

Smart Triage Hospital and Queue Management System

Group Members:

- Javan Otieno
- Deny Suri
- Patrick Kimani

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

The rising influx of patients in hospitals has strained the efficiency of manual triage and queuing systems. With healthcare demands increasing, many medical facilities struggle to manage patient flow effectively. Overcrowded waiting areas, delayed services, and poor communication between patients and healthcare providers have become common issues, especially in emergency and outpatient departments.

A Smart Triage Hospital and Queue Management System offers a transformative solution to these inefficiencies. By leveraging artificial intelligence (AI), IoT devices, and real-time analytics, such a system can intelligently assess patient needs, assign appropriate triage levels, and guide them through optimized queues. This innovation minimizes waiting times, reduces congestion, and ensures that critical patients receive prompt attention.

The system integrates automated registration, symptom evaluation, smart prioritization based on severity, and dynamic queue management displayed on digital dashboards. It not only enhances operational efficiency but also significantly improves patient experience and safety.

1.2 Problem Statement

Conventional hospital queuing systems are largely static and dependent on manual processes, which are error-prone and inefficient. Patients with urgent medical needs often experience delays due to the lack of a priority-based triage mechanism. These inefficiencies lead to patient dissatisfaction, increased workload on staff, and, in critical cases, adverse health outcomes. There is a pressing need for a dynamic, intelligent system that can optimize hospital workflows through real-time, automated triage and queue management.

1.3 Research Objectives

- To design and implement an AI-driven smart triage system that classifies patients based on urgency.
- To develop a real-time hospital queue management system that optimizes patient flow.
- To evaluate the effectiveness of the system in reducing patient waiting time and improving service delivery.

1.4 Research Questions

- How can AI be integrated into hospital triage to improve accuracy and efficiency?
- What technologies can be used to implement real-time queue management?
- How does a smart triage system impact patient outcomes and staff workflow?

1.5 Justification of the Study

This project addresses the need for smarter healthcare delivery models that optimize resource utilization and improve patient care. By introducing intelligent automation in triage and queuing, hospitals can better manage high patient volumes, enhance response times, and allocate medical resources more effectively. The research aligns with global health priorities focusing on improving access, equity, and efficiency in healthcare services.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

A review of current healthcare triage and queue management approaches reveals a reliance on manual procedures, which often lack adaptability, especially in high-volume scenarios. Emerging technologies offer promising alternatives for real-time and intelligent queue regulation and triage classification.

2.2 Traditional Triage and Queue Systems

Historically, hospitals have used manual triage methods based on subjective assessments by nurses or receptionists. This often results in misclassification, where less urgent cases are treated ahead of critical ones. Queue systems are generally first-come-first-served, which disregards urgency and leads to inefficient resource allocation.

2.3 Technological Advances in Hospital Automation

With the advent of electronic health records (EHRs), sensor networks, and AI, modern healthcare facilities have started exploring intelligent solutions. AI-powered symptom checkers, wearable health monitors, and patient management dashboards are transforming traditional healthcare delivery.

2.4 AI-Based Triage Systems

AI-based triage uses symptom data and patient history to make decisions. Decision trees, random forests, and neural networks are commonly employed. These models improve over time by learning from new data inputs, ensuring continuous optimization of patient classification.

2.5 Queue Management with Real-Time Tracking

Smart queue systems utilize sensors, digital signage, and mobile integration to display and update

patient queues in real-time. Studies show that integrating RFID and facial recognition technologies in hospitals reduces check-in times and improves queue fairness.

2.6 Gaps in Current Literature

- Limited research on combining smart triage and queue systems into one integrated solution.
- Few implementations consider patient emotion or stress during triage.
- Lack of mobile app integration for patients to view queue status remotely.
- Existing solutions lack dynamic prioritization when patient conditions worsen while waiting.