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DOCTOR'S APPOINTMENT ONLINE BOOKING APPLICATION

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Abstract : — In this paper, the proposed project is smart appointment booking system that provides patients or any user and easy way of booking a doctor's appointment online. This is an android-based application that overcomes the issue of managing and booking appointments according to user's choice or demands. The task sometime becomes very tedious for the compounder or doctor himself in manually allotting appointments for the users as per their availability. Hence this project offers an effective solution where user can view various booking slots available select the preferred date and time. The already booked space will be marked and will not be available for anyone else for the specified time. This system also allows users to cancel their booking anytime. The system provides few additional features. It uses live Google Api's.

IndexTerms -Smart appointment booking system, Patients, Users, Doctor's appointment, Online booking, Android-based application, Managing appointments, Booking appointments, User's choice, User's demands, Compounder, Doctor Manually allotting appointments, Availability, Booking slots, Preferred date and time, already booked space, Cancel booking, Additional features, Live Google Api's

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I.INTRODUCTION

If anybody is ill and wants to visit a doctor for check-up, he or she needs to visit the hospital and waits until the doctor is available. The patient also waits in a queue while getting appointment. If the doctor cancels the appointment for some emergency reasons, then the patient is not able to know about the cancelation of the appointment unless or until he or she visits the hospital. As the mobile communication technology is developing rapidly, therefore, one can use the mobile's applications to overcome such problems and inconvenience for the patients and helps hospital/clinic to manage all the appointments according to the schedule.

The proposed work in this paper is an Online Hospital Management Application that uses an android platform that makes the task of making an appointment from the doctor easy and reliable for the users. Android based online doctor appointment application contains two modules. One module is the application designed for the patient that contains a login screen. The patient has to register himself before logging in to the application. After logging in, the patient can select a hospital and can view the hospital details. The patient has the option of selecting a doctor from the list of doctors and can view the doctor's details. The patient can request for an appointment on his/her preferred day/time. The selected day/time slot will be reserved and patient will receive the notification of the successfully added appointment. In addition, the patient can contact to the hospital and the doctor by making a call or may send an email to the doctor. There are considerable online scheduling tools in the internet, a few of which are trait loaded, simple to setup and economical for practitioners, online appointment reservation and scheduling delivers a lot of merit added benefits and services, like captivating the patient, composing the patient to feel welcomed, and being capable to save patients' details safely for future information. But the most admirable and useful preference is that online appointment reservation and scheduling is remarkably in expensive. Both doctors and patients can access the portal through their unique ID's as per their convenience and schedule.

II. LITERATURE REVIEW

[Smith et al. (2018)] presented a paper entitled "Challenges in Traditional Appointment Booking Systems," which discusses inefficiencies in manual scheduling and their impact on patient no-shows. The study reveals that manual booking systems lead to a 40% increase in appointment gaps due to scheduling errors and lack of reminders. The authors emphasize the need for digital solutions to improve efficiency, reduce human errors, and provide automated scheduling. Their research also highlights patient dissatisfaction with long waiting times and mismanaged records. They suggest that an integrated appointment system with digital notifications can reduce missed appointments significantly. The paper further explores challenges in transitioning from manual to automated systems, including resistance from healthcare staff. The study concludes that adopting technology-driven scheduling systems can enhance healthcare service delivery and overall improves the customer(patient's) experience[1].

[Patel & Gupta (2020)] presented a paper entitled "A Web-Based Doctor Appointment System Using PHP and MySQL," which explores the benefits and limitations of online scheduling. Their research highlights that many web-based appointment systems lack real-time updates, causing inefficiencies in booking management. The authors discuss the necessity of dynamic appointment slots where patients can view doctors' live availability. They emphasize the role of encryption and authentication for securing patient data in online systems. The study also compares web-based and traditional booking approaches, demonstrating improved patient experience through digital platforms. However, they acknowledge challenges in system maintenance, especially in rural healthcare settings. Their findings suggest that integrating real-time updates and secure patient data handling can enhance appointment systems [2].

