# MATRIX MULTIPLICATION RESULTS:

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12 threads, 16 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 8.1e-05 seconds.
Parallel execution time: 0.00445274 seconds.
Speedup: 0.0181911
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.0003911 seconds.
Parallel execution time: 0.0029192 seconds.
Speedup: 0.13397506166072898
PS C:\Users\deept\Desktop\matmul_rust>
```

12 threads, 32 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.003682 seconds.
Parallel execution time: 0.00491974 seconds.
Speedup: 0.748414
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.17s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.0031391 seconds.
Parallel execution time: 0.0028358 seconds.
Speedup: 1.1069539459764441
```

12 threads, 64 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.035867 seconds.
Parallel execution time: 0.0220278 seconds.
Speedup: 1.62826
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.06s
     Running 'target\debug\matmul_rust.exe'
Serial execution time: 0.0280424 seconds.
Parallel execution time: 0.0067919 seconds.
Speedup: 4.1288004829281935
PS C:\Users\deept\Desktop\matmul_rust>
```

12 threads, 128 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.382459 seconds.
Parallel execution time: 0.108847 seconds.
Speedup: 3.51372
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running 'target\debug\matmul_rust.exe'
Serial execution time: 0.222809 seconds.
Parallel execution time: 0.0456788 seconds.
Speedup: 4.877733215408461
PS C:\Users\deept\Desktop\matmul_rust>
```

12 threads, 256 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 1.82582 seconds.
Parallel execution time: 0.356328 seconds.
Speedup: 5.124
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.06s
     Running 'target\debug\matmul_rust.exe'
Serial execution time: 1.8259158 seconds.
Parallel execution time: 0.2380793 seconds.
Speedup: 7.669359746941461
PS C:\Users\deept\Desktop\matmul_rust>
```

12 threads, 512 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 15.6312 seconds.
Parallel execution time: 2.65851 seconds.
Speedup: 5.87968
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ |
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 15.0239844 seconds.
Parallel execution time: 1.4314876 seconds.
Speedup: 10.495364682166999
PS C:\Users\deept\Desktop\matmul_rust>
```

12 threads, 1024 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 124.391 seconds.
Parallel execution time: 22.6706 seconds.
Speedup: 5.48691
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ |
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 122.9293364 seconds.
Parallel execution time: 12.5387495 seconds.
Speedup: 9.80395504352328
PS C:\Users\deept\Desktop\matmul_rust> |
```

8 threads, 16 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 8.1e-05 seconds.
Parallel execution time: 0.00199841 seconds.
Speedup: 0.0405322
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.0004109 seconds.
Parallel execution time: 0.0016239 seconds.
Speedup: 0.253032822218169
PS C:\Users\deept\Desktop\matmul_rust>
```

8 threads, 32 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.004658 seconds.
Parallel execution time: 0.00656732 seconds.
Speedup: 0.70927
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.06s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.0041423 seconds.
Parallel execution time: 0.0020848 seconds.
Speedup: 1.9869052187260168
PS C:\Users\deept\Desktop\matmul_rust>
```

8 threads, 64 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.041965 seconds.
Parallel execution time: 0.0216636 seconds.
Speedup: 1.93712
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.0348912 seconds.
Parallel execution time: 0.0052821 seconds.
Speedup: 6.605554608962344
PS C:\Users\deept\Desktop\matmul_rust>
```

8 threads, 128 data size

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.2419166 seconds.
Parallel execution time: 0.0468069 seconds.
Speedup: 5.1683961125389635
PS C:\Users\deept\Desktop\matmul_rust>
```

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.254586 seconds.
Parallel execution time: 0.0535394 seconds.
Speedup: 4.75511
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

8 threads, 256 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 2.02053 seconds.
Parallel execution time: 0.456634 seconds.
Speedup: 4.42483
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 1.8544451 seconds.
Parallel execution time: 0.2391707 seconds.
Speedup: 7.75364666324094
PS C:\Users\deept\Desktop\matmul_rust>
```

8 threads, 512 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 15.671 seconds.
Parallel execution time: 2.80953 seconds.
Speedup: 5.57782
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.04s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 15.1080247 seconds.
Parallel execution time: 1.7907864999999998 seconds.
Speedup: 8.436530373665427
PS C:\Users\deept\Desktop\matmul_rust>
```

8 threads, 1024 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 160.788 seconds.
Parallel execution time: 30.0977 seconds.
Speedup: 5.34221
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 152.2318764 seconds.
Parallel execution time: 22.2702012 seconds.
Speedup: 6.8356758447247445
PS C:\Users\deept\Desktop\matmul_rust>
```

