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Enhanced QR – Based Emergency Medical Information Retrieval with AI – Assisted Medical Record Summarization

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Abstract—

In emergency healthcare, getting the right patient information fast can make all the difference. Doctors and nurses need details like blood type, allergies, current medications, past surgeries, lab results you name it. When a patient has a long and complicated medical history, it can take precious minutes just to find the most important facts. This paper introduces an Enhanced QR-Based Emergency Medical Information Retrieval System that uses AI to help summarize patient records. Here's how it works: Each patient gets a unique QR code linked to their secure digital profile. When needed, authorized doctors simply scan the code with a web app and instantly access the patient's medical information. If the records are bulky and full of complex details no problem. The system includes an AI-assisted module that lets doctor input large blocks of text. The AI processes all that data and spits out a summary highlighting what really matters. As for medical images like X-rays, CTs, or MRIs they're stored and available for viewing, but the AI doesn't attempt to analyze or summarize them. The paper also compares this QR code-based approach to the usual, slower methods of retrieving medical records. It evaluates how well the system works by looking at the accuracy, completeness, relevance, and clarity of the summaries it generates

Keywords— Emergency Healthcare, QR Code Retrieval, AI Summarization, Electronic Health Records, Natural Language Processing, Patient Profiles

I. INTRODUCTION

In healthcare, patient medical information is crucial. During emergency care, routine examinations, diagnosis, surgery, and other medical procedures, doctors need access to a patient's medical history. Blood group, allergies, current illnesses, medications, prior surgeries, diagnostic reports, prior treatments, and medical history are examples of information that may be found in medical records Medical data may be dispersed throughout paper records, registers, reports, or several digital documents in conventional systems. When crucial information is needed in an emergency, searching through these records can take up valuable time The need to create automated and effective systems that can quickly detect and resolve information retrieval delays is highlighted by this shortcoming in traditional emergency access workflows. By creating a distinct QR code for each registered patient, the suggested system solves this issue. Following authorization and authentication, a physician can use a secure web application to scan the QR code and obtain the patient's medical records.



AI-assisted text summarization is another crucial part of this system. The doctor shouldn't have to go through the entire medical history of a patient who has a lot of textual information in order to find crucial details. After processing the lengthy text, the system produces a condensed summary with pertinent details.

The primary goals are to create a distinct QR code for every registered patient and create a safe digital system for handling patient medical data. By scanning the QR code, the system enables authorized physicians to obtain patient data, cutting down on the time needed to find crucial information like blood type, allergies, illnesses, prescription drugs, prior surgeries, diagnostic reports, and medical history. It also offers an AI/NLP-based module that condenses long textual medical information into a brief summary, assesses the summaries' accuracy, completeness, relevance, and readability, contrasts QR-based retrieval with the conventional retrieval method, and keeps a safe dashboard for records and audit data.

II. LITERATURE REVIEW

A. Existing Electronic Health Record Systems

Hospital Information Management Systems (HIMS) and Electronic Health Records (EHR) have undergone substantial development in order to digitize patient records and optimize administrative processes. However, interoperability, quick access during critical care, and structured data extraction are frequently problems for traditional centralized and digital record systems. During medical emergencies, searching through disjointed digital records or paper files takes up critical time.

B. QR-Code Based Healthcare Access

In recent Because Quick Response (QR) codes can swiftly connect digital records with physical media, their use in emergency medical access has grown in popularity. Research already conducted shows that dynamic or encrypted QR codes can safely connect dynamic patient records to healthcare platforms without revealing private health information on the physical code.

C. AI and NLP in Medical Summarization

Large Language Models (LLMs) and Natural Language Processing (NLP) have brought new approaches to extracting important information from long, unstructured clinical notes. By processing lengthy medical histories, text summarization models lessen the cognitive burden on physicians by succinctly presenting crucial medical information like prior illnesses, surgeries, and medication allergies.

