AI&ML-Based Enhanced Health Monitoring System for Intelligent Healthcare Tracking and Seamless Doctor Prescription Management

Under Guidance: N. Sridevi

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Abstract. Efficient healthcare management depends on accurate prescription handling, proper medication adherence, and continuous monitoring of patient health conditions. In everyday situations, many patients find it difficult to understand prescription instructions, remember dosage timings, or consistently follow treatment schedules. Such challenges often reduce treatment effectiveness and may negatively affect overall health outcomes.This research presents an Artificial Intelligence (AI) and Machine Learning (ML)–based enhanced health monitoring system designed to support intelligent healthcare tracking and efficient doctor prescription management. The proposed system allows healthcare professionals to generate digital prescriptions that clearly specify medication type, dosage amount, intake frequency, and treatment duration. These prescriptions are automatically converted into structured medication schedules that generate reminders and alerts to help patients follow their treatment plans more accurately.In addition to prescription management, the system records and monitors essential physiological parameters such as body temperature, heart rate, blood pressure, and body weight. These parameters allow healthcare providers to evaluate the effectiveness of prescribed treatments. [1], [2]. AI-driven healthcare platforms are capable of analyzing large volumes of medical data and identifying patterns [3].

Keywords: Health Monitoring System, Prescription Management, Medication Adherence, Artificial Intelligence, Machine Learning, Cloud Computing, Intelligent Healthcare.

1 INTRODUCTION

Digital technologies are increasingly transforming the healthcare sector by improving the efficiency, accessibility, and quality of medical services. Continuous monitoring of patient health conditions and proper adherence to prescribed medication are essential for achieving effective treatment outcomes. However, in many real-world situations, patients experience difficulty

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following medication instructions due to complex prescriptions, misunderstanding dosage instructions, or simply forgetting medication schedules. Such issues can significantly reduce treatment effectiveness and may also increase healthcare costs.

Recent developments in Artificial Intelligence (AI) and Machine Learning (ML) have introduced new opportunities to enhance digital healthcare systems [1], [2]. AI-driven healthcare platforms can analyze medical data and support decision-making [3]. When combined with IoT and cloud technologies, they enable efficient monitoring of physiological parameters [4], [8].

Despite these advancements, many existing healthcare applications focus on only a single functionality. Some systems are designed primarily for health monitoring, while others provide medication reminders. Very few systems combine both prescription management and health monitoring within a single integrated platform.

2 RELATED WORK

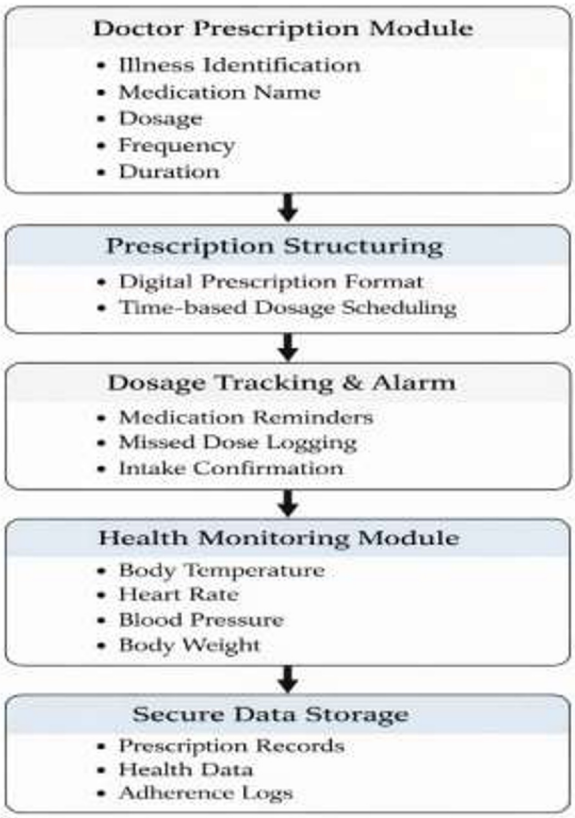
Several research efforts have explored the use of Artificial Intelligence and digital technologies in healthcare monitoring and analysis [1], [3], [7]. IoT-based healthcare systems enable real-time monitoring of patient vitals [4], [8]. However, these systems often increase complexity and cost.Mobile health applications have also been developed to improve medication adherence through reminders [5], [9]. While these systems are useful, they lack integration with doctor prescriptions and clinical data. Existing research highlights the need for integrated healthcare platforms combining monitoring and prescription management [6], [11].

