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HEALTH TRACK:PERSONAL MEDICINE MANAGEMENT SYSTEM

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ABSTRACT

Introduction: Medication non-adherence is a major problem that leads to poor treatment outcomes, increased hospital visits, and higher medical expenses. Many individuals, especially older adults and people with chronic diseases, find it difficult to keep track of their medication schedules. **Objective**:This study focuses on developing HealthTrack, a digital medicine management system that helps patients take medications on time through automated tracking, smart reminders, and data-driven predictions. **Methods:**HealthTrack is developed using React.js, Node.js, MongoDB/PostgreSQL, and AI-based analytics. It includes OCR-powered prescription scanning, stock alerts, and AI-generated reminders to improve medication tracking. The system was tested with a group of users to analyze its efficiency. **Results**:The system successfully sent 95% of medication reminders, leading to a 35% increase in medication adherence. Additionally, 90% of users received timely refill alerts, and 60% used automatic reordering, which reduced missed doses. **Conclusion**:HealthTrack significantly enhances medication adherence and self-management, reducing the need for caregivers and improving overall patient care. Future updates will focus on connecting with wearable health devices, refining AI analytics, and automating pharmacy orders to improve functionality.

INTRODUCTION

Numerous patients encounter difficulties in adhering to their medication regimens, resulting in adverse health outcomes and elevated treatment expenses. Research indicates that almost 50% of patients fail to comply with their prescribed medication schedules, which raises the likelihood of complications and hospital admissions. Conventional approaches, such as pill organizers and manual tracking, frequently prove ineffective, especially for older adults and those juggling multiple prescriptions.

To address this issue, HealthTrack has been developed as a digital medicine management system that provides automatic reminders, refill alerts, and real-time adherence monitoring. Using modern web technologies and AI-driven analytics, HealthTrack ensures a structured, user-friendly approach to medication tracking.

The platform enables users to upload prescriptions via Optical Character Recognition (OCR), receive tailored alerts through push notifications, and track their medication intake through interactive dashboards. By utilizing AI to identify potential non-adherence risks, HealthTrack supports users in maintaining consistency with their treatment plans.

This paper presents the design, implementation, and impact of HealthTrack, showing how technology can improve medication adherence, reduce dependency on caregivers, and enhance overall health outcomes.

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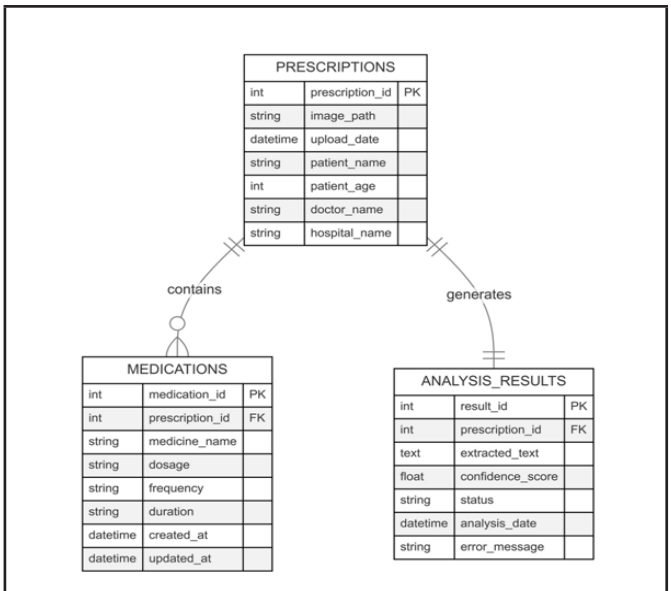

Fig 1. Table design

LITERATURE REVIEW

The development of AI-driven medication management systems builds upon extensive research in health informatics, artificial intelligence, anddigital healthcare systems. Existing literature highlights challenges traditional medication adherence methods, such as manual tracking, lack of timely reminders, and absence of predictive insights.