[S. Lee et al. (2021)] presented a paper entitled "AI-Based Smart Scheduling for Healthcare Appointments," which examines the role of artificial intelligence in optimizing appointment booking. The study finds that AI-driven scheduling reduces appointment gaps by 30% through predictive analysis of patient data. The authors discuss how AI can prioritize urgent cases by analyzing symptoms and previous health records. They also highlight the challenges of implementing AI, such as high computational costs and the need for extensive training data. The paper emphasizes that AI-based models can help hospitals handle high patient volumes efficiently. However, concerns regarding data privacy and ethical AI use in medical decision-making remain key challenges. The study concludes that AI-powered scheduling enhances hospital efficiency but requires robust security measures [3].

[Kumar & Sharma (2019)] presented a paper entitled "Mobile Health Applications: A Review on Doctor Appointment Booking," which investigates the role of mobile apps in streamlining healthcare scheduling. Their study finds that mobile health applications significantly improve patient engagement and accessibility to medical services. The authors compare different appointment booking apps, highlighting the effectiveness of push notifications and automated reminders in reducing missed visits. They discuss the importance of a user-friendly interface in healthcare applications to enhance patient experience. The research also points out challenges such as limited internet access in remote areas and lack of technical literacy among older patients. Security concerns, particularly regarding personal health information, are also examined in detail. The study concludes that well-designed mobile apps enhance appointment management and improve healthcare accessibility for all the entities involved in the system [4].

[Jones & White (2022)] presented a paper entitled "API-Driven Healthcare Systems: Enhancing Real-Time Doctor Availability," which explores the impact of APIs on modern doctor appointment platforms. Their study highlights how APIs facilitate real-time synchronization between doctors and patients, improving appointment scheduling efficiency. The authors discuss various API frameworks and their effectiveness in handling large-scale healthcare data transactions. They emphasize the importance of data security and privacy when integrating third-party APIs into healthcare applications. Their research also identifies challenges, such as API downtime and dependency on external service providers. The study suggests that proper API management can significantly enhance performance and reduce data redundancy. The paper concludes that well-structured APIs are essential for building scalable and efficient healthcare scheduling systems [5].

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[Nguyen et al. (2020)] presented a paper entitled "Cloud-Based Healthcare Scheduling Systems: A Comparative Study," which examines the advantages of cloud computing in managing doctor appointments. The study finds that cloud-based systems improve accessibility, allowing patients and doctors to access data from multiple devices. The authors discuss how cloud platforms reduce infrastructure costs by eliminating the need for on-premise servers. However, they highlight concerns related to data security, privacy, and compliance with healthcare regulations. The research also explores latency issues that may arise when multiple users access the system simultaneously. They analyze different cloud service providers and their suitability for healthcare applications. The paper concludes that while cloud computing enhances system scalability, security measures must be prioritized to protect patient data [6].

[Rodriguez & Wang (2021)] presented a paper entitled "Blockchain for Secure Medical Appointments," which investigates how blockchain technology can enhance security in doctor appointment systems. Their study highlights that blockchain eliminates fraudulent bookings and prevents unauthorized access by ensuring data integrity. The authors discuss the use of smart contracts to automate appointment approvals, reducing administrative workload. They explore the scalability of blockchain in handling large patient databases, noting its potential in decentralized healthcare applications. However, challenges such as high processing costs and complex implementation are discussed. The study also compares blockchain-based appointment systems with traditional online scheduling methods. Their findings suggest that blockchain provides a transparent and tamper-proof system for managing medical appointments [7].