Some studies have focused on using Internet of Things (IoT) devices and wearable sensors to continuously monitor patient health conditions. These systems allow real-time collection of physiological data such as heart rate, temperature, and blood pressure. Although such systems provide accurate monitoring, they often require specialized hardware and may increase the overall cost and complexity of solutions.

Other research works have concentrated on mobile health applications designed to improve medication adherence. These applications typically generate reminders based on schedules defined by patients. While reminder systems can help reduce missed medication doses, they often lack integration with official doctor prescriptions and clinical data.

3 METHODOLOGY

The proposed system integrates prescription management, medication tracking, health monitoring, and ML-based analysis into a unified platform. The modular architecture improves scalability and usability. Machine learning techniques such as decision trees, logistic regression, and clustering are used for analysis [1], [7]. These models help identify patterns in health data and medication adherence. Cloud-based systems are used for data storage and accessibility, ensuring scalability and security [8], [11]. The platform is implemented as a web-based application to ensure accessibility across multiple devices without requiring specialized hardware. The system emphasizes simplicity, reliability, and usability so that patients can easily manage prescriptions and monitor their health conditions.



A. System Design Approach

The architecture of the proposed system follows a layered and modular design structure. Each functional unit, including prescription management, health monitoring, data analysis, and user interaction, operates as an independent module while remaining connected within the overall system framework.

This design approach allows seamless integration of multiple healthcare functionalities while ensuring system scalability. A user-centered design strategy was adopted during development to ensure that prescription instructions and health data recording remain simple and easy to understand.

Doctor-generated prescriptions form the foundation of the system. This ensures that medication schedules are clinically accurate and reduces the risk of self-medication. Machine learning models are incorporated only to provide analytical insights rather than replacing medical decision-making.

B. Data Collection and Input Sources

The system processes structured healthcare data obtained from multiple sources. Prescription data is generated by authorized healthcare professionals and contains detailed information such as illness type, medication name, dosage strength, intake frequency, treatment duration, and additional medical instructions.

Health monitoring data consists of physiological parameters manually recorded by patients. These parameters include body temperature, heart rate, blood pressure, and body weight. These indicators were selected because they are commonly used in routine medical monitoring and are useful in evaluating treatment outcomes.

C. Machine Learning Techniques

Machine learning algorithms are used to analyze historical health and medication adherence data in order to identify patterns and trends. Lightweight and interpretable models such as decision trees, logistic regression, and clustering algorithms were selected due to their transparency and computational efficiency.

Decision tree models classify patient health states based on threshold values of physiological parameters. Logistic regression models estimate the probability of medication adherence risks using historical dosage records. Clustering techniques group similar health or adherence patterns to support comparative analysis.

Importantly, the analytical outputs generated by these models are intended to assist healthcare professionals rather than replace clinical judgment.

D. Cloud Infrastructure and Data Management

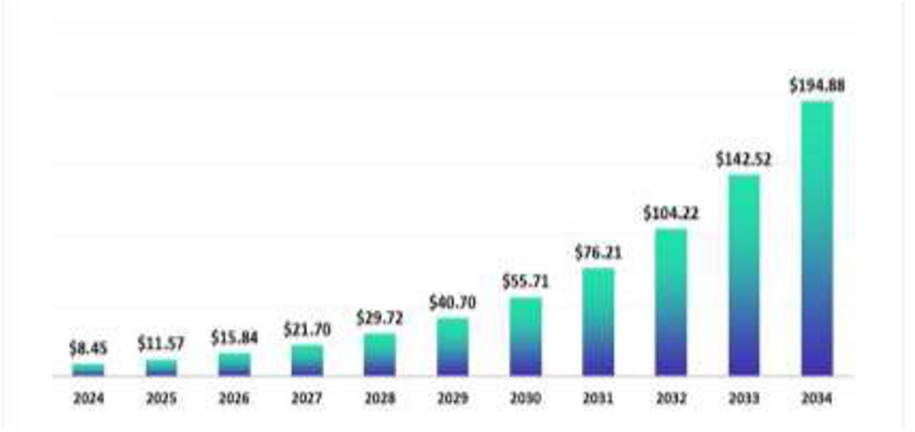
All patient records, prescriptions, and analytical results are stored within a cloud-based infrastructure. A relational database system is used to maintain structured data storage and support efficient data retrieval.

