Summary of Benchmark Results for Matrix Multiplication

1 Python Results

1.1 Summary of Averages

- Execution time for 256x256: 2.75 seconds
- Execution time for 128x128: 0.82 seconds
- Execution time for 64x64: 0.11 seconds
- Average CPU usage for 128x128: 8.68%
- Average CPU usage for 64x64: 10.26%

1.2 Memory Usage for Matrices

- 128x128:
  - Current memory usage: 554560 bytes
  - Maximum memory usage: 554720 bytes
- 64x64:
  - Current memory usage: 140768 bytes
  - Maximum memory usage: 140928 bytes

1.3 Execution Times for Matrices

- 256x256:
  - 2.954234 s, 2.413932 s, 2.963056 s, 2.723877 s, 2.687829 s
- 128x128:
  - 0.831150 s, 0.835084 s, 0.793739 s, 0.835359 s, 0.807931 s
- 64x64:
  - 0.131083 s, 0.102994 s, 0.097095 s, 0.100709 s, 0.121288 s, 0.113997 s

1.4 Other Measurements

- Execution time for 512x512 matrices: 206.413062 s
- Current memory usage: 8480272 bytes
- Maximum memory usage: 8480576 bytes
- Average CPU usage: 8.8%

2 C++ Results

2.1 Execution Times

- 64x64:
  - 12.105 ms, 10.996 ms, 6.080 ms, 9.996 ms, 11.996 ms
- 128x128:
  - 62.314 ms, 59.965 ms, 71.952 ms, 40.288 ms, 53.981 ms
- 256x256:
  - 315.594 ms, 310.355 ms, 315.416 ms, 338.162 ms, 358.637 ms
- 512x512: 2426.82 ms
- 1024x1024: 61003.2 ms

2.2 Memory Usage

- 64x64: 98304 bytes (constant)
- 128x128: 393216 bytes (constant)
- 256x256: 1572864 bytes (constant)
- 512x512: 6291456 bytes
- 1024x1024: 25165824 bytes

3 Java Results

3.1 Execution Times for 1024x1024 Matrices

- Average Execution Times:
  - Iteration 1: 4426.33 ms
  - Iteration 2: 5020.50 ms

  - Iteration 3: 4231.67 ms
  - Iteration 4: 4186.33 ms
  - Iteration 5: 4211.33 ms
- Total Average: 4215.23 ms/op

3.2 Memory Usage

- Total average memory usage:
  - Iteration 1: 10485818.67 bytes
  - Iteration 2: 10587198.67 bytes
  - Iteration 3: 10483625.33 bytes
  - Iteration 4: 10485734.00 bytes
  - Iteration 5: 10330496.00 bytes
- Total average: 10484574.134 bytes

3.3 Matrix 64x64

- Average time per operation: 0.321 ms/op
- Range: [0.139 ms, 0.504 ms] (99.9% CI)
- Minimum: 0.281 ms
- Maximum: 0.404 ms
- Standard deviation: 0.048 ms

3.4 Matrix 128x128

- Average execution time: 3.400 ms/op
- Memory allocation rate: 37.652 MB/sec
- Memory allocation per operation: 133672.957 B/op

3.5 Matrix 256x256

- Average execution time: 39.841 ms/op
- Memory allocation rate: 12.179 MB/sec
- GC count: 5
- Total GC time: 8 ms