# ASSIGNMENT 4


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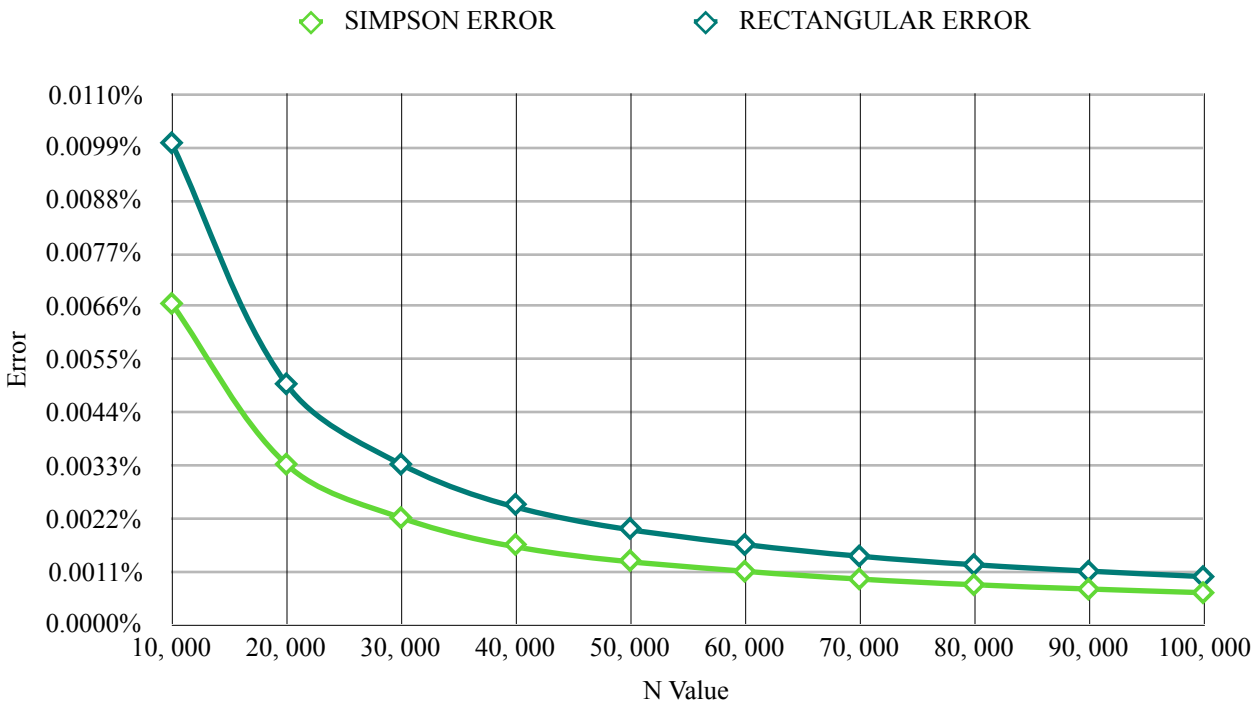
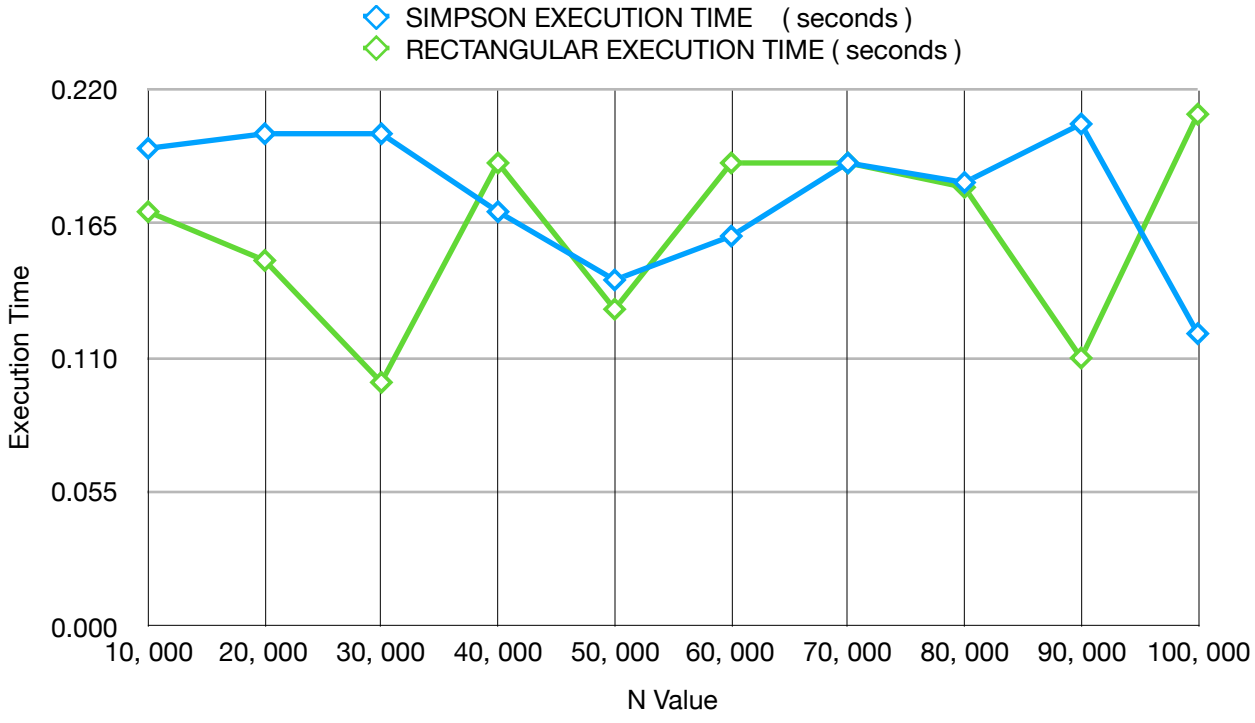
## Question 1

