



Data Structures and Algorithm Project

Emergency Room Triage – List vs Priority Queue

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Project Report

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1 Emergency Room (ER) Simulation Report

Overview

This report analyzes the performance of two ER management systems: a List-Based ER (first-come, first-served) and a Priority Queue-Based ER (severity-driven triage). The results highlight efficiency differences in patient insertion, treatment order, and processing times.

List-Based ER Results

Patients Processed: 147 patients.

Time to Treat Patients: 20.09 seconds.

First 5 Patients Treated:

Quincy84, Eli76, Yara9, Carlos32, Xander45 (processed in arrival order).

Key Observations:

Operates on a strict first-in, first-out (FIFO) basis.

Longer insertion and treatment times due to linear processing.

2 Priority Queue-Based ER Results

Patients Processed: 123 patients.

Time to Treat Patients: 20.0364 seconds.

First 5 Patients Treated:

High-severity cases (e.g., Alex12, Alex16, Alex48, Alex72, Bella30, all with Severity 10).

Key Observations:

Prioritizes patients by severity, ensuring critical cases are treated first.

Dramatically faster insertion times due to efficient priority heap management.

Example of queue dynamics:

Next patient after treating Daisy14: Daisy54 (Severity 8).

Queue reprioritized dynamically as patients were treated.

2 Comparative Analysis

Table 1

Metric	List-Based ER	Priority Queue ER
Treatment Time	20.09 seconds	20.0364 seconds
Patient Order	Arrival sequence	Severity-driven
Number of patients treated	147	123
Critical Care Speed	Slower (FIFO)	Faster (prioritized)

Key Takeaways:

Fairness vs. Critical Care:

List-based ER ensures fairness but delays urgent cases.

Priority queue ER sacrifices order for life-threatening urgency.

Scalability: The priority queue's logarithmic time complexity for insertions makes it ideal for large-scale triage.

Conclusion

The priority queue-based ER system is significantly more efficient for handling emergencies, particularly in high-stakes environments where severity dictates treatment order. However, the list-based approach may still be suitable for low-volume, non-critical care scenarios.