4 threads, 16 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 8.1e-05 seconds.
Parallel execution time: 0.00213906 seconds.
Speedup: 0.0378672
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.0005656 seconds.
Parallel execution time: 0.0027867 seconds.
Speedup: 0.20296407937704095
PS C:\Users\deept\Desktop\matmul_rust>
```

4 threads, 32 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.003516 seconds.
Parallel execution time: 0.00309325 seconds.
Speedup: 1.13667
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.04s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.0036483 seconds.
Parallel execution time: 0.001742 seconds.
Speedup: 2.094316877152698
PS C:\Users\deept\Desktop\matmul_rust>
```

**4 threads, 64 data size**

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.036392 seconds.
Parallel execution time: 0.0101711 seconds.
Speedup: 3.578
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.0271798 seconds.
Parallel execution time: 0.0066022 seconds.
Speedup: 4.116779255399716
PS C:\Users\deept\Desktop\matmul_rust>
```

**4 threads, 128 data size**

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.214041 seconds.
Parallel execution time: 0.0740821 seconds.
Speedup: 2.88924
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.2306754 seconds.
Parallel execution time: 0.0497609 seconds.
Speedup: 4.635675801683652
PS C:\Users\deept\Desktop\matmul_rust>
```

**4 threads, 256 data size**

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 1.91951 seconds.
Parallel execution time: 0.664444 seconds.
Speedup: 2.8889
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.04s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 1.8177458 seconds.
Parallel execution time: 0.4063939 seconds.
Speedup: 4.472668417513155
PS C:\Users\deept\Desktop\matmul_rust>
```

**4 threads, 512 data size**

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 14.2698 seconds.
Parallel execution time: 4.15823 seconds.
Speedup: 3.43169
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.04s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 19.3991665 seconds.
Parallel execution time: 3.4339934 seconds.
Speedup: 5.6491566058338964
PS C:\Users\deept\Desktop\matmul_rust>
```

**4 threads, 1024 data size**

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 123.985 seconds.
Parallel execution time: 39.8417 seconds.
Speedup: 3.11193
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.04s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 120.7661157 seconds.
Parallel execution time: 29.9517813 seconds.
Speedup: 4.032017811908903
PS C:\Users\deept\Desktop\matmul_rust>
```

**2 threads, 16 data size**

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 8.1e-05 seconds.
Parallel execution time: 0.000663541 seconds.
Speedup: 0.122072
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.0003946 seconds.
Parallel execution time: 0.0009746 seconds.
Speedup: 0.40488405499692176
PS C:\Users\deept\Desktop\matmul_rust> |
```

2 threads, 32 data size

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.0038188 seconds.
Parallel execution time: 0.0021121 seconds.
Speedup: 1.808058330571469
PS C:\Users\deept\Desktop\matmul_rust>
```

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.004182 seconds.
Parallel execution time: 0.0022817 seconds.
Speedup: 1.83285
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

2 threads, 64 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.032615 seconds.
Parallel execution time: 0.0208075 seconds.
Speedup: 1.56746
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 0.0253578 seconds.
Parallel execution time: 0.0123672 seconds.
Speedup: 2.050407529594411
PS C:\Users\deept\Desktop\matmul_rust>
```

2 threads, 128 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 0.242263 seconds.
Parallel execution time: 0.126868 seconds.
Speedup: 1.90956
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
     Finished dev [unoptimized + debuginfo] target(s) in 0.05s
      Running `target\debug\matmul_rust.exe`
Serial execution time: 0.2106853 seconds.
Parallel execution time: 0.0972466 seconds.
Speedup: 2.166505564204815
PS C:\Users\deept\Desktop\matmul_rust>
```

2 threads, 256 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 1.94043 seconds.
Parallel execution time: 1.15263 seconds.
Speedup: 1.68348
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
     Finished dev [unoptimized + debuginfo] target(s) in 0.05s
      Running `target\debug\matmul_rust.exe`
Serial execution time: 1.862886 seconds.
Parallel execution time: 0.7535196 seconds.
Speedup: 2.47224624283164
PS C:\Users\deept\Desktop\matmul_rust>
```

