

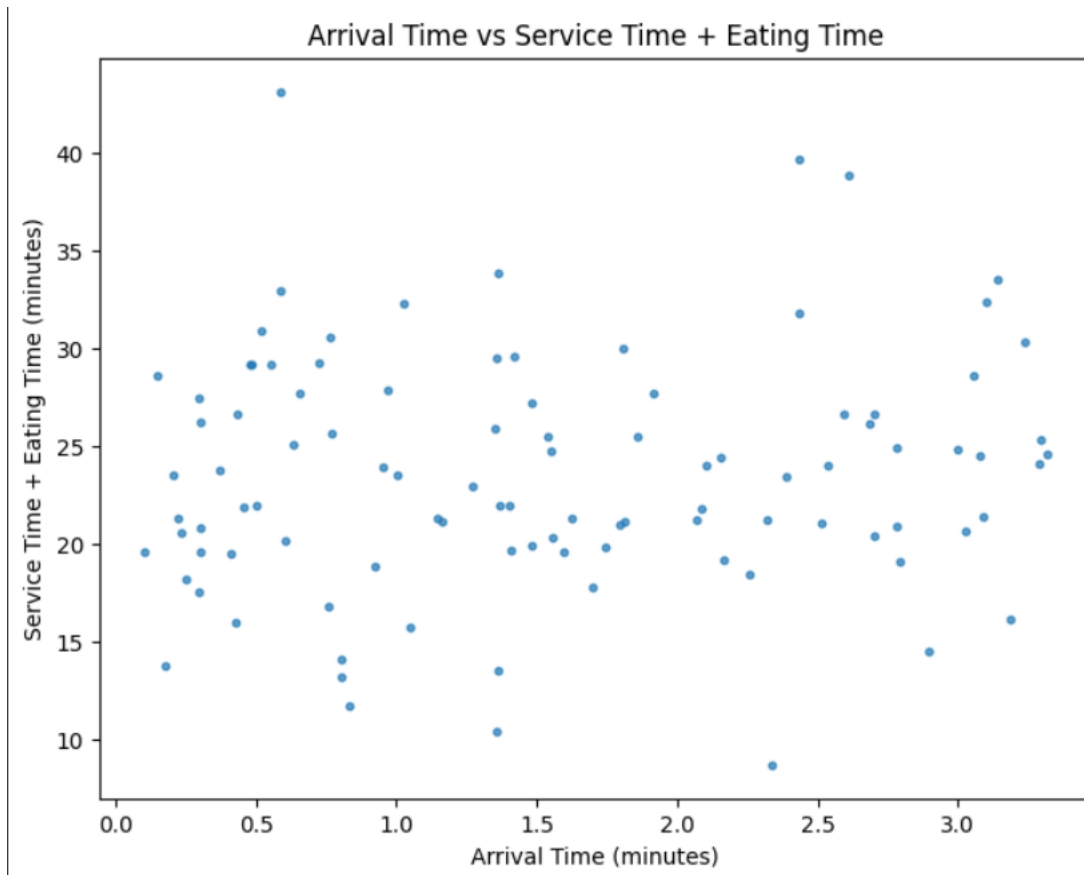
REPORT FOR MINIMUM TIME IN MESS

Introduction: In this simulation, we generate data for students in a mess hall. We generate their interarrival times, service times, and eating times. Using this data, we compute the total time spent in the mess for each student and plot their arrival times against their service times and eating times. We also plot a histogram of the time spent in the mess and determine the minimum time spent.

