
# OS PROJECT REPORT

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## Introduction

This project demonstrates and visualizes the comparison between different CPU Scheduling Algorithms.

Here are the Scheduling Algorithms which are available in the project code.

Non-Preemptive:

1. Longest Job First (LJF)
2. Highest Response Ratio Next

(HRRN) Preemptive:

1. Longest Remaining Time First (LRTF)
2. Shortest Remaining Time First (SRTF)

## Methodology:

- CPU SCHEDULING ALGORITHMS

  The CPU Scheduling Algorithm functions are implemented to perform calculations based on the number of processes and burst times. The specific algorithm calculates the average turnaround time, average throughput time, average response time, and average waiting time.

- Plotting

  GNU PLOTTING is used in this project to visualize the comparison of average throughput time, average response time, average waiting time, and average turnaround time of different algorithms. (Screenshots are attached below).

- Output

  The bar graph is used to visualize the comparison. On the x-axis, Numbers (0,1,2,3) show the Number of CPU Scheduling Algorithm as Longest Remaining Time First (LRTF), Longest Job First (LJF),
  Shortest Remaining Time First (SRTF), and Highest Response Ratio Next (HRRN) respectively.

## Tools:

- Visual Studio
- Ubuntu 20.04 and Windows 10/11
- C++
- GNUPLOT (imported as *“sudo apt install gnuplot”)*

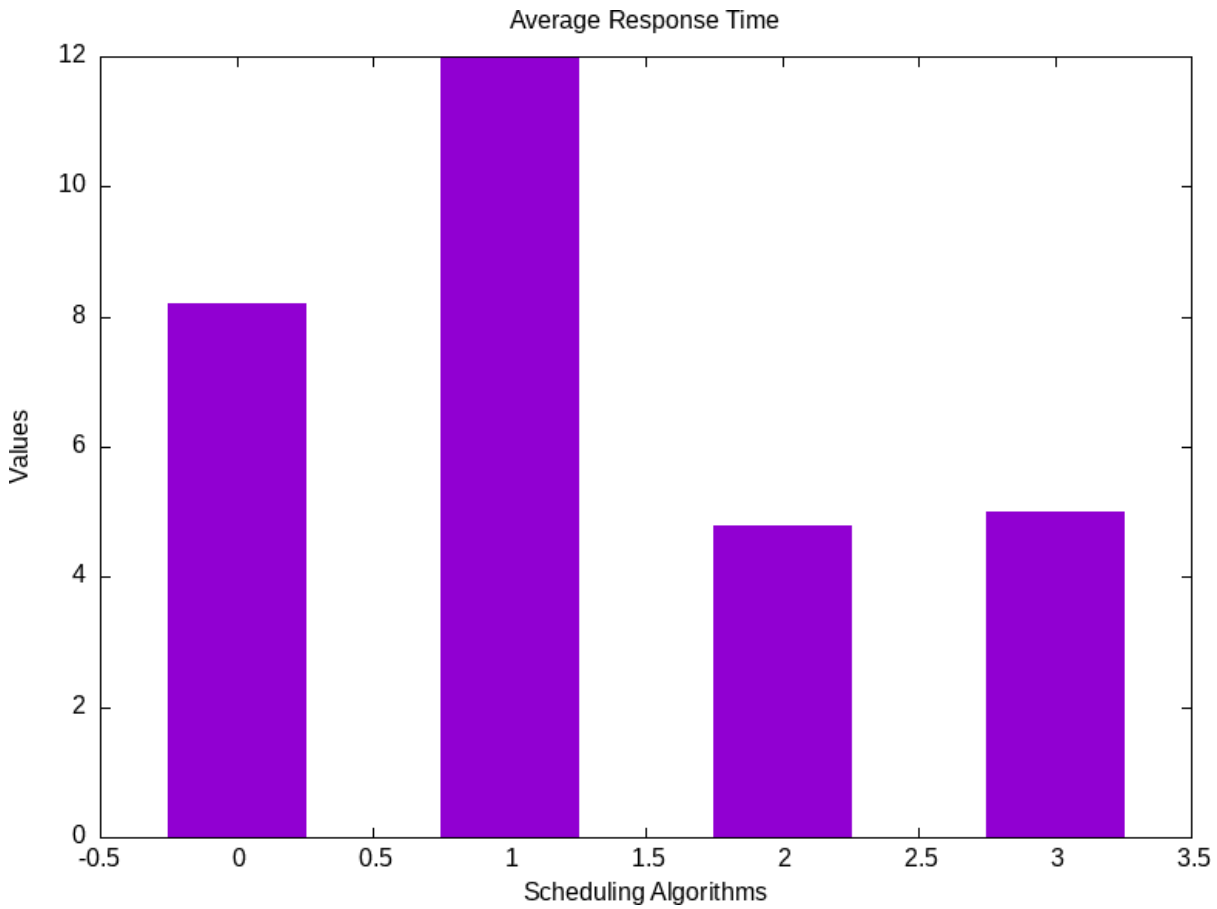
## Screenshots:

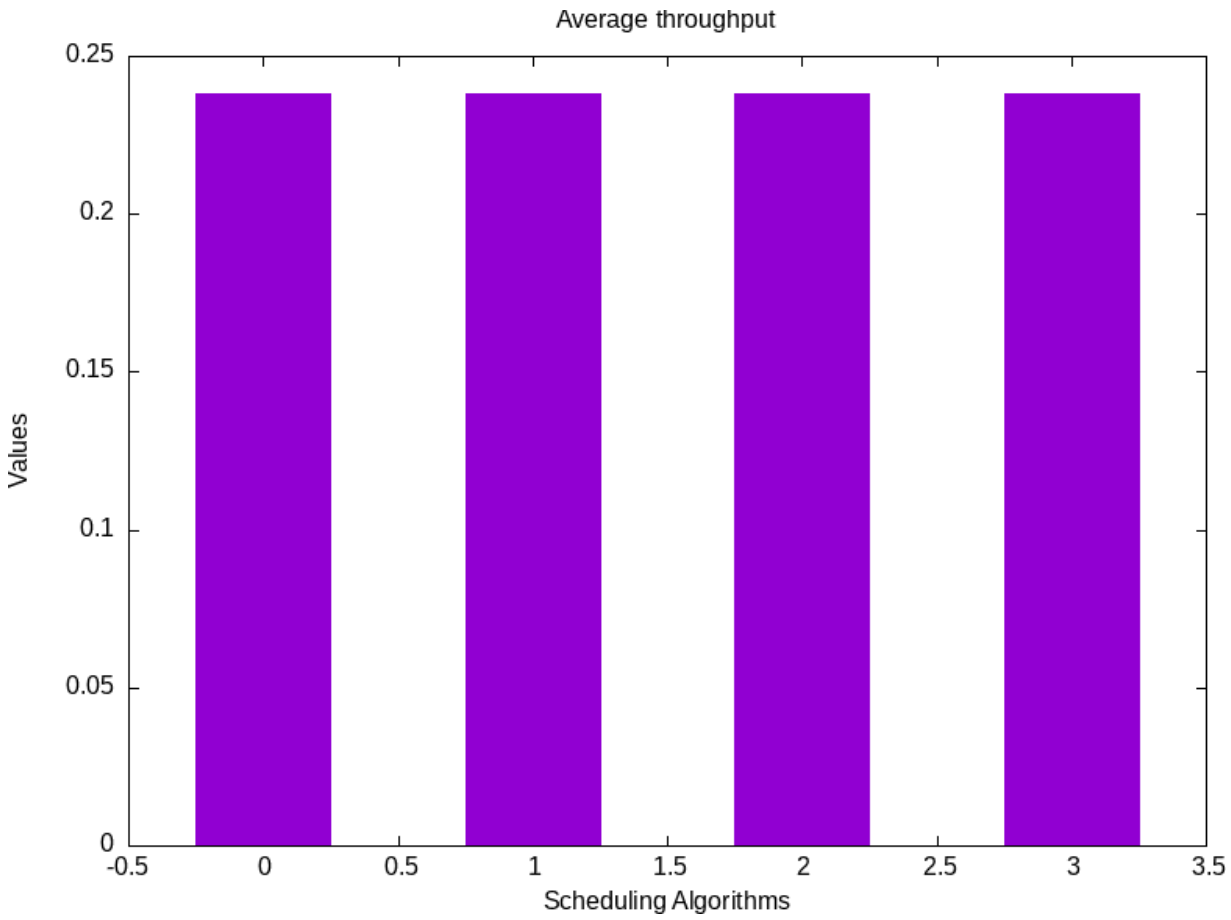
```
Enter the number of processes: 5
Enter arrival time for process 1: 0
Enter burst time for process 1: 2
Enter arrival time for process 2: 0
Enter burst time for process 2: 6
Enter arrival time for process 3: 0
Enter burst time for process 3: 4
Enter arrival time for process 4: 0
Enter burst time for process 4: 8
Enter arrival time for process 5: 0
Enter burst time for process 5: 1
LRTF

#P      AT      BT      ST      CT      TAT     WT      RT

0       0       2       12      17      17      15      12

1       0       6       2       18      18      12      2

2       0       4       7       19      19      15      7

3       0       8       0       20      20      12      0

4       0       1       20      21      21      20      20

Average Turnaround Time = 19
Average Waiting Time = 14.8
Average Response Time = 8.2
CPU Utilization = 100%
Throughput = 0.238095 process/unit time

LJF

#P      AT      BT      ST      CT      TAT     WT      RT

0       0       2       18      20      20      18      18

1       0       6       8       14      14      8       8

2       0       4       14      18      18      14      14
```