2 threads, 512 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 15.5872 seconds.
Parallel execution time: 9.32583 seconds.
Speedup: 1.6714
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
     Finished dev [unoptimized + debuginfo] target(s) in 0.05s
      Running `target\debug\matmul_rust.exe`
Serial execution time: 14.9361866 seconds.
Parallel execution time: 6.1232643 seconds.
Speedup: 2.4392523118755465
PS C:\Users\deept\Desktop\matmul_rust>
```

2 threads, 1024 data size

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$ ./a.out
Serial execution time: 131.905 seconds.
Parallel execution time: 73.4204 seconds.
Speedup: 1.79657
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/matrixmultiply_cpp/sample$
```

```
PS C:\Users\deept\Desktop\matmul_rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.05s
     Running `target\debug\matmul_rust.exe`
Serial execution time: 123.1039377 seconds.
Parallel execution time: 54.9460872 seconds.
Speedup: 2.240449574724222
PS C:\Users\deept\Desktop\matmul_rust> |
```

# QUICKSORT RESULTS

No. of threads =12

Data size 100

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 0.000630388 seconds
Parallel execution time: 0.010689 seconds
Speedup: 0.0589754
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
     Finished dev [unoptimized + debuginfo] target(s) in 0.10s
      Running `target\debug\rust.exe`
Configuration:
num_elements: 100, sort_order: 0, num_threads: 12, num_of_runs: 1, code_config: 0

[sort rust serial]:     [0.035] ms
[sort parallel]:               [0.024] ms
++++           (1.46x speedup from 12 threads)

PS C:\Users\deept\Desktop\quicksort\rust>
```

Data size =1000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 0.00125862 seconds
Parallel execution time: 0.0468141 seconds
Speedup: 0.0268856
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
     Finished dev [unoptimized + debuginfo] target(s) in 0.10s
      Running `target\debug\rust.exe`
Configuration:
num_elements: 1000, sort_order: 0, num_threads: 12, num_of_runs: 1, code_config: 0

[sort rust serial]:     [0.351] ms
[sort parallel]:               [0.369] ms
++++           (0.95x speedup from 12 threads)

PS C:\Users\deept\Desktop\quicksort\rust> |
```

Data size =10000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 0.219147 seconds
Parallel execution time: 0.37155 seconds
Speedup: 0.589818
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.10s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 10000, sort_order: 0, num_threads: 12, num_of_runs: 1, code_config: 0

[sort rust serial]:     [3.509] ms
[sort parallel]:              [2.057] ms
++++           (1.71x speedup from 12 threads)

PS C:\Users\deept\Desktop\quicksort\rust>
```

Data size =100000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 28.957 seconds
Parallel execution time: 8.21565 seconds
Speedup: 3.52462
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
Finished dev [unoptimized + debuginfo] target(s) in 1.03s
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.09s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 100000, sort_order: 0, num_threads: 12, num_of_runs: 1, code_config: 0

[sort rust serial]:     [40.31] ms
[sort parallel]:              [14.153] ms
++++           (2.85x speedup from 12 threads)

PS C:\Users\deept\Desktop\quicksort\rust>
```

No. of threads = 8
Data size =100

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 4.3363e-05 seconds
Parallel execution time: 0.000683119 seconds
Speedup: 0.063478
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
   Compiling rust v0.1.0 (C:\Users\deept\Desktop\quicksort\rust)
    Finished dev [unoptimized + debuginfo] target(s) in 1.62s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 100, sort_order: 0, num_threads: 8, num_of_runs: 1, code_config: 0

[sort rust serial]:      [0.069] ms
[sort parallel]:                  [0.025] ms
++++            (2.76x speedup from 8 threads)

PS C:\Users\deept\Desktop\quicksort\rust>
```

Data size =1000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 0.000572228 seconds
Parallel execution time: 0.00230012 seconds
Speedup: 0.248782
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.09s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 1000, sort_order: 0, num_threads: 8, num_of_runs: 1, code_config: 0

[sort rust serial]:      [0.389] ms
[sort parallel]:                  [0.334] ms
++++            (1.16x speedup from 8 threads)
```

Data size =10000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 0.0962031 seconds
Parallel execution time: 0.0486788 seconds
Speedup: 1.97629
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.09s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 10000, sort_order: 0, num_threads: 8, num_of_runs: 1, code_config: 0

[sort rust serial]:     [4.074] ms
[sort parallel]:               [1.937] ms
++++            (2.10x speedup from 8 threads)

