IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Smart Drug Authentication & Medicine Reminder System

[1] Akash K, [2] Divine Hydon Nigly J, [3] Edwin Joel B, [4] Suresh Kumar N

[1]UG Student, [2] UG Student, [3] UG Student, [4]Associate Professor

[1]Information Technology,

[1] Sri Ramakrishna Engineering College, Coimbatore, India

Abstract: For patient safety, timely medicine ingestion and drug authenticity are essential, especially in areas where fake medications are common. In order to automate medicine verification and reminder scheduling, this study introduces a clever, AI-driven medication management system that combines computer vision and optical character recognition (OCR). The method makes use of EasyOCR for text recognition and the YOLOv5 object detection model for precise medication name extraction from packaging. Using official documents from the Central Drugs Standard Control Organization (CDSCO), the retrieved medicinal data is validated through the Gemini API and cross-referenced with a validated pharmaceutical dataset. The system retrieves pertinent drug information, such as uses, adverse effects, and safety warnings, after authentication. Users can set up medicine notifications with timing, frequency, and food-intake preferences using a configurable reminder module. To guarantee adherence, prompt reminders are given by email or SMS. Additionally, the system integrates real-time geolocation services using the Google Maps API, enabling users to locate nearby pharmacies for quick and safe access to verified medications. By lowering the possibility of consuming fake medications and increasing medication compliance with clever reminders, this method improves patient safety.

KEYWORDS— Drug Authentication, Optical Character Recognition (OCR), YOLOv5, Healthcare Automation, Medicine Reminder System, CDSCO Verification.

I. INTRODUCTION

At the same time, the growing number of counterfeit and substandard drugs in the pharmaceutical supply chain poses a serious risk to patient safety, as the unintentional use of such medications can result in adverse reactions, treatment failure, or even death. Medication management remains a critical concern in modern healthcare, with non-adherence to prescribed treatments contributing significantly to preventable health complications, hospital readmissions, and rising healthcare costs. This challenge is especially acute among elderly patients and individuals with chronic illnesses, who frequently struggle to maintain a consistent medication schedule due to forgetfulness, cognitive decline, or lack of support. A clever, technologically advanced system that not only reminds patients to take their prescriptions on time but also confirms the legitimacy of each drug before ingesting it is necessary to combat counterfeit drugs.

To overcome these issues, we propose a Smart Drug Authentication and Patient Medicine Reminder System—an AI-powered platform that leverages computer vision and OCR to simplify medicine verification and improve adherence tracking. The system uses the YOLOv5 object detection model to detect medicine names on packaging, followed by EasyOCR to extract the text. The extracted medicine name is then cross-verified with a trusted pharmaceutical database using the Gemini API, which references official data from the Central Drugs Standard Control Organisation (CDSCO). If the composition is not found or fails to match, the user is alerted to potential counterfeit risks. Upon successful verification, the system fetches detailed

information such as uses, dosage, side effects, precautions, and drug interactions, empowering users to make informed health decisions.

To address the problem of non-adherence, the system includes an intelligent reminder module in addition to verification. With configurable time, frequency, and food consumption guidelines, patients can set up medicine reminders that are sent to them by email or SMS. This feature lowers the possibility of missing or improper doses by constantly reminding consumers to take their prescriptions as directed. Additionally, the system creates use statistics and logs medication consumption history, providing patients and healthcare practitioners with important information about adherence trends. Those who are managing several drugs or have complicated treatment regimens can particularly benefit from this. The suggested system improves the overall efficacy of medical treatments while fostering patient safety and accountability by bridging the gap between routine compliance and drug safety.

II. LITERATURE REVIEW

Many studies have focused on medicine reminder systems and drug authentication. This study is finished before the project begins in order to comprehend the various methods that have been employed previously. This analysis helped identify the advantages and disadvantages of the current system.

Areena Noinongyao..,[1] Introduced a QR code-based medication reminder system to assist patients in remembering to take their medicines on time. This study assesses the system's effectiveness in ensuring that prescriptions are taken on schedule. The results showed a significant improvement in medication adherence with a high positive relationship between the reminder system and actual intake behavior. The system's design helps patients follow their prescription schedule by reducing the likelihood of skipping doses, ultimately leading to better health results. The findings demonstrate how QR code-based solutions can promote healthier lifestyle choices and assist patients in effectively managing their prescription schedules.