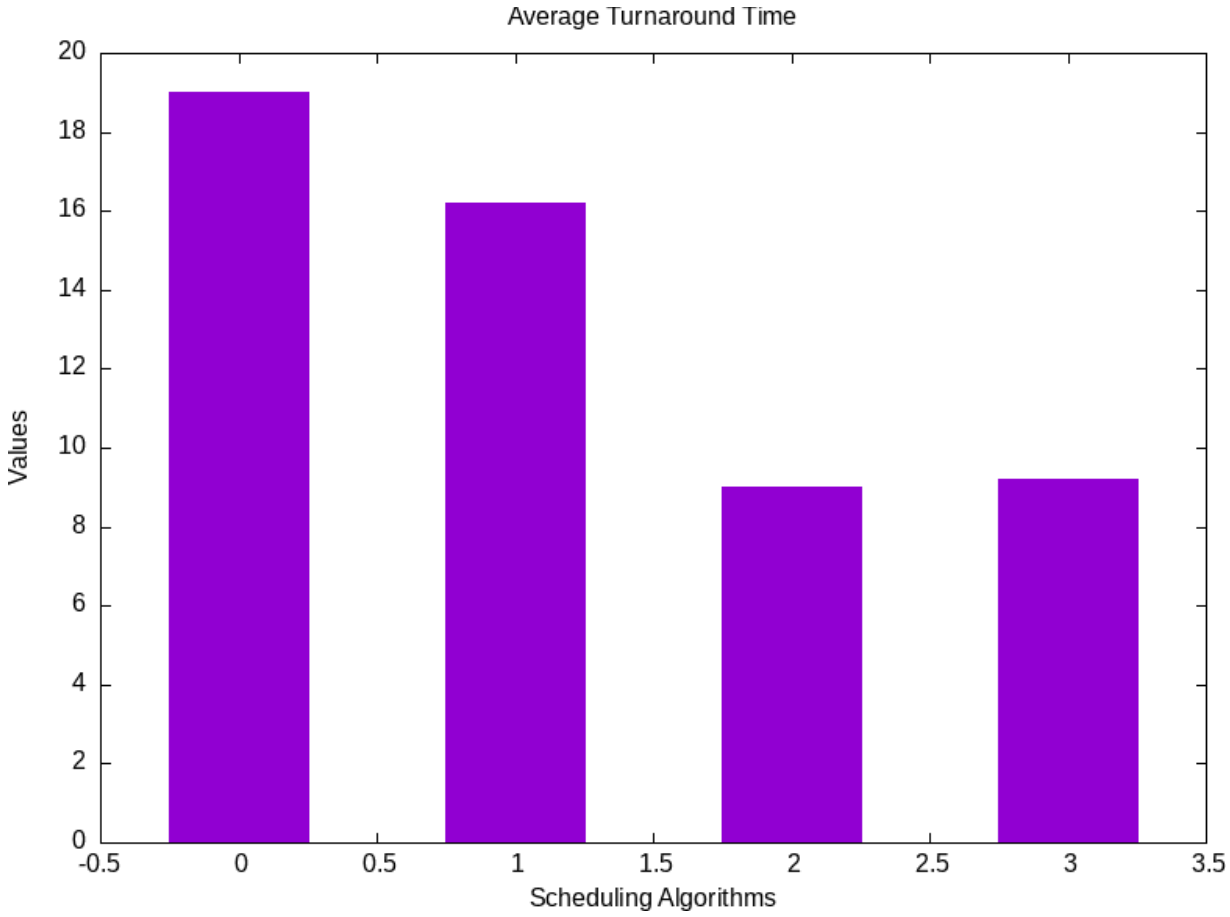
```
3       0       8       0       8       8       0       0

4       0       1       20      21      21      20      20

Average Turnaround Time = 16.2
Average Waiting Time = 12
Average Response Time = 12
CPU Utilization = 100%
Throughput = 0.238095 process/unit time

SRTF

#P      AT      BT      ST      CT      TAT     WT      RT

0       0       2       1       3       3       1       1

1       0       6       7       13      13      7       7

2       0       4       3       7       7       3       3

3       0       8       13      21      21      13      13

4       0       1       0       1       1       0       0

Average Turnaround Time = 9
Average Waiting Time = 4.8
Average Response Time = 4.8
CPU Utilization = 100%
Throughput = 0.238095 process/unit time

HRRN

#P      AT      BT      ST      CT      TAT     WT      RT

0       0       2       0       2       2       0       0

1       0       6       7       13      13      7       7

2       0       4       3       7       7       3       3
```