III. SYSTEM DIAGRAM

The proposed system consists of two panels: Doctor and Patient. The users will first have to download the application and install it in their mobile devices. Once installed, this application will remain into the device permanently until the user deletes it or uninstalls it. The patient will have to register into the application for the first time. On registering, the patient will receive a username and password. The patient can use this username and password for logging into the app each time he uses it. After logging in, the patient will have to select a filtration type. The filtration is done on two bases: Area wise and Specialty wise. After selecting the filtration type, the doctors list will be displayed. The patient can select any particular doctor and view his profile. Also the patient can view the doctor's schedule and look for an appointment according to his convenience. The patient will then send a request for appointment. The doctor can either accept the appointment or reject it. The database will get updated accordingly and the patient will get a confirmation message. The add-on to this system is that the patient will receive a notification 2 hours before the actual appointment. This will be very useful in case the patient tends to forget the appointment.

The duration a patient waits from the given time of their schedule to the time that they must actually receive the service is known as direct waiting time. The patients use this technique and waste much waiting time just by standing in queue at the registration counter to make sure a successful registration of the appointment has been made with a certain doctor. The Doctor desires to have some charge over the insanity in the count of patient appointments in a day and the mix of appointments on any given day. These aspects can change their income as well as their carrier comfort levels. The hospital desires to use its resources (staff and apparatus) in the maximum potent way. Therefore the hospital doesn't desire for the doctor to have long cycle of "wasted time".