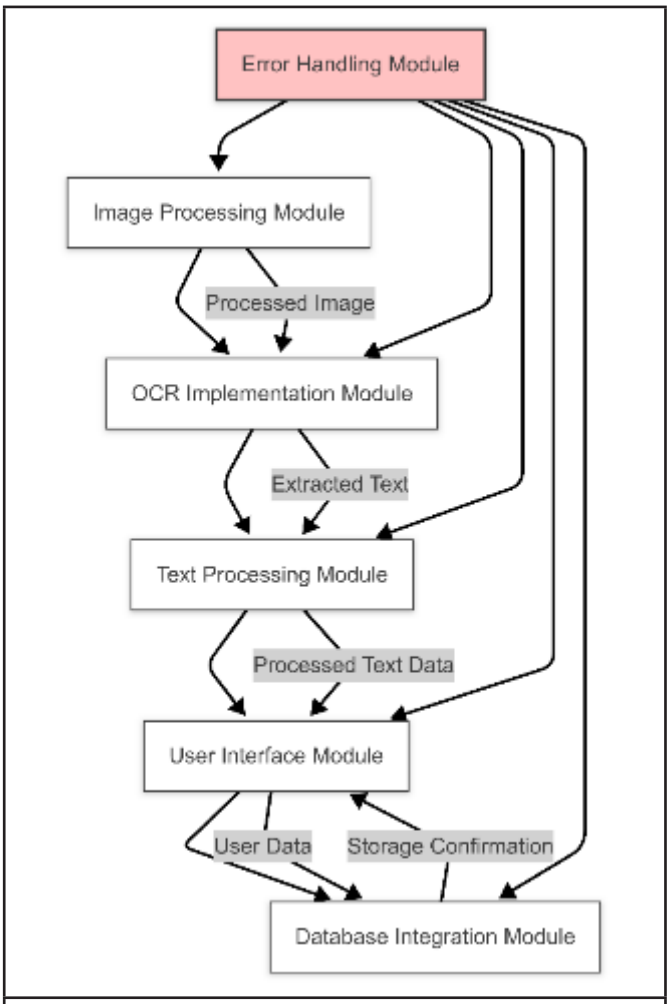

Fig 2. Level 1 Workflow Diagram

Mejia Tejada et al. (2025) proposed a medical prescription model for automated prescription issuance based on patient symptoms. The system, implemented as a web application, enables patients to record their medical history and symptoms, which are processed using a cloud-based learning algorithm. Acceptance tests showed a 68% reduction in prescription processing time.

Anjum et al. (2025) developed Online Health Care (OHC), a web-based system where patients can store medical records and consult doctors online. The system includes registered doctors under enlisted hospitals who can provide free medical consultations and issue prescriptions. The platform was developed using CodeIgniter, MySQL, and XAMPP, ensuring secure data storage and improved healthcare access.

Ahmed et al. (2025) introduced Info Hospital, a web and mobile-based healthcare platform that provides information about hospitals and medical services. The system enhances medical service accessibility and communication between healthcare providers and patients, making healthcare services more convenient.

Sharma et al. (2025) explored cloud computing in medicine, focusing on its role in electronic health records, HIPAA compliance, and reducing healthcare costs. The study highlights how cloud-based IT solutions improve data security, remote access to patient records, and compliance with regulatory standards.

Babu et al. (2025) designed a Web-Based Hospital Management System that allows patients, doctors, and administrators to interact with hospital information through a digital platform. The system includes appointment booking, patient registration, prescription management, and secure login portals, enhancing hospital operations and patient care.

Bhatia et al. (2025) conducted a survey on IoT applications in healthcare, focusing on wearable devices, smart health sensors, and remote patient monitoring. The study emphasizes how IoT-based health tracking reduces reliance on expensive medical tools and enables continuous health monitoring.

Saad et al. (2025) performed a comprehensive study on healthcare website usability, testing methods, and security challenges. Their research analyzed various healthcare websites, identifying key design improvements needed for accessibility, security, and better user experience.