**Compare accuracy and timing of the two algorithms.**

Execution Time and Error

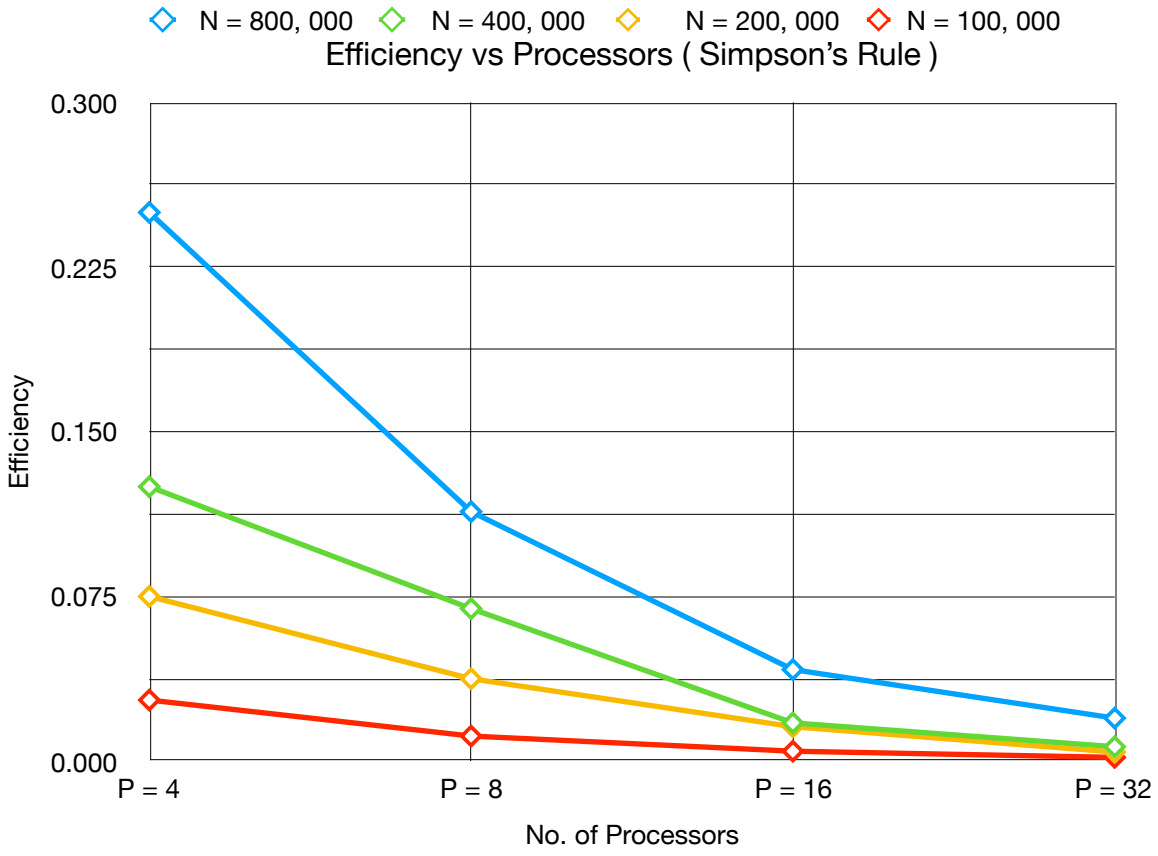
| N VALUE | SIMPSON ERROR ( % ) | RECTANGULAR ERROR ( % ) | SIMPSON EXECUTION TIME ( seconds ) | RECTANGULAR EXECUTION TIME ( seconds ) |
|---|---|---|---|---|
| 10, 000 | 0.006667% | 0.010000% | 0.196000 | 0.170000 |
| 20, 000 | 0.003333% | 0.005000% | 0.202000 | 0.150000 |
| 30, 000 | 0.002222% | 0.003333% | 0.202000 | 0.100000 |
| 40, 000 | 0.001667% | 0.002500% | 0.170000 | 0.190000 |
| 50, 000 | 0.001333% | 0.002000% | 0.142000 | 0.130000 |
| 60, 000 | 0.001111% | 0.001667% | 0.160000 | 0.190000 |
| 70, 000 | 0.000952% | 0.001429% | 0.190000 | 0.190000 |
| 80, 000 | 0.000833% | 0.001250% | 0.182000 | 0.180000 |
| 90, 000 | 0.000741% | 0.001111% | 0.206000 | 0.110000 |
| 100, 000 | 0.000667% | 0.001000% | 0.120000 | 0.210000 |