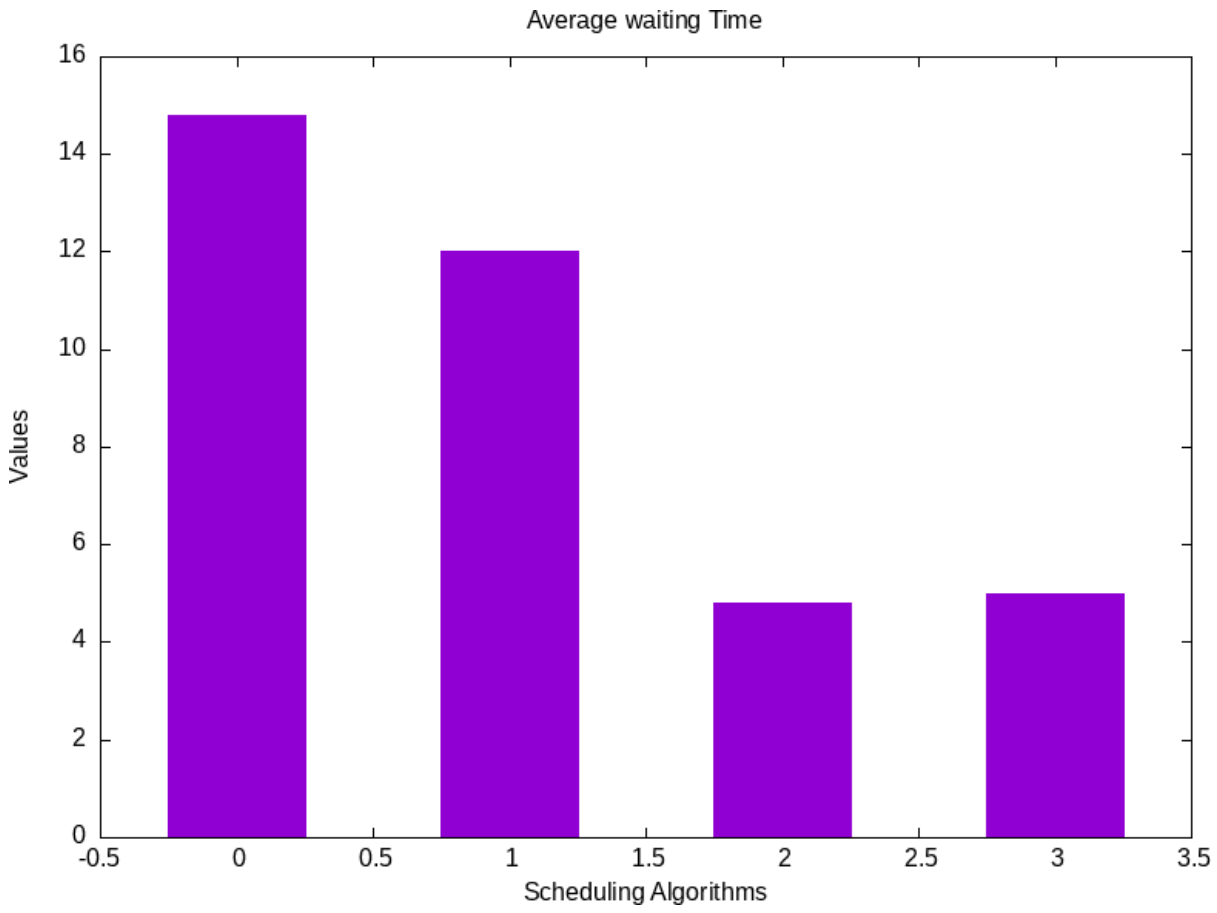
```
3       0       8       13      21      21      13      13

4       0       1       2       3       3       2       2

Average Turnaround Time = 9.2
Average Waiting Time = 5
Average Response Time = 5
CPU Utilization = 100%
Throughput = 0.238095 process/unit time
```

## Graphs


Average Response Time
Values
Scheduling Algorithms
12
10
8
6
4
2
0
-0.5
0
0.5
1
1.5
2
2.5
3
3.5


Average throughput
Values
Scheduling Algorithms
0.25
0.2
0.15
0.1
0.05
0
-0.5
0
0.5
1
1.5
2
2.5
3
3.5


Average Turnaround Time
Values
Scheduling Algorithms
20
18
16
14
12
10
8
6
4
2
0
-0.5
0
0.5
1
1.5
2
2.5
3
3.5


Average waiting Time
Values
Scheduling Algorithms
16
14
12
10
8
6
4
2
0
-0.5
0
0.5
1
1.5
2
2.5
3
3.5

References:

https://www.geeksforgeeks.org/introduction-of-shortest-remaining-time-first-srtf-algorithm/

https://www.geeksforgeeks.org/longest-job-first-ljf-cpu-scheduling-algorithm/

https://www.geeksforgeeks.org/longest-remaining-time-first-lrtf-cpu-sc heduling-algorithm/

https://www.geeksforgeeks.org/highest-response-ratio-next-hrrn-cpu-scheduling/