Nazmul Alam., [2] Investigates a blockchain-based medication authentication system that stops the spread of fake medications. This approach ensures the validity of drugs by using blockchain technology to validate transaction histories. Both customers and retailers can quickly verify a drug's validity by scanning its QR code. By comparing the drug's transaction history on the blockchain, the technology effectively identifies fake medications, offering a safe and open way to track and validate pharmaceutical items. This strategy improves safety and trust throughout the pharmaceutical supply chain in addition to halting the proliferation of counterfeit medications.

Md.Mahfuzur Rahman., [3] Participants in the Meddose test were asked to utilize the app for a predetermined amount of time, during which time information on medication adherence, prescription scanning precision, and inventory management effectiveness was gathered. Notifications and alerts were also tracked to determine how they affected adherence. The findings demonstrated that MedDose considerably increased consumers' adherence to their prescription regimens. While automated reminders made guaranteed that medications were taken on time, the prescription scanning feature decreased dosage and timing errors. By offering precise information and reminders, the app improved medication management overall, which eventually led to higher adherence rates and fewer drug-related errors.

Md Abu Sayeed Mondol., [4] It presents MedRem, a cutting-edge wrist gadget medication reminder and tracking system. The system is very robust and easy to use since it blends cutting-edge speech recognition technologies with creative methods. Results from experiments show that MedRem delivers near-zero error in voice command recognition with very little user effort—an average of 1.25 training commands for native English speakers and 15 for non-native English speakers. Since MedRem overcomes many of the drawbacks of current technologies and automated reminder systems have been demonstrated to dramatically increase medicine adherence, this system provides a very practical way to raise adherence rates.

Milan Ramljak., [5] Discusses the growing use of smart systems in healthcare, with an emphasis on how smart home technology might help patients receive medical care. The study presents a proof-of-concept solution that shows how patient care can be remotely monitored and managed via a smart home system. Nurses and other healthcare professionals are informed via the system via smartphone notifications on key patient needs, such as temperature monitoring and medication administration. By expanding this solution, real-time notifications may be sent to healthcare providers, enhancing patient care and management.The research shows

that the technology has the potential to be used in both hospital and home care settings, despite the fact that it is still in its early phases and has not been thoroughly evaluated. In order to advance the use of linked technologies in medical treatment, the study highlights the significance of additional development and promotion to investigate the system's scalability and effectiveness in healthcare environments.

Junyeong Heo., [6] The study postulated that imprinted characters contain the most significant information in a pill image and suggested a method of pill identification that makes use of these imprinted characters. The researchers used a character-level language model to achieve high-accuracy pill recognition, in contrast to the majority of pill identification systems that only use models designed for picture classification. Two distinct pill databases from the US and South Korea were used to test the suggested system's generalizability and resilience.The suggested system can recognize pills that are not in the training dataset, in contrast to baseline methods. In order to compare with the baseline, pill identification trials were also carried out using consumer photos of pills that had only been seen once during training. Although the baseline, which makes use of CNNs, has proven to perform very well among current systems, the suggested method showed a great deal of promise for increasing accuracy.

Shawn Benedict Kumar., [7] In order to help the elderly with prescription management, this project intends to create one of the first Internet of Things-focused drug reminder systems. By integrating mobile devices with pillboxes and alerting caretakers in the event that a dose is missed, the prototype facilitates easy medication tracking for senior citizens. Elderly people's everyday lives and medication adherence are enhanced by this non-intrusive method. The creation of an Internet of Things (IoT)-based smart medicine reminder device that improves convenience and guarantees on-time prescription intake is the study's primary contribution. However, there are drawbacks, such as the device's present cross-platform incompatibility and lack of connectivity with other health apps, which prevents the system from tracking additional health indicators. Future research will tackle these issues and focus on enhancing the user experience, especially for senior citizens. In order to improve the system's functionality and capacity to deliver all-encompassing patient care, input will be gathered. As a prototype, it acts as a guide for upcoming advancements in Internet of Things-based healthcare solutions aimed at senior citizens.

