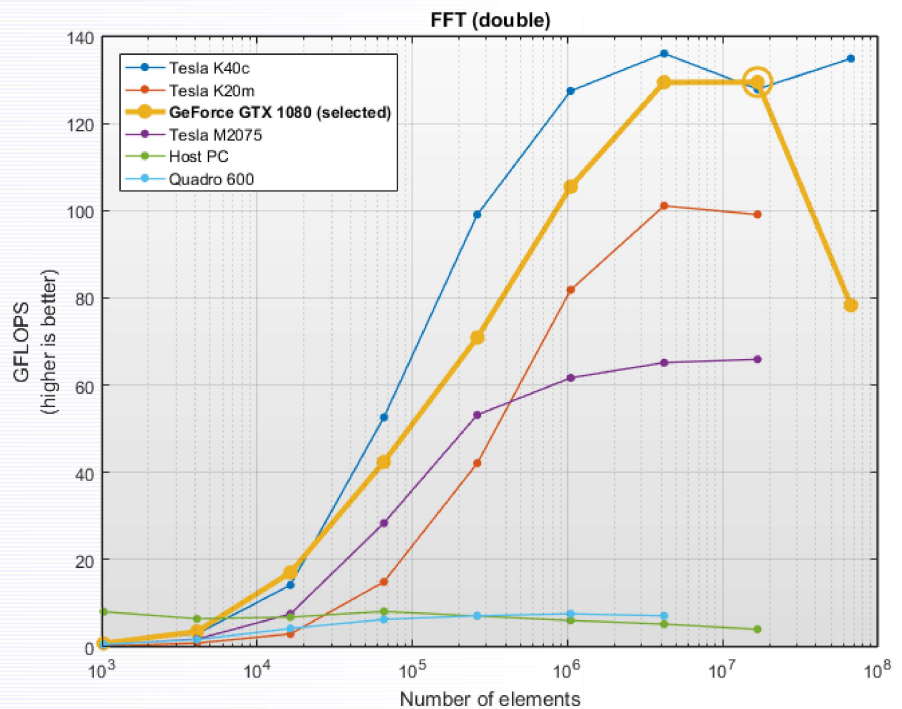
These results show the performance of the GPU or host PC when calculating the **Fast-Fourier-Transform** of a vector of complex numbers. The number of operations for a vector of length N is assumed to be $5N \log_2(N)$.

This calculation is usually memory-bound, i.e. the performance depends mainly on how fast the GPU or host PC can read and write data.

Raw data for GeForce GTX 1080 - FFT (double)

| Array size (elements) | Num Operations | Time (ms) | GigaFLOPS |
|-----------------------|----------------|-----------|-----------|
| 1,024 | 51,200 | 0.06 | 0.83 |
| 4,096 | 245,760 | 0.07 | 3.54 |
| 16,384 | 1,146,880 | 0.07 | 17.05 |
| 65,536 | 5,242,880 | 0.12 | 42.40 |
| 262,144 | 23,592,960 | 0.33 | 70.89 |
| 1,048,576 | 104,857,600 | 0.99 | 105.48 |
| 4,194,304 | 461,373,440 | 3.56 | 129.42 |
| 16,777,216 | 2,013,265,920 | 15.55 | 129.45 |
| 67,108,864 | 8,724,152,320 | 111.39 | 78.32 |

(N gigaflops = $N \times 10^9$ operations per second)



Results for MTimes (single)

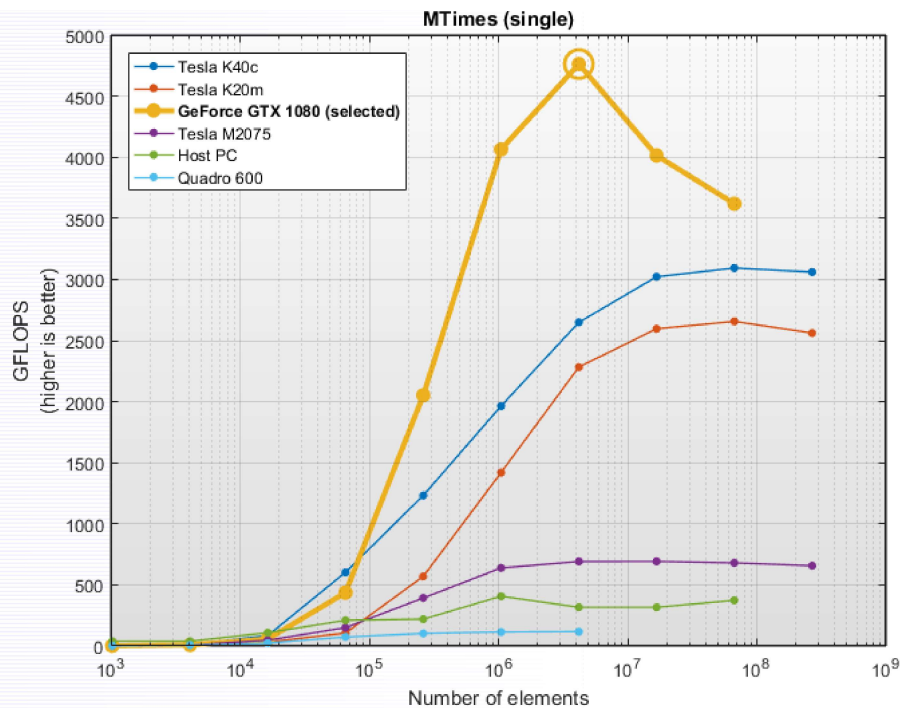
These results show the performance of the GPU or host PC when calculating a **matrix multiplication** of two $N \times N$ real matrices. The number of operations is assumed to be $2N^3 - N^2$.