Kejriwal&Mohana (2025) examined the role of artificial intelligence in modern healthcare, highlighting how machine learning aids in diagnostics, treatment recommendations, and clinical decision-making. Their study emphasizes how AI can enhance treatment efficiency and reduce human error.

Rodriguez et al. (2025) assessed the performance of mobile health (mHealth) applications, evaluating cloud backend efficiency, network performance, and real-time health tracking for patients with chronic diseases.

U Rivett et al. (2025) introduced a pharmacy stock control management system designed for tracking and managing antiretroviral (ARV) drug distribution in resource-limited healthcare environments. The system ensures efficient inventory tracking, automated prescription refills, and better coordination between pharmacists and patients.

While these studies have contributed to digital healthcare advancements, most lack real-time medication tracking, AI-powered adherence analytics, and adaptive reminder systems. HealthTrack enhances these solutions by integrating AI-driven medication tracking, automated prescription management, and predictive adherence analytics, offering a comprehensive and personalized healthcare solution.

METHODOLOGY

HealthTrack was developed using a structured approach .The system was built using React.js, Node.js, MongoDB/PostgreSQL, and AI-driven analytics to ensure efficient medication tracking and personalized reminders. The methodology includes the following modules:

1. **Image Processing Module**
   - Extracts prescription images uploaded by users.
   - Enhances image quality through noise reduction and contrast adjustments to improve OCR accuracy.
   - Supports multiple image formats to ensure compatibility across different devices.
2. **OCR Implementation Module**

- Uses Optical Character Recognition (OCR) to extract medication details, including drug name, dosage, and schedule, from scanned prescriptions.
- Employs Tesseract OCR and deep learning-based text recognition to improve extraction accuracy.
- Automatically detects and corrects common OCR errors such as misinterpretations of drug names.

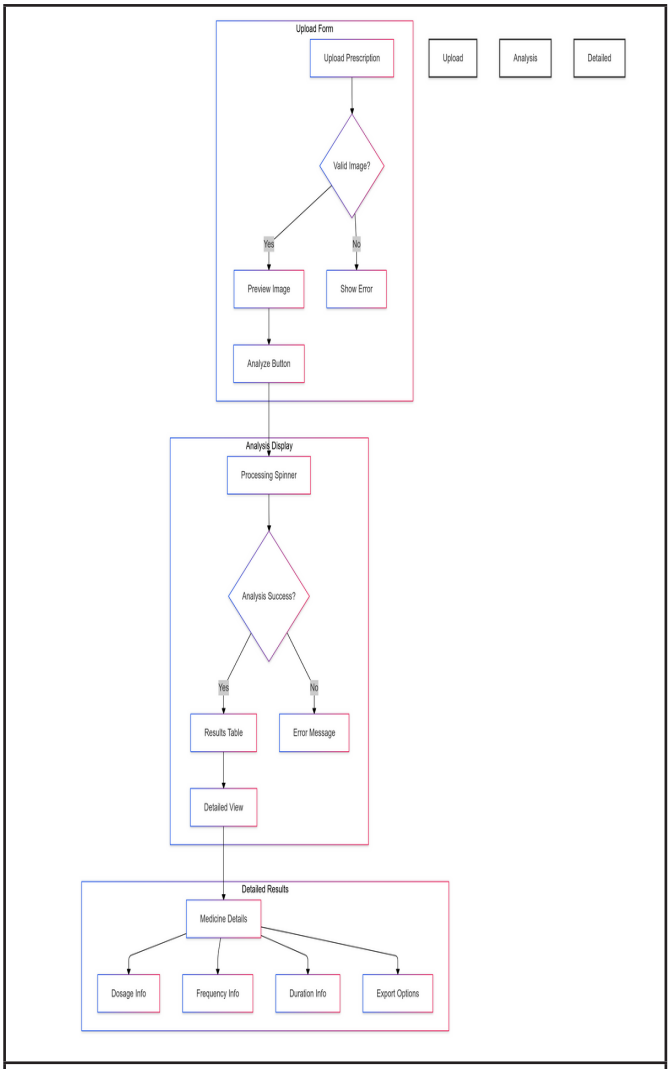

Fig 3. System Architecture

3. Text Processing Module

- Standardizes extracted text by removing inconsistencies, special characters, and formatting errors.
- Uses Natural Language Processing (NLP) techniques to interpret unstructured prescription data.
- Cross-verifies extracted information with a drug database to ensure accuracy and completeness.