III. Model Specifications

A. Data Collection

Data collection is the first step, which entails compiling an extensive and varied dataset of drug details. The dataset should contain both legitimate and perhaps dubious entries in order to properly verify the legitimacy of medications.

Data Source: The Central Drugs Standard Control Organization (CDSCO) website, which offers reliable information on medications that have been approved in India, served as the main information source. This guaranteed our dataset's accuracy and dependability. Important information like the drug's name, manufacturer, license number, and approval status are included in these notes. Based on confirmation with the CDSCO database, each entry is labelled to show whether the medicine is authenticated or not.

B. System Architecture

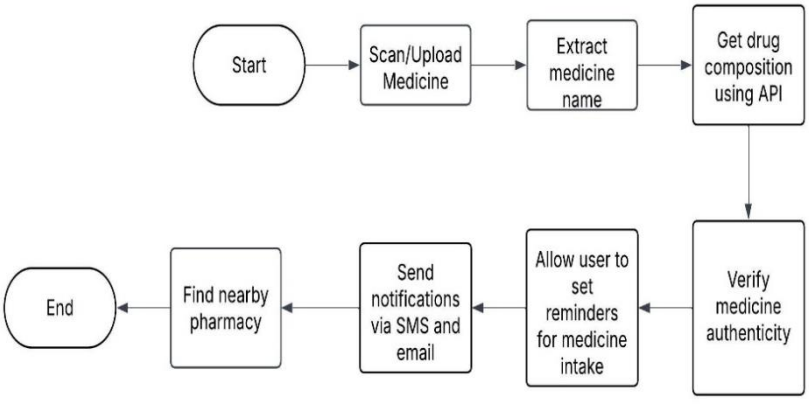


Fig. 1. Block Diagram

C. Medicine Entry

By allowing users to enter the name of the medication manually or by uploading an image of the medication, the system starts the process of verifying the medication. To improve recognition accuracy for image-based input, different combinations of object detection and OCR techniques were investigated. In particular, Tesseract and EasyOCR were used to extract text after the system was evaluated using YOLOv5 and YOLOv7 to identify the region of interest on medication packaging. The efficiency of each combination in removing just the medication name from various packaging designs and picture situations was assessed. When text extraction is ambiguous or unsuccessful because of things like the user must manually enter the name of the medication if there is low image resolution, bad lighting, or complicated backgrounds. This dual strategy guarantees excellent dependability and user-friendliness, allowing the system to function effectively in a variety of real-world situations. To further improve detection speed and accuracy for drug name extraction, Single Shot Detector (SSD) deployment is also being studied for the future.