SIMPSON ERROR
RECTANGULAR ERROR
0.0110%
0.0099%
0.0088%
0.0077%
0.0066%
0.0055%
0.0044%
0.0033%
0.0022%
0.0011%
0.0000%
Error
10, 000
20, 000
30, 000
40, 000
50, 000
60, 000
70, 000
80, 000
90, 000
100, 000
N Value

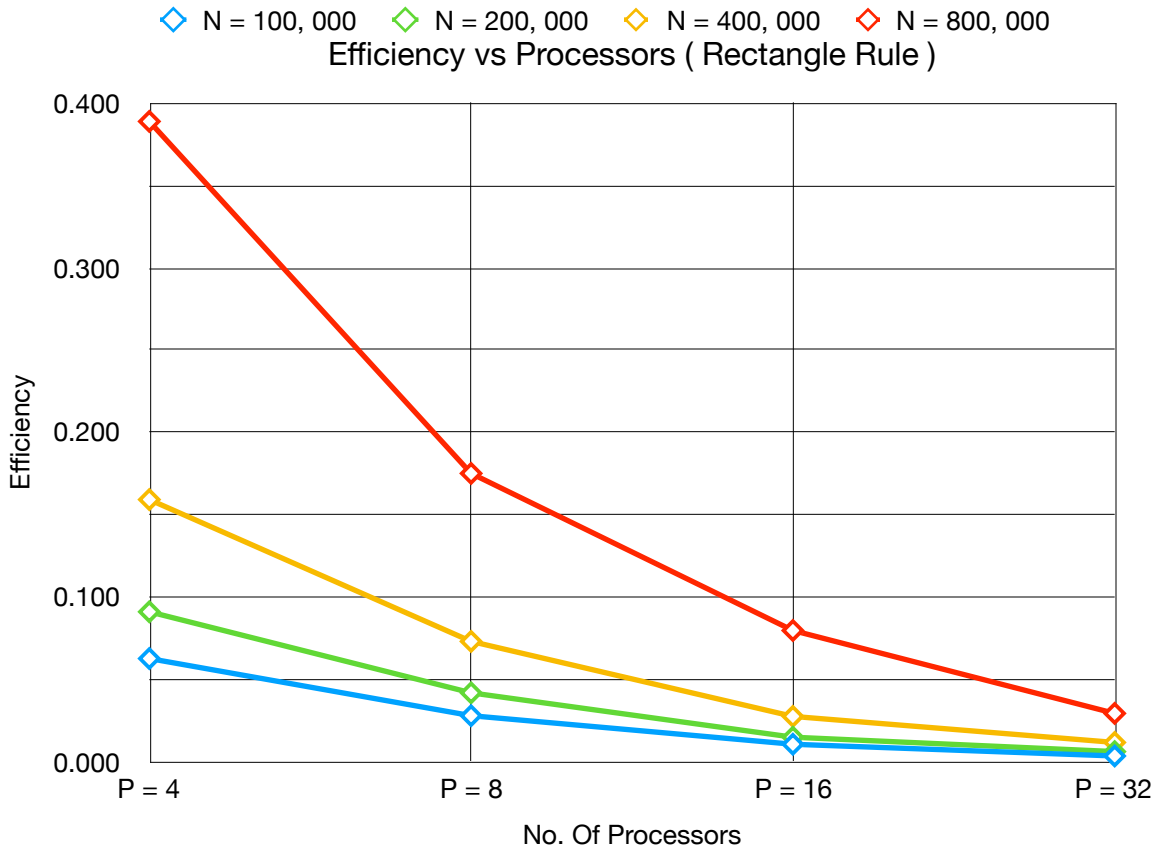

SIMPSON EXECUTION TIME ( seconds )
RECTANGULAR EXECUTION TIME ( seconds )
0.220
0.165
0.110
0.055
0.000
Execution Time
10, 000
20, 000
30, 000
40, 000
50, 000
60, 000
70, 000
80, 000
90, 000
100, 000
N Value

**Analyze the scalability of the problem by varying both the number of processors and n (P = 4, 8, 16, 32, n = 100,000, 200,000, 400,000, 800,000). Draw a plot of this scalability (efficiency vs number of processors and 4 curves, one for each data size).**

| SIMPSON'S RULE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | P = 4 | | P = 8 | | P = 16 | | P = 32 | |
| | Scalability | Efficiency | Scalability | Efficiency | Scalability | Efficiency | Scalability | Efficiency |
| N = 100, 000 | 0.111111 | 0.027778 | 0.090909 | 0.011364 | 0.071429 | 0.004464 | 0.052632 | 0.001645 |
| N = 200, 000 | 0.300000 | 0.075000 | 0.300000 | 0.037500 | 0.250000 | 0.015625 | 0.130435 | 0.004076 |
| N = 400, 000 | 0.500000 | 0.125000 | 0.555556 | 0.069444 | 0.277778 | 0.017361 | 0.208333 | 0.006510 |
| N = 800, 000 | 1.000000 | 0.250000 | 0.909091 | 0.113636 | 0.666667 | 0.041667 | 0.625000 | 0.019531 |