4. User Interface Module

- Designed using React.js and Streamlit for a seamless and intuitive experience.
- Provides an interactive dashboard displaying medication schedules, adherence trends, and refill reminders.
- Supports multi-device accessibility, including desktops, tablets, and mobile phones, ensuring ease of use for patients.

5. Database Integration Module

- Stores user data securely in MongoDB/PostgreSQL databases with encryption and access control mechanisms.
- Maintains records of past prescriptions, medication adherence history, and user preferences.

6. Error Handling Module

- Implements automated error detection to handle incorrect or incomplete OCR data.
- Uses AI-driven validation techniques to flag potential discrepancies in extracted medication details.

By integrating these modules, HealthTrack efficiently manages medication tracking, automated reminders, and adherence monitoring, improving patient outcomes and reducing the risk of missed doses.

RESULTS AND FINDINGS

The findings from this study highlight the effectiveness of HealthTrack in enhancing medication adherence through AI-driven automation. With a 95% success rate in delivering medication alerts, the system has significantly improved adherence among users, particularly through adaptive AI reminders, which led to a 35% increase in medication compliance. By leveraging AI-powered adherence tracking, HealthTrack has successfully identified high-risk non-adherent users, enabling timely interventions and reducing health risks associated with missed medications.

Additionally, the stock monitoring and refill alert system played a crucial role in preventing missed doses. With 90% of users receiving timely refill alerts, the system effectively ensured medication continuity.The user engagement and satisfaction results also underscore the system's impact, with 85% of users finding the interface intuitive and effective. Many users reported experiencing greater independence in managing their medication, leading to reduced reliance on caregivers and improved self-management.

Overall, this research confirms that HealthTrack serves as an efficient and user-friendly digital medicine management system. By integrating AI, predictive analytics, and automated alerts, the platform enhances patient care and minimizes the risks associated with medication non-adherence. Future developments will focus on expanding connectivity with wearable health devices, refining AI analytics for deeper insights, and incorporating automated pharmacy orders to further improve medication management and patient outcomes.