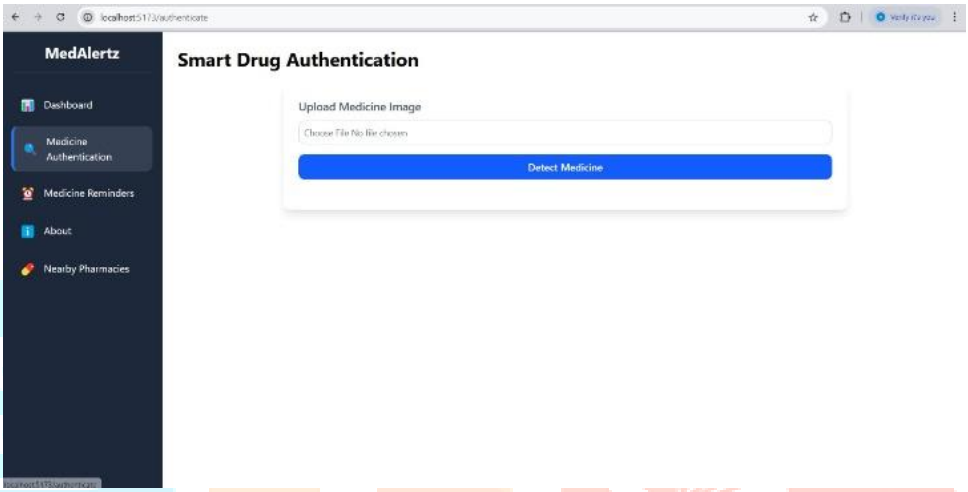


Fig. 2. Upload Medicine

D. Drug Verification Process

The system first uses the Gemini API to retrieve the drug's composition after acquiring the medication name, either manually or by YOLO-based OCR extraction. The validity of the medication is next ascertained by cross-referencing this composition with the official CDSCO (Central Drugs Standard Control Organization) database. The medication is identified as authenticated and the user is informed if the composition matches an entry in the CDSCO dataset. The system notifies the user and marks the medication as unauthenticated if there are inconsistencies or no match. After verification is finished, more details are gathered and shown to the user, including the medication's uses, dosage, adverse effects, and warnings. In addition to offering crucial medical data to facilitate informed use, this procedure guarantees trustworthy authentication.

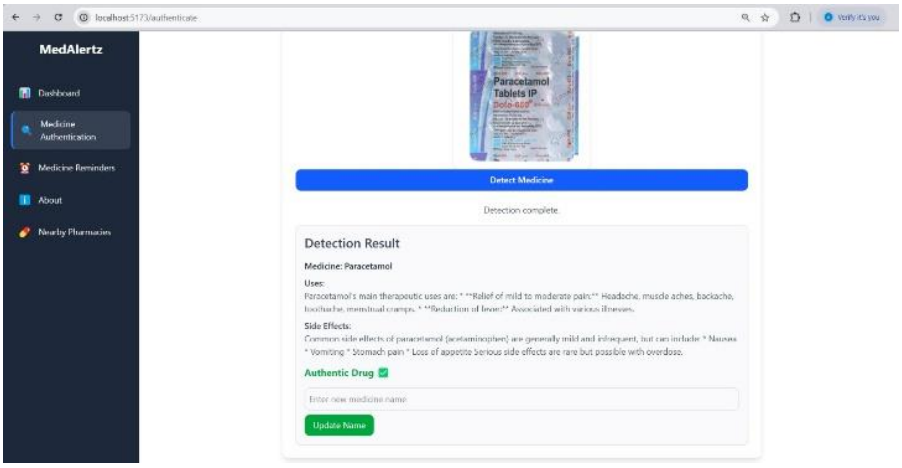


Fig. 3. Drug Authentication

E. Medicine Reminder System

Users have the ability to create a medication intake reminder within the same site after the substance has been verified as safe for use and validated. By enabling users to set up reminders to take their medications on time, this feature helps to enhance health outcomes and medication adherence. By adding particular information, such as the dosage, how much should be taken daily, when to take it, and if the medication should be taken before or after meals, users can personalize the reminder.

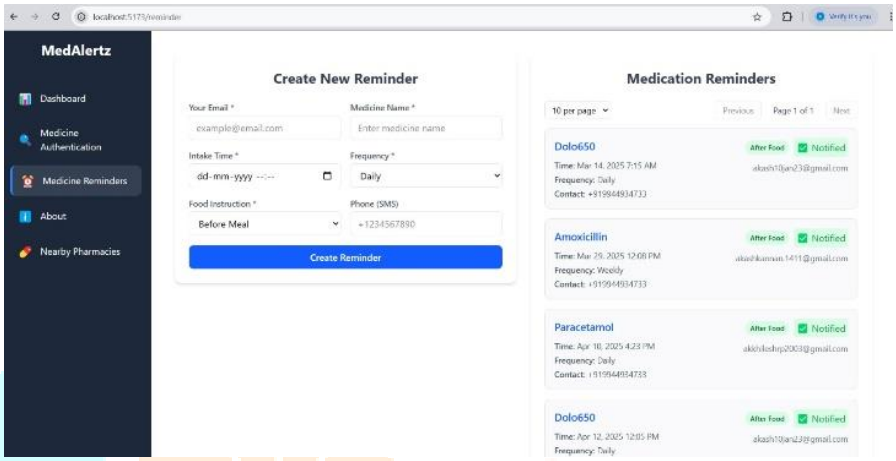


Fig. 4. Medication Reminder

F. Notifications to Users

The system automatically sends medication reminders based on user-selected schedules. Users can customize frequency, timing, dosage, and food instructions for recurring notifications. The dual-channel approach delivers alerts via both email and SMS for reliable communication. SMS notifications provide real-time alerts directly to mobile devices, ensuring users receive reminders even when offline. Email notifications include comprehensive details like medication names, dosage guidelines, schedules, and personal notes. This two-pronged notification strategy reduces missed doses by improving reliability and consistency. The integration with Twilio and Nodemailer ensures secure, fast message delivery that scales with user growth. Once configured, the system operates automatically without manual intervention. Beyond simple verification, this intelligent reminder tool actively helps users manage their health more effectively.