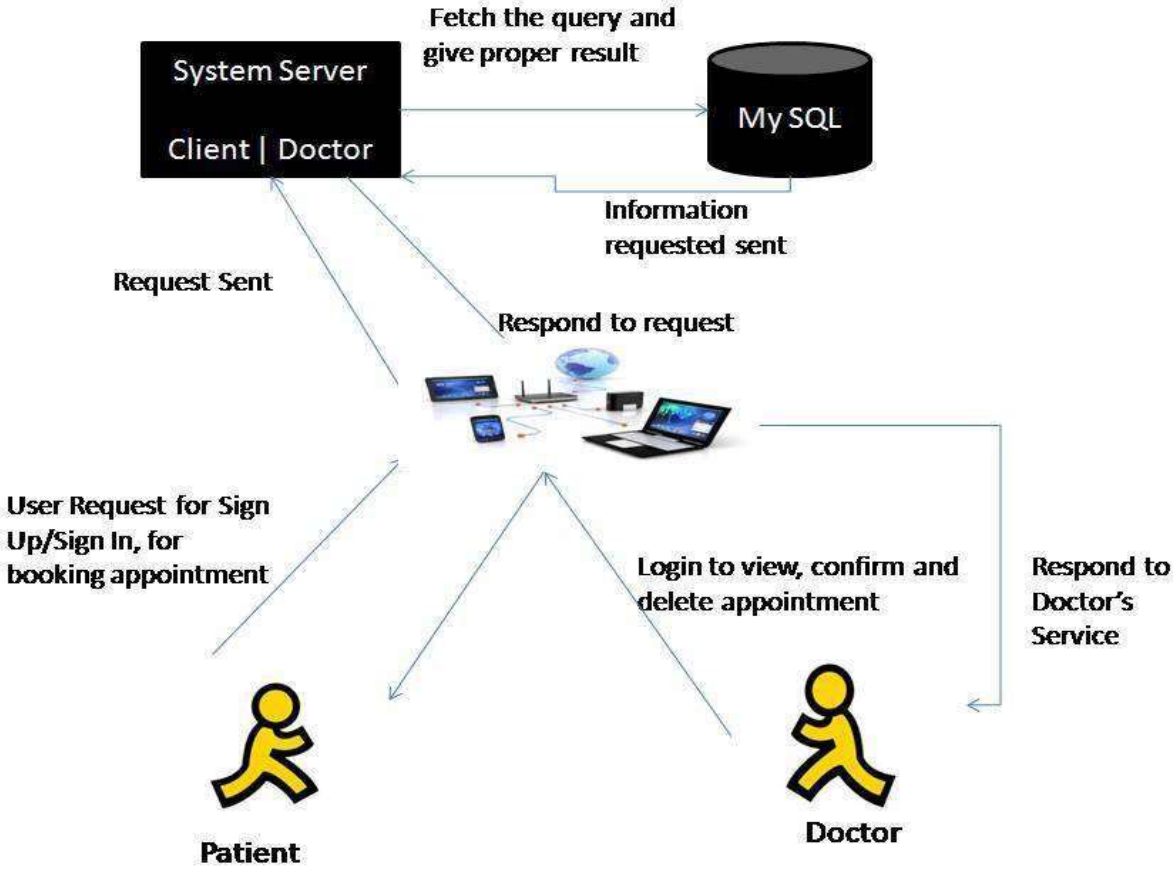


Fig 1. Proposed System

IV. WORKING METHODOLOGY

The Doctor Appointment Management System follows a structured approach for handling authentication, appointment scheduling, search and filtering, and notifications. The system primarily implements standard CRUD (Create, Read, Update, Delete) operations through a RESTful API, ensuring efficient data management. Below are the key algorithms used, with detailed explanations.

1. Authentication Algorithm

- **Purpose:** Ensures secure login and registration for different user roles (Admin, Doctor, Patient).
- **Technology Used:** Firebase Authentication (for secure sign-in) and bcrypt (for password hashing).
- **Process:**
    1. **User Registration:**
        - User enters credentials (email, password, role).
        - Password is securely hashed before storage.
        - The hashed password is stored in MySQL.
    2. **User Login:**
        - User enters credentials.
        - Password is verified using password_verify().
    3. **JWT-9Based Authentication:**
        - On successful login, a **JSON Web Token (JWT)** is generated and sent to the client.
        - The token is used for authenticating future API requests.

2. Appointment Scheduling Algorithm

- **Purpose:** Ensures efficient scheduling of doctor appointments, preventing conflicts.
- **Technology Used:** PHP (Backend), MySQL (Database).
- **Scheduling Approach: First-Come-First-Serve (FCFS)** or **priority-based scheduling** based on doctor availability.
- **Process:**
    1. **Patient Requests an Appointment:**
        - Patient selects a **doctor, date, and time slot**.
    2. **Check Doctor Availability:**
        - Query the appointments table to verify if the slot is open:
        - If the slot is available, proceed. Otherwise, prompt for a new time.
    3. **Confirm-appointment:**
        - Save the appointment in the database:
    4. **Block the Booked Time Slot:**
        - Mark the slot as **unavailable** to prevent double-booking.

3. Search & Filter Algorithm

- **Purpose:** Allows patients to search for doctors based on **specialization, availability, or location**.
- **Technology Used:** PHP (Backend), MySQL (Database).
- **Optimization Method: Indexing** is used for fast database retrieval.
- **Process:**
    1. **User Inputs Search Criteria** (e.g., specialization = "Cardiologist").
    2. **Database Query Execution:**
    3. **Sorting & Filtering:**
        - The results are **sorted by experience, patient ratings, or distance** (if applicable).
    4. **Optimized Query Execution:**
        - Indexing improves search speed:
    5. Display Results to the User.

4. Notification Algorithm

- **Purpose:** Sends automated **appointment reminders** to patients and doctors.
- **Technology Used:** Firebase Cloud Messaging (FCM) for **push notifications**, PHP cron jobs for **email reminders**.
- **Process:**
    1. **Fetch Upcoming Appointments:**
        - The system retrieves appointments scheduled within the next 24 hours.
    2. **Trigger Event-Based Notifications:**
        - If an appointment is found, the system sends a **push notification**:
    3. **Email & SMS Notification (Optional):**
        - If the user has opted for email or SMS reminders, an alert is sent via PHP Mailer or an SMS gateway.