PS C:\Users\deept\Desktop\quicksort\rust> cargo run
```

Data size =100000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 29.725 seconds
Parallel execution time: 7.83191 seconds
Speedup: 3.79537
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.09s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 100000, sort_order: 0, num_threads: 8, num_of_runs: 1, code_config: 0

[sort rust serial]:     [46.637] ms
[sort parallel]:               [18.904] ms
++++            (2.47x speedup from 8 threads)

PS C:\Users\deept\Desktop\quicksort\rust>
```

No. of threads = 4

Data size 100

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 6.9205e-05 seconds
Parallel execution time: 0.000800861 seconds
Speedup: 0.0864132
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.10s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 100, sort_order: 0, num_threads: 4, num_of_runs: 1, code_config: 0

[sort rust serial]:     [0.047] ms
[sort parallel]:               [0.029] ms
++++            (1.62x speedup from 4 threads)

PS C:\Users\deept\Desktop\quicksort\rust>
```

Data size 1000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 0.000967046 seconds
Parallel execution time: 0.0100446 seconds
Speedup: 0.0962749
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ |
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.09s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 1000, sort_order: 0, num_threads: 4, num_of_runs: 1, code_config: 0

[sort rust serial]:     [0.429] ms
[sort parallel]:               [0.341] ms
++++            (1.26x speedup from 4 threads)

PS C:\Users\deept\Desktop\quicksort\rust>
```

Data size 10000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 0.224818 seconds
Parallel execution time: 0.0711804 seconds
Speedup: 3.15842
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
    Finished dev [unoptimized + debuginfo] target(s) in 0.09s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 10000, sort_order: 0, num_threads: 4, num_of_runs: 1, code_config: 0

[sort rust serial]:     [3.228] ms
[sort parallel]:            [2.417] ms
++++            (1.34x speedup from 4 threads)

PS C:\Users\deept\Desktop\quicksort\rust>
```

Data size 100000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 29.7136 seconds
Parallel execution time: 6.04085 seconds
Speedup: 4.91878
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
>>
    Finished dev [unoptimized + debuginfo] target(s) in 0.09s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 100000, sort_order: 0, num_threads: 4, num_of_runs: 1, code_config: 0

[sort rust serial]:     [44.303] ms
[sort parallel]:            [18.51] ms
++++            (2.39x speedup from 4 threads)

PS C:\Users\deept\Desktop\quicksort\rust>
```

No. of threads = 2
Data size 100

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 6.838e-05 seconds
Parallel execution time: 0.000543729 seconds
Speedup: 0.125761
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
>>
    Finished dev [unoptimized + debuginfo] target(s) in 0.10s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 100, sort_order: 0, num_threads: 2, num_of_runs: 1, code_config: 0

[sort rust serial]:     [0.042] ms
[sort parallel]:               [0.025] ms
++++            (1.68x speedup from 2 threads)

PS C:\Users\deept\Desktop\quicksort\rust>
```

Data size 1000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 0.000988244 seconds
Parallel execution time: 0.00316973 seconds
Speedup: 0.311775
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
>>
    Finished dev [unoptimized + debuginfo] target(s) in 0.10s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 1000, sort_order: 0, num_threads: 2, num_of_runs: 1, code_config: 0

[sort rust serial]:     [0.438] ms
[sort parallel]:               [0.355] ms
++++            (1.23x speedup from 2 threads)

PS C:\Users\deept\Desktop\quicksort\rust>
```

Data size 10000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 0.23298 seconds
Parallel execution time: 0.0783256 seconds
Speedup: 2.9745
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```

```
PS C:\Users\deept\Desktop\quicksort\rust> cargo run
>>
    Finished dev [unoptimized + debuginfo] target(s) in 0.10s
     Running `target\debug\rust.exe`
Configuration:
num_elements: 10000, sort_order: 0, num_threads: 2, num_of_runs: 1, code_config: 0

[sort rust serial]:      [3.611] ms
[sort parallel]:                [2.78] ms
++++           (1.30x speedup from 2 threads)
```

Data size 100000

```
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$ ./a.out
Serial execution time: 30.9935 seconds
Parallel execution time: 7.72338 seconds
Speedup: 4.01294
deeptanshu@DESKTOP-BBS6LAK:/mnt/c/Users/deept/Desktop/quicksort/C++$
```