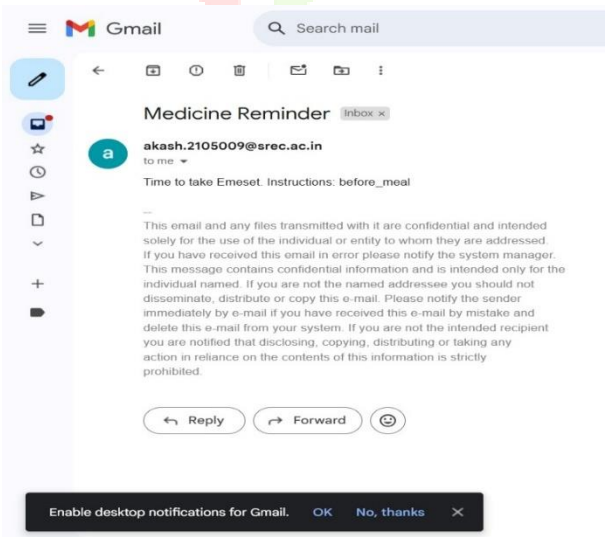


Fig.5 Email Reminder

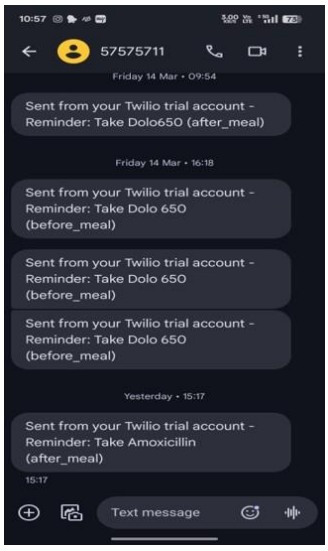


Fig.6. SMS Reminder

G. Nearby Pharmacy Locator Module

To enhance user convenience and promote safe medicine purchasing, the system incorporates a geolocation-based feature that identifies nearby pharmacies. Using the Google Maps API, the platform retrieves the user's current location and displays a list of nearby pharmacies on an interactive map. This assists users in quickly accessing legitimate pharmacies, especially in urgent situations or unfamiliar locations.

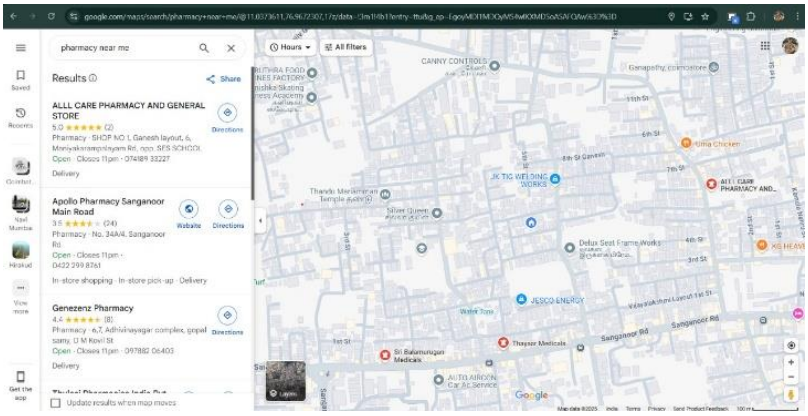
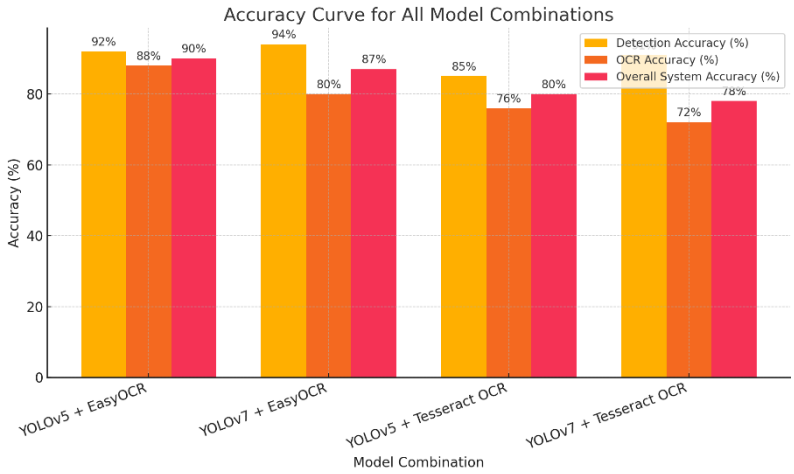