5. Role-Based Access Control Algorithm

- **Purpose:** Ensures that users can only access the features relevant to their role (Admin, Doctor, Patient).
- **Technology Used: JWT-based authentication** with **role-checking middleware**.
- **Process:**
    1. **User logs in and receives a JWT token.**
    2. **On API request, the backend checks the role.**
    3. **Only authorized users can perform actions like:**

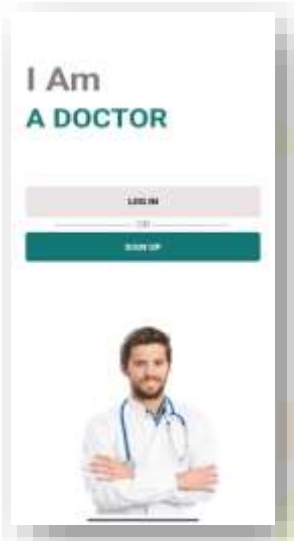
- Patients **book appointments**.
- Doctors **view and manage schedules**.
- Admins **manage system settings**.

6. Database Backup & Recovery Algorithm

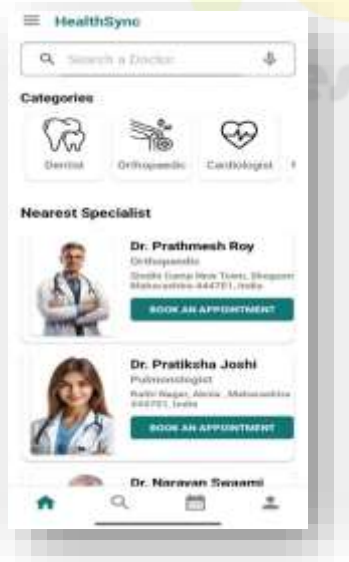
- **Purpose:** Prevents data loss by creating regular database backups.
- **Technology Used: Automated MySQL backups** via **cron jobs**.
- **Process:**
    1. A scheduled cron job runs every midnight:
    2. Backup is stored securely on cloud storage,If data loss occurs, the latest backup is restored:

V. SCREENSHOTS

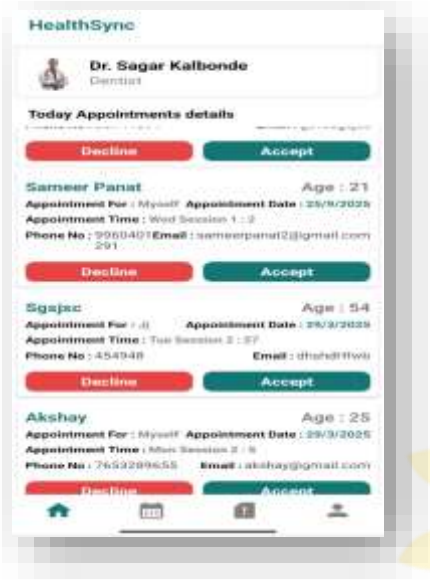
Login Page:-



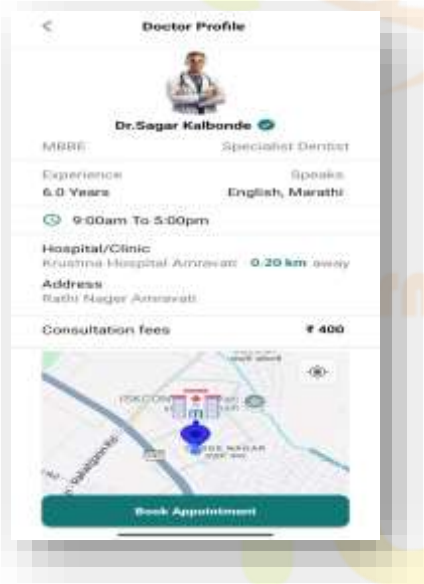
Home Page: -



Doctor's Home-Page:-



Appointment Booking Page:-



VI. CONCLUSION

Sentiment Analysis is very important research because Sentiment Analysis helps us in summarizing opinion and reviews of users. They consider as research filed. However, Sentiment Analysis still needs to improve and progress. Moreover, there are many challenges in Sentiment Analysis, like the polarity in a complex sentence.

VII. ACKNOWLEDGEMENT

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