# PRIORITY QUEUE REPORT

Davide Di Mauro

*Politecnico di Torino*

Student ID: 306089

s306089@studenti.polito.it

## Abstract

**The main objective of this homework is to implement a priority queue with k servers, and waiting line of size N, which implements a strict priority service discipline**

## Assumptions

1. The queue has a finite size **N = 1000**
2. There are **k = 2** servers
3. The arrival time is modeled with a Poisson distribution

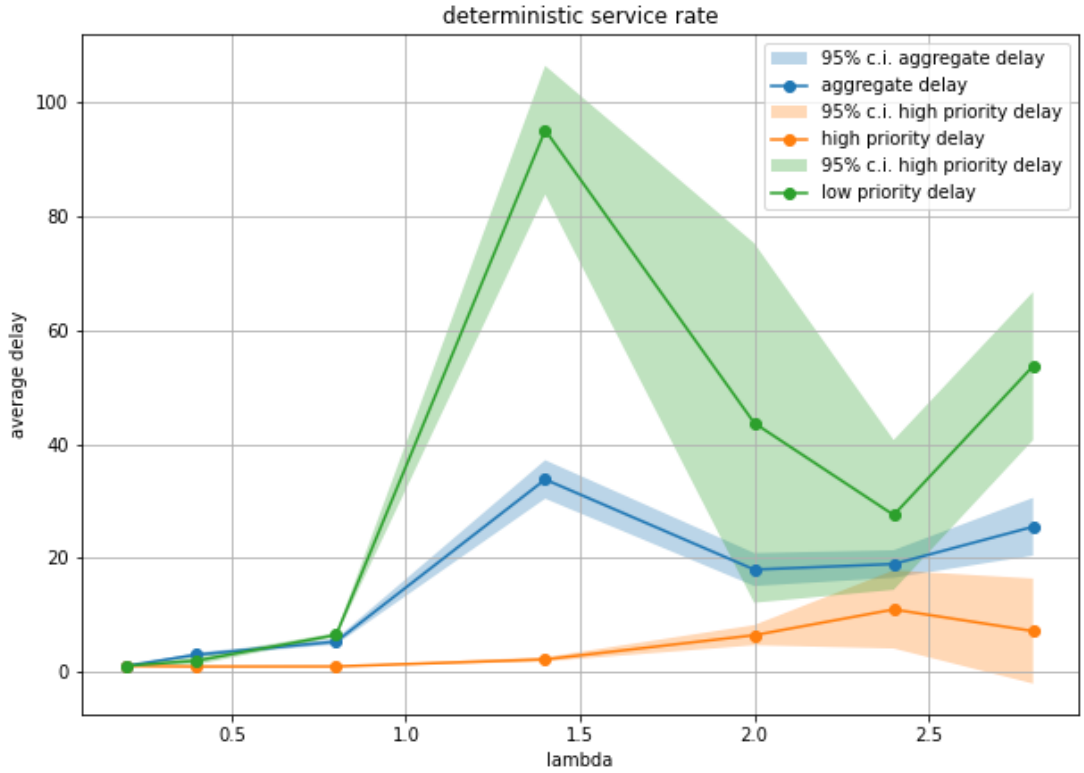
## Simulation Parameters

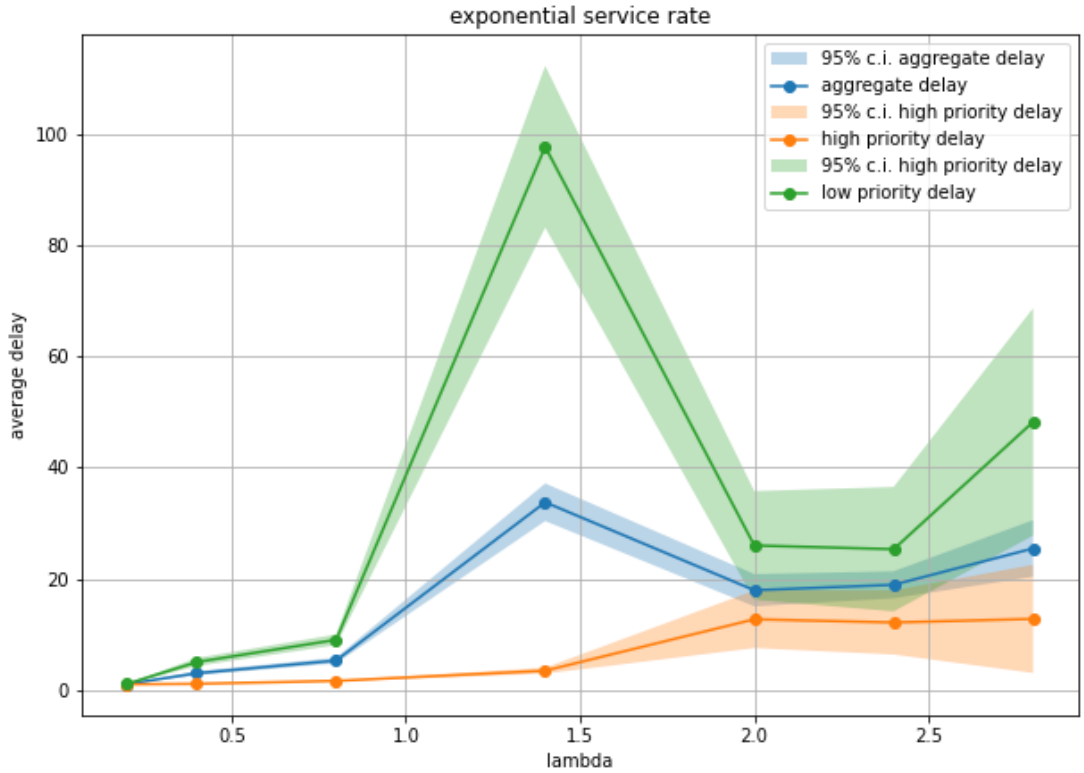
The queue has 4 input parameters:

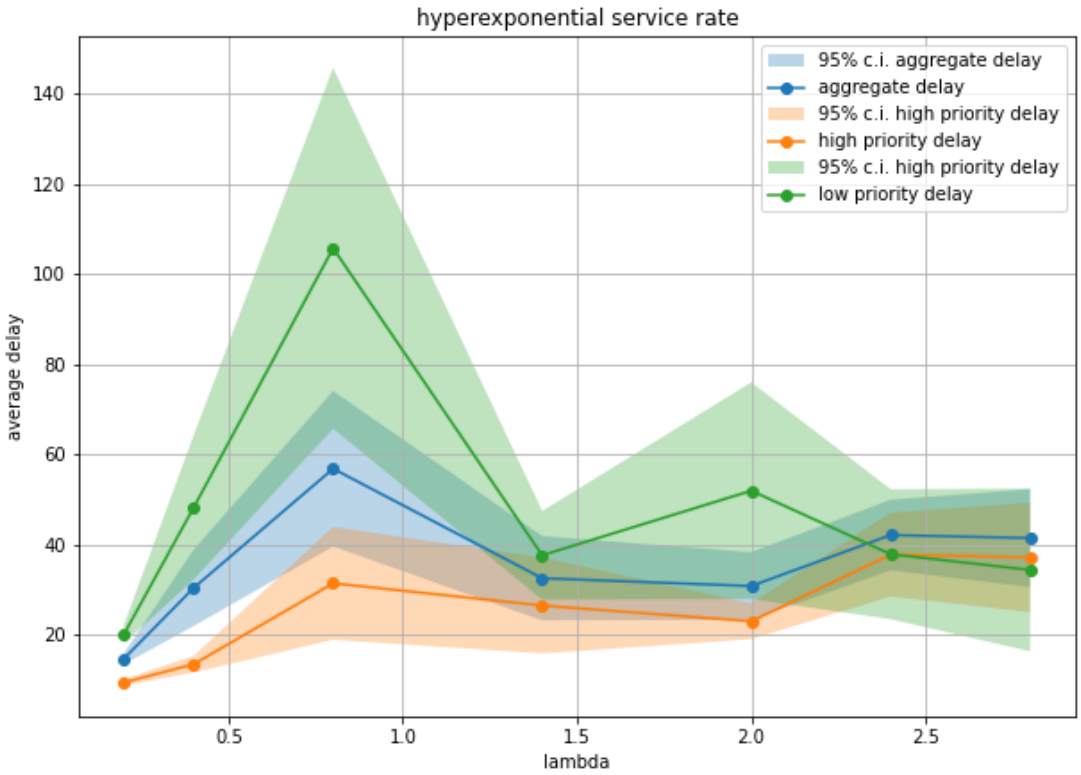
1. N: the size of the queue, set to 1000
2. The rate of arrival time, set to [0.2, 0.4, 0.8, 1.4, 2.0, 2.4, 2.8]
3. The type of service time distribution, that can be Exponential, Deterministic or HyperExponential
4. K: the number of servers, set to 2

## Algorithm

- k <- 2
- N <- 1000
- **for each** rate **in** [0.2, 0.4, 0.8, 1.4, 2.0, 2.4, 2.8]:
- **for each** seed **in** range (10):
    - **for each** service_time distribution:
        - set the seed
        - create a queue
        - **run the simulation**
        - store the average delay
- **compute the confidence interval for each rate and distribution**
- plot the results


deterministic service rate
95% c.i. aggregate delay
aggregate delay
95% c.i. high priority delay
high priority delay
95% c.i. high priority delay
low priority delay
average delay
lambda
0
20
40
60
80
100
0.5
1.0
1.5
2.0
2.5


exponential service rate
95% c.i. aggregate delay
aggregate delay
95% c.i. high priority delay
high priority delay
95% c.i. high priority delay
low priority delay
average delay
lambda
0
20
40
60
80
100
0.5
1.0
1.5
2.0
2.5




*E[S]_{HP}= E[S]_{LP}=1.0

## Conclusions

From the results we can conclude that as expected increasing the rate of the arrival time increases the delay for all type of customers and consequently the aggregated delay and the same reasoning applies for the confidence interval, that tends to grow larger as the delay increases.

The results also show that the priority discipline adopted works, in fact the delay for high priority customers is always lower than the delay for the low priority ones.

In all cases we notice a spike in the average delay in the middle of the graph (lambda = 1.4 for the exponential and deterministic cases, and lambda = 0.8 for the HyperExponential one). The cause of this phenomenon is unclear.