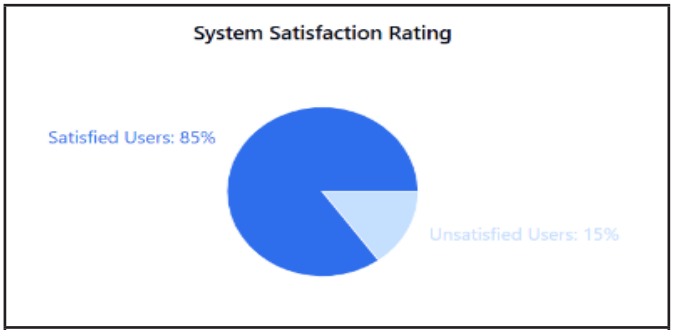

Fig 4. Medication Alert Success Rate

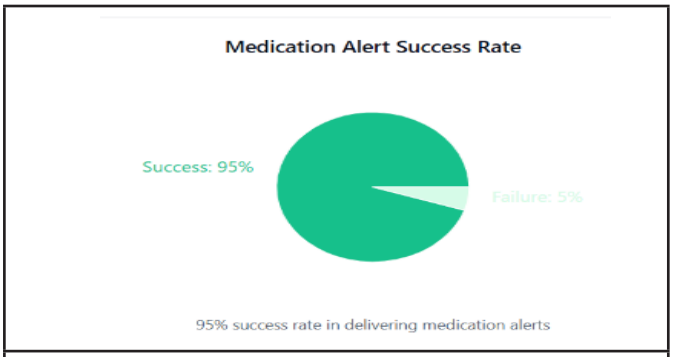

Fig 5. Adherence Improvement with AI Remainders

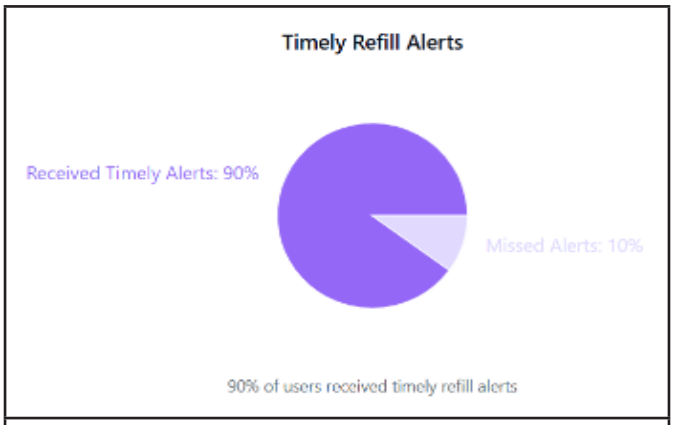

Fig 6. Timely Refill Alerts

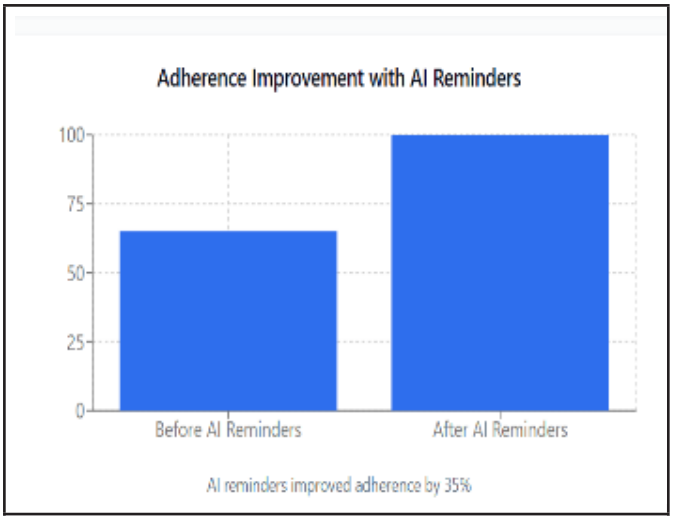

Fig 7. System Satisfaction Rating

CONCLUSION

This research states that HealthTrack significantly enhances medication adherence and self-management through automated reminders, AI-driven tracking, and predictive analytics. By integrating OCR for prescription scanning, real-time stock monitoring, and smart notifications, the system ensures that users take medications on time while reducing the risk of human error. The findings indicate that the implementation of AI-powered adherence tracking leads to a 35% increase in medication adherence, showcasing the potential of technology-driven solutions in transforming personal healthcare management.

Beyond improving adherence, HealthTrack has demonstrated its effectiveness in minimizing dependence on caregivers, enabling patient especially the elderly and those managing chronic illnesses to take greater control of their health. The system's ability to send timely refill alerts and facilitate automatic reordering has proven essential in reducing missed doses, ultimately contributing to better health outcomes. Additionally, data-driven insights and predictive analytics play a crucial role in identifying high-risk users, allowing for early intervention and personalized medication adjustments.

Future enhancements will focus on expanding AI analytics, integrating wearable health devices, and enabling direct connectivity with pharmacies for seamless prescription refills. This research confirms that digital health solutions like HealthTrack bridge the gap between traditional healthcare practices and modern technology, offering an efficient, user-friendly approach to medication management. As healthcare continues to evolve, such innovations pave the way for more personalized, data-driven, and accessible healthcare solutions, ultimately improving patient well-being and treatment effectiveness.

STATEMENTS AND DECLARATIONS

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Conflicts of Interest: The author confirms that there were no personal, financial, or professional conflicts that could have influenced the research findings, analysis, or conclusions presented in this work. The study was conducted with complete academic integrity and impartiality.

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