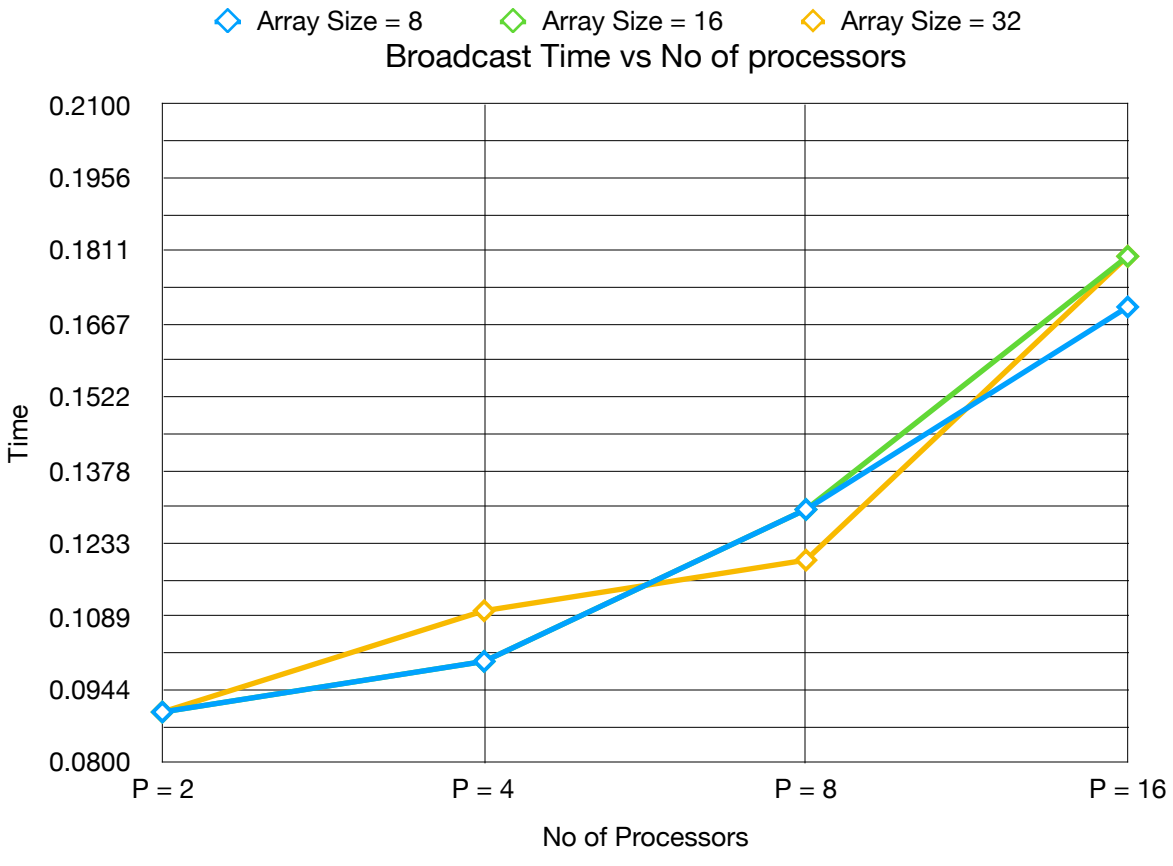
| RECTANGULAR RULE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | P = 4 | | P = 8 | | P = 16 | | P = 32 | |
| | Scalability | Efficiency | Scalability | Efficiency | Scalability | Efficiency | Scalability | Efficiency |
| N = 100, 000 | 0.250000 | 0.062500 | 0.222222 | 0.027778 | 0.166667 | 0.010417 | 0.105263 | 0.003289 |
| N = 200, 000 | 0.363636 | 0.090909 | 0.333333 | 0.041667 | 0.235294 | 0.014706 | 0.190476 | 0.005952 |
| N = 400, 000 | 0.636364 | 0.159091 | 0.583333 | 0.072917 | 0.437500 | 0.027344 | 0.368421 | 0.011513 |
| N = 800, 000 | 1.555556 | 0.388889 | 1.400000 | 0.175000 | 1.272727 | 0.079545 | 0.933333 | 0.029167 |



# Question 2

**Draw a curve for broadcast with the number of processors on the x-axis (2, 4, 8, 16) and the timing in y-axis (one curve for array size 8 in each processors, another for 16 and another for 32). Draw another curve for the same communication using send and receive.**

| Broadcast ( Time in seconds ) | | | |
|---|---|---|---|
| | **Array Size = 8** | **Array Size = 16** | **Array Size = 32** |
| **P = 2** | 0.090000 | 0.090000 | 0.090000 |
| **P = 4** | 0.100000 | 0.100000 | 0.110000 |
| **P = 8** | 0.130000 | 0.130000 | 0.120000 |
| **P = 16** | 0.170000 | 0.180000 | 0.180000 |



| Send Receive Pair | | | |
|---|---|---|---|
| | **Array Size = 8** | **Array Size = 16** | **Array Size = 32** |
| **P = 2** | 0.090000 | 0.100000 | 0.100000 |
| **P = 4** | 0.110000 | 0.110000 | 0.110000 |
| **P = 8** | 0.130000 | 0.130000 | 0.130000 |
| **P = 16** | 0.200000 | 0.190000 | 0.200000 |