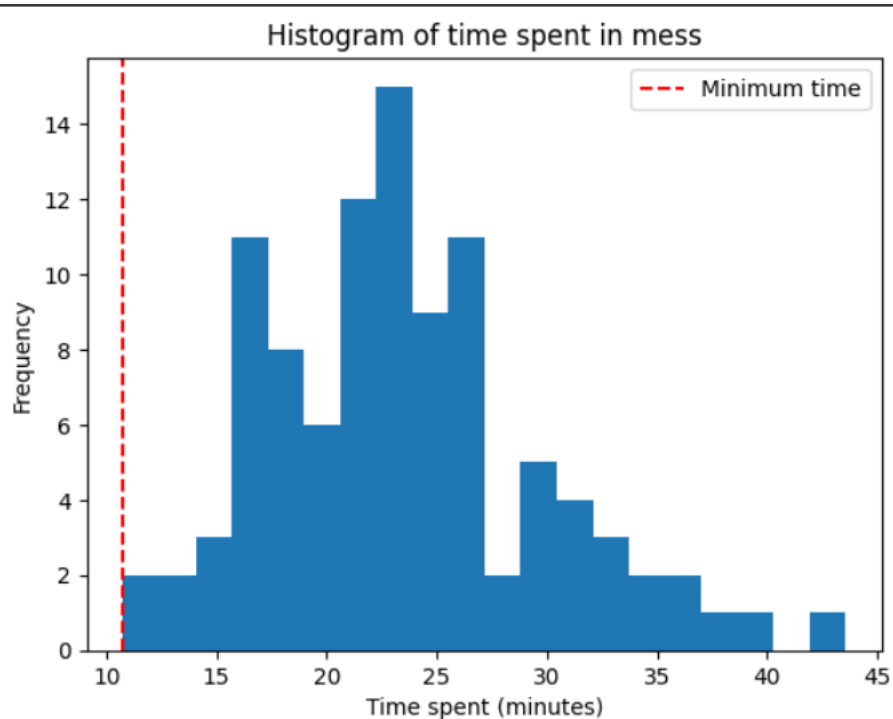
Data Generation: We generated data for 100 students using the following parameters: entry rate = 30.0, service rate = 1/3.0, eating time mean = 20.0, and eating time standard deviation = 5.0. We used the NumPy library to generate the interarrival times, service times, and eating times. We computed the total time spent in the mess, arrival times, and departure times for each student.

```
def generate_students(num_students, entry_rate, service_rate, eating_time_mean, eating_time_std):  
    """  
    Generate students and their service times and eating times.  
    """  
    # Generate interarrival times  
    interarrival_times = np.random.exponential(1/entry_rate, size=num_students)  
    # Generate service times  
    service_times = np.random.exponential(1/service_rate, size=num_students)  
    # Generate eating times  
    eating_times = np.random.normal(eating_time_mean, eating_time_std, size=num_students)  
    # Compute total time spent in mess  
    total_times = service_times + eating_times  
    # Compute arrival times  
    arrival_times = np.cumsum(interarrival_times)  
    # Compute departure times  
    departure_times = arrival_times + total_times  
  
    return arrival_times, service_times, eating_times, departure_times
```

Arrival Time vs Service Time + Eating Time: We plotted the arrival times against the service times and eating times of each student using a scatter plot. The x-axis shows the arrival time of each student in minutes, and the y-axis shows the service time plus eating time in minutes. The scatter plot shows that students who arrive earlier tend to have longer service and eating times than those who arrive later.



[Histogram of Time Spent in Mess](#): We computed the time spent in the mess for each student by subtracting their arrival time from their departure time. We plotted a histogram of the time spent in the mess with 20 bins. The x-axis shows the time spent in minutes, and the y-axis shows the frequency. We also included a vertical line at the minimum time spent in the mess, which is shown in red and dashed. The histogram shows that most students spent between 20 to 25 minutes in the mess, and the minimum time spent was around 10.7 minutes.



Conclusion: In conclusion, we generated data for students in a mess hall and analysed their arrival times, service times, and eating times. We plotted the arrival times against the service times and eating times, which showed that students who arrive earlier tend to have longer service and eating times. We also plotted a histogram of the time spent in the mess, which showed that most students spent between 20 to 25 minutes in the mess, and the minimum time spent was around 10.7 minutes. These results can be useful for the mess management to improve their services and reduce wait times for students.



```
print("Minimum time spent in mess:", min_time_spent)
```

```
Minimum time spent in mess: 10.76926917689643
```

Plots:

- Figure 1: Arrival Time vs Service Time + Eating Time (scatter plot)
- Figure 2: Histogram of Time Spent in Mess (histogram with vertical line at minimum time)