This calculation is usually compute-bound, i.e. the performance depends mainly on how fast the GPU or host PC can perform floating-point operations.

Raw data for GeForce GTX 1080 - MTimes (single)

| Array size (elements) | Num Operations | Time (ms) | GigaFLOPS |
|-----------------------|-------------------|-----------|-----------|
| 1,024 | 64,512 | 0.08 | 0.79 |
| 4,096 | 520,192 | 0.07 | 7.82 |
| 16,384 | 4,177,920 | 0.07 | 56.50 |
| 65,536 | 33,488,896 | 0.08 | 436.28 |
| 262,144 | 268,173,312 | 0.13 | 2052.11 |
| 1,048,576 | 2,146,435,072 | 0.53 | 4064.45 |
| 4,194,304 | 17,175,674,880 | 3.61 | 4763.19 |
| 16,777,216 | 137,422,176,256 | 34.24 | 4014.02 |
| 67,108,864 | 1,099,444,518,912 | 303.74 | 3619.70 |

(N gigaflops = $N \times 10^9$ operations per second)



Results for Backslash (single)

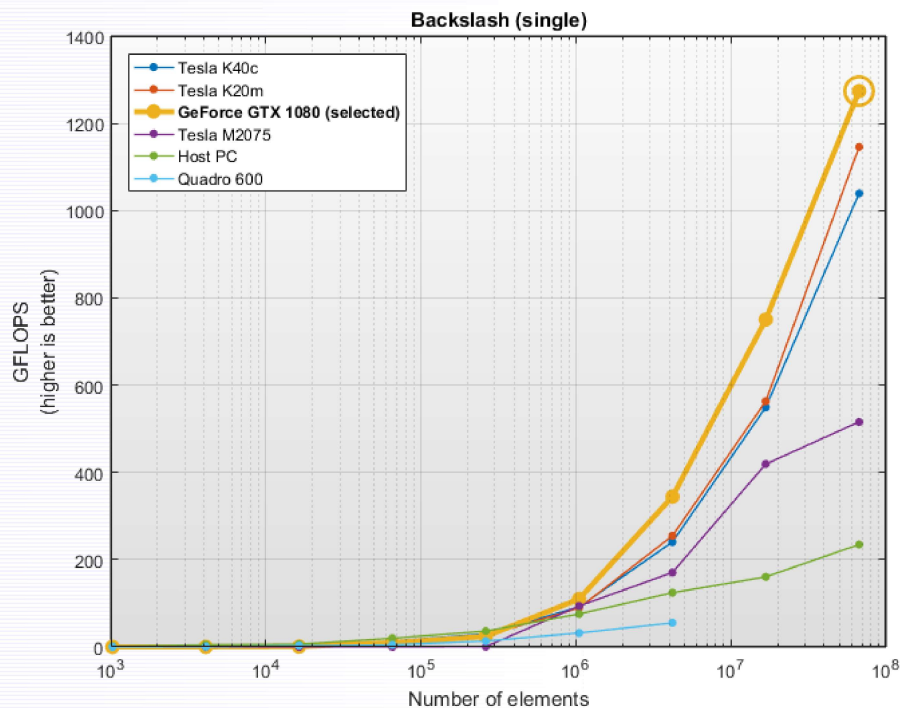
These results show the performance of the GPU or host PC when calculating the **matrix left division** of an $N \times N$ matrix with an $N \times 1$ vector. The number of operations is assumed to be $2/3 * N^3 + 3/2 * N^2$.

This calculation is usually compute-bound, i.e. the performance depends mainly on how fast the GPU or host PC can perform floating-point operations.

Raw data for GeForce GTX 1080 - Backslash (single)

| Array size (elements) | Num Operations | Time (ms) | GigaFLOPS |
|-----------------------|-----------------|-----------|-----------|
| 1,024 | 23,381 | 1.62 | 0.01 |
| 4,096 | 180,907 | 1.95 | 0.09 |
| 16,384 | 1,422,677 | 1.77 | 0.80 |
| 65,536 | 11,283,115 | 1.17 | 9.61 |
| 262,144 | 89,871,701 | 3.73 | 24.13 |
| 1,048,576 | 717,400,747 | 6.52 | 109.98 |
| 4,194,304 | 5,732,914,517 | 16.64 | 344.43 |
| 16,777,216 | 45,838,150,315 | 61.09 | 750.34 |
| 67,108,864 | 366,604,539,221 | 287.77 | 1273.97 |

(N gigaflops = $N \times 10^9$ operations per second)



Results for FFT (single)

These results show the performance of the GPU or host PC when calculating the **Fast-Fourier-Transform** of a vector of complex numbers. The number of operations for a vector of length N is assumed to be $5 * N * \log_2(N)$.

This calculation is usually memory-bound, i.e. the performance depends mainly on how fast the GPU or host PC can read and write data.

Raw data for GeForce GTX 1080 - FFT (single)

| Array size (elements) | Num Operations | Time (ms) | GigaFLOPS |
|-----------------------|----------------|-----------|-----------|
|-----------------------|----------------|-----------|-----------|

| | | | |
|------------|---------------|-------|--------|
| 1,024 | 51,200 | 0.08 | 0.62 |
| 4,096 | 245,760 | 0.08 | 3.26 |
| 16,384 | 1,146,880 | 0.07 | 15.62 |
| 65,536 | 5,242,880 | 0.22 | 23.94 |
| 262,144 | 23,592,960 | 0.33 | 70.49 |
| 1,048,576 | 104,857,600 | 0.42 | 247.62 |
| 4,194,304 | 461,373,440 | 1.24 | 371.39 |
| 16,777,216 | 2,013,265,920 | 4.69 | 429.39 |
| 67,108,864 | 8,724,152,320 | 21.91 | 398.19 |

(N gigaflops = $N \times 10^9$ operations per second)