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III. METHODOLOGY

The suggested system combines dynamic QR-code scanning, credential-based authorization, and automated NLP-assisted text summarization to address information retrieval delays and time-consuming record review during emergency care. The User Interaction Layer, Application Processing Layer, and Data Storage Layer are the three main operational layers that make up the core architectural framework.

A. Data Collection and Preparation

User Interaction Layer: Serves as the primary entry interface for patients, administrative staff, and medical professionals. Patients and staff use this interface for registration, profile updates, and diagnostic record uploads. Authorized doctors access the scanning interface to scan patient QR codes and view retrieved medical profiles.

Application Processing Layer: This layer, which was created with Python and the D jango framework, manages API interactions, access control, and business logic. It includes the AI/NLP summarization processing pipeline, session-based authentication verification, and the fundamental QR code scanning parser.

Data Storage Layer: controlled by a relational database system called My SQL. It keeps track of structured medical histories (blood types, allergies, previous surgeries, current medications) encrypted reference identifiers, patient profiles, and system access audit logs. For speedy dashboard rendering, diagnostic images (X-rays, CT scans, MRIs) are saved as secure binary objects or file references.

B. Methodological Flow

Registration & Encoding: A secure, one-of-a-kind identifier is generated and a patient profile is created in the database. A high-density QR code is created using this identifier.

Scanning & Verification: An authorized physician uses a camera interface to scan the patient's QR code in an emergency. The web application retrieves the



relevant medical record from the database, verifies doctor permissions, and extracts the secure identifier.

Text Processing & Summarization: The doctor can activate the AI text summarization module when long clinical histories are retrieved. After processing the unstructured raw text, the NLP model finds important clinical entities (current prescriptions, allergies, and chronic conditions) and produces a succinct, accurate summary. Without automated alteration or interpretation, diagnostic images are presented with the summary for manual clinical review.

IV. RESULTS AND DISCUSSION

The quality of the AI-generated text summaries and the speed and accuracy of information retrieval during emergencies are the two main operational parameters that are used to evaluate the proposed system.

Emergency Information Retrieval Analysis:

The suggested workflow was contrasted with conventional paper-based and fragmented digital record access in order to assess the efficacy of QR-based medical retrieval. Finding paper files or searching through several physical registers in traditional record retrieval usually takes several minutes to hours, with procedural friction brought on by manual indexing and the possibility of losing physical records.

AI Summarization Quality Assessment:

Four main clinical criteria were used to assess the AI-assisted text summarization module's performance: accuracy, completeness, relevance, and readability:

a) **Accuracy:** Only the supplied textual medical history is processed by the NLP module, which produces a summary free of factual errors or unconfirmed details.
b) **Completeness:** Essential clinical information, such as blood types, known allergies, current medications, and previous surgical procedures, are successfully extracted from extensive clinical notes by the generated summary.
c) **Relevance:** The summarization model solely concentrates on actionable medical information needed during critical emergency care, eliminating repetitive administrative text.
d) **Readability:** Without having to read long paragraphs, medical professionals can quickly understand the patient's background thanks to the output's concise, clear statements

V. CONCLUSION

An improved QR-Based Emergency Medical Information Retrieval System with AI-Assisted Medical Record Summarization was presented in this paper. Critical delays in obtaining patient histories during emergency care are addressed by the system. Through the integration of role-based doctor authentication, dynamic QR-code identification, and automated NLP text summarization, the platform offers quick access to crucial medical profiles and reduces long clinical notes into succinct summaries. Additionally, the system offers automated access logging and diagnostic image storage, giving medical professionals a productive workflow while guaranteeing record security.

Future improvements for this project will include adding QR codes to wearable emergency badges or NFC tags, implementing encrypted offline caching mechanisms for emergency retrieval in remote locations with poor internet connectivity, expanding the AI summarization engine to support multi-language translation for regional clinical notes, and implementing FHIR/HL7 data standards for smooth interoperability across multi-hospital networks.

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