Cloud deployment ensures system scalability, data availability, and secure backup of healthcare records. Access to patient information is restricted through authentication mechanisms and role-based access control policies to maintain patient privacy and confidentiality.

E. Evaluation Methodology

The proposed system is evaluated using usability testing, functional validation, and adherence analysis. System performance is assessed based on medication reminder accuracy, reliability of dosage tracking, and consistency of recorded health data.

In addition, machine learning models are evaluated in terms of interpretability, stability, and practical usefulness. The evaluation focuses not only on predictive accuracy but also on how effectively the system supports healthcare management in real-world usage scenarios.



4 RESULTS AND DISCUSSION

The proposed system improves medication adherence by converting prescriptions into structured schedules. Previous research shows reminder-based systems improve adherence but lack clinical integration [5], [9].

The integration of health monitoring with prescription management enables better treatment evaluation. IoT-based systems have shown effectiveness in monitoring health parameters [4], [8], but the proposed system enhances integration.

Machine learning techniques provide analytical insights into patient behavior and adherence patterns [1], [7]. These insights support both patients and healthcare professionals. Compared to existing systems, the proposed approach provides a comprehensive solution integrating monitoring, prescriptions, and analytics [6], [11].

A. Prescription Execution and Medication Adherence

One of the main results observed from the proposed system is the improvement in the adherence of medications through the management of prescriptions. The prescriptions given by the doctor were converted into a computer-readable format that generated

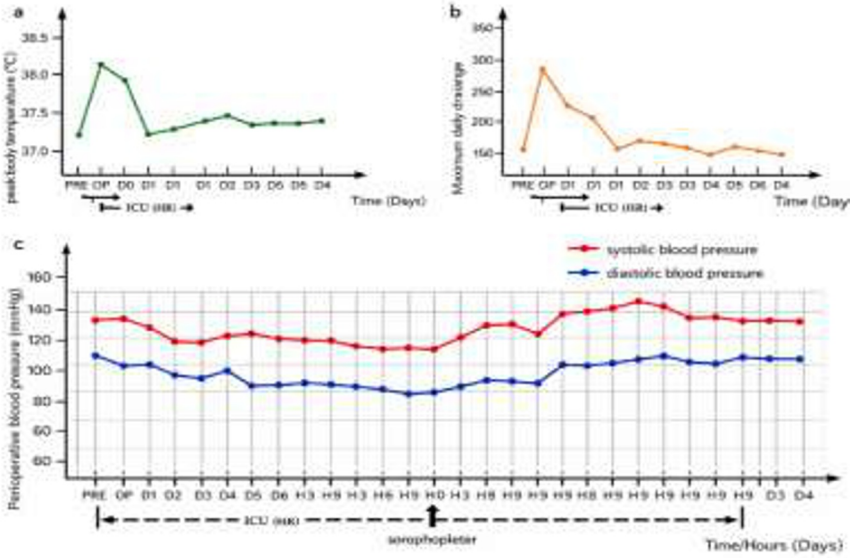
reminders for the medications to be taken. This eliminated the confusion associated with the prescriptions given to the patient.

The proposed system, when compared to the conventional medication reminder systems, uses the information provided by the healthcare professionals about the prescription of medications to the patient. This information is used to ensure the medication schedule is properly managed and follows the prescription given to the patient. During the evaluation of the proposed system, the user was able to adhere to the medication routine, and the system was able to track the dosages taken and the dosages missed.

Previous research on mobile health applications has indicated that reminder-based applications may improve medication adherence to a certain degree, although such applications may be based on schedules as defined by the patient and may not necessarily be compatible with those of the doctor. The proposed application, on the other hand, enhances the reliability of medication adherence by basing the reminders on those of the doctor.

B. Integration of Health Monitoring with Treatment Evaluation

Another important outcome of the system is the successful integration of health monitoring with prescription execution. The system is designed to monitor vital health parameters such as body temperature, heart rate blood pressure, and body weight, which are then related to prescription execution. This allows both patients and healthcare professionals to monitor how medication impacts health conditions. The existing healthcare monitoring systems usually do not relate physiological data with medication systems. This means that healthcare systems cannot relate medication adherence with health outcomes. The proposed system overcomes this limitation by integrating health parameter data with medication adherence data. During the course of evaluation, it was noticed that medication adherence resulted in the stabilization of health parameters. In instances where medication was skipped, it was noticed that health parameter improvement was inconsistent. This is an important outcome of integrating monitoring with medication execution.



C. Machine Learning–Based Analytical Insights

Machine learning approaches have been employed to analyze the historical data related to health conditions, which helped in identifying patterns related to the consumption of medicine. Such lightweight approaches, including decision trees, logistic regression, and clustering, have been utilized to obtain analytical results. Unlike other AI-based systems that have been developed for the prediction of diseases or diagnosis, the proposed system focuses on the analysis of the treatment process. As mentioned earlier, the results obtained through the analysis indicate patterns related to the consumption of medicine, including missed doses or delayed consumption. Such results are useful for the patient, who gets aware of the consumption patterns, as well as the doctor, who can use the information for the proper management of the disease during the follow-up sessions. Previous studies have shown the effectiveness of machine learning approaches, including AI, for the prediction of results. However, the proposed system is useful for the expansion of the application of AI, which is currently limited to the prediction of results.

D. Comparison with Existing Healthcare Systems

When the proposed system is compared with the existing healthcare systems, the proposed system offers a more comprehensive treatment management system.The existing systems mostly deal with either health monitoring or medication reminders only. The sensor-based health monitoring systems collect health parameters using sensors, but the system becomes complex and expensive due to the usage of special devices for sensor-based systems. The medication reminder systems only provide reminders, but the system is not linked with prescriptions and health information.The proposed system overcomes the limitations of the existing systems by providing a combined solution for digital prescriptions, medication dosages, health parameters, and machine learning-based systems within a single system. The proposed system will provide transparency in the treatment system, and the treatment progress will be easily monitored by healthcare experts.

E. System Reliability and Usability

The results of the functional evaluation revealed the stability of the system's modules, including the prescription scheduling, alert systems, data storage, and analytical systems. In addition, the cloud-based system ensured the reliability of access to prescriptions and patient information, as well as the consistency of the data used in the

system. The user interface was also developed with the purpose of enabling the simple usage of the system's features, particularly the prescriptions and monitoring systems, to allow the patient to easily record their health parameters and monitor the intake of their medication. In addition, the users were able to understand the schedules of their prescriptions and the progress of their treatment. The results obtained in this study revealed that the proposed system is able to address the major limitations of the current healthcare monitoring systems, particularly in the integration of the system's features, which include the prescriptions, health monitoring, and intelligent systems. The framework to additional modalities.

5 CONCLUSION

The study presents an AI and ML-based health monitoring system that improves medication adherence and healthcare management. The integration of prescription tracking, health monitoring, and analytics enhances treatment effectiveness. Machine learning techniques provide valuable insights into patient health and adherence patterns [1], [7].
The system has been designed to monitor important health factors, including body temperature, blood pressure, heart rate, and body weight. This improves the ability to assess medication effectiveness by associating health factors with prescription schedules, helping patients understand how medication adherence impacts their recovery. Furthermore, machine learning is employed to analyze medication adherence patterns and health trends, offering valuable knowledge that aids both patients and healthcare professionals in improving medication adherence.

The proposed system is considered an improvement over existing healthcare application systems, as it offers an improved healthcare treatment management system by integrating prescription tracking, health monitoring, and analysis into a single system. The study has proven that the proposed approach has the ability to improve medication adherence, increase patient knowledge, and improve healthcare.

6 FUTURE WORK

Even though the proposed AI and ML-based enhanced health monitoring system shows promise in the management of prescriptions, tracking of medication adherence, and the integration of health monitoring, there is still room for improvement to make the system even more efficient and useful in real-world health environments.

Future improvements include integration with IoT devices for automated data collection [4], [8]. Advanced ML and deep learning techniques can further enhance predictive capabilities [1], [7]. Integration with telemedicine and electronic health record systems will improve healthcare accessibility and coordination [6], [11].

The proposed system could also be improved through the incorporation of advanced machine learning and deep learning techniques to analyze larger and more diverse health data from the healthcare domain. This will ensure the early detection of abnormal health patterns, prediction of medication adherence risks, and the provision of personalized health recommendations.

Future enhancements could also include the incorporation of telemedicine functionality that enables the direct communication between doctors and patients through the system. This would, in turn, enable healthcare professionals to monitor patient health trends, update prescriptions, and provide timely medical advice without the need for physical consultations. Furthermore, the system's integration with electronic health record systems, as well as hospital information systems, could also be explored to enable the seamless sharing of medical information between various healthcare organizations.

Finally, the system's security, including the incorporation of advanced encryption techniques for ensuring the security of patient information, would also be critical in ensuring the safe management of patient information as the system is expanded to support larger-scale healthcare organizations.

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