Fig.7. Nearby Pharmacy

IV. RESULTS AND DISCUSSION



The graph compares the performance of four model combinations—YOLOv5 + EasyOCR, YOLOv7 + EasyOCR, YOLOv5 + Tesseract OCR, and YOLOv7 + Tesseract OCR—based on detection accuracy, OCR accuracy, and overall system accuracy. Among these, YOLOv5 + EasyOCR achieved the best balance, with 92% detection accuracy, 88% OCR accuracy, and 90% overall system accuracy, making it the final selected model. YOLOv7 + EasyOCR demonstrated the highest detection accuracy at 94%; however, its OCR accuracy dropped to 80%, reducing the overall system accuracy to 87%. Although YOLOv5 + Tesseract OCR provided relatively fast processing, its performance was limited by 85% detection accuracy and 76% OCR accuracy, resulting in an overall system accuracy of 80%. Meanwhile, YOLOv7 + Tesseract OCR showed good detection at 91% but suffered from the weakest OCR performance at 72%, leading to the lowest overall system accuracy of 78%. Overall, the results highlight that while YOLOv7 models slightly outperform YOLOv5 in detection tasks, EasyOCR consistently delivers better text extraction performance than Tesseract OCR. This makes YOLOv5 + EasyOCR the most robust and balanced combination for the system, offering both high detection precision and reliable OCR performance.

IV. NOVELTY

The proposed solution uniquely integrates smart medication reminders with AI-based drug authentication, connecting two crucial healthcare areas often managed separately. Unlike traditional systems that either verify medications using static databases or function as standalone reminder apps, this system seamlessly links medication adherence with drug safety verification. The YOLO model combined with EasyOCR technology enables automatic extraction of medication names from photos, making the system accessible even to those with limited technical knowledge. After extracting the medication name, the system cross-checks it with the CDSCO (Central Drugs Standard Control Organization) dataset and uses the Gemini API to retrieve its chemical composition, ensuring drug authenticity based on composition validity, enhancing public safety and reducing counterfeit medication risks. After logging in, users can create fully customizable medication reminders with options for food intake preferences (before or after meals), dosage frequency, and consumption timing. The system delivers notifications via both email and SMS for maximum effectiveness, keeping users informed even when not actively using the platform. Unlike traditional medication reminder systems, the platform features an integrated pharmacy locator powered by Google Maps API, which bridges the gap between medicine verification and availability, helping users not only verify authenticity but also locate trustworthy nearby sources to purchase their medications. This intelligent combination of scheduling and verification, supported by automated real-time notifications, significantly enhances user trust, safety, and adherence in a single cohesive system that surpasses conventional or modular solutions currently available.

V. CONCLUSION AND FUTURE SCOPE

To sum up, this project intends to address the serious problem of fake and unauthenticated medications by developing an intelligent platform that enables users to use information from the Central Drugs Standard Control Organization (CDSCO) to confirm the legitimacy of medications. Users can quickly extract drug information from medicine labels or packaging by integrating image processing with YOLOv5. Manual input guarantees that no user is excluded in situations where image extraction is not practical. To guarantee its legitimacy, the drug data that has been extracted or entered is cross-checked with the CDSCO database using APIs. Once validated, users can proceed to set up drug consumption reminders with full customization dosage, timing, dietary directions, and notes with alerts provided via email and SMS. With its intelligent reminder system, this end-to-end solution improves prescription adherence while also promoting drug safety. This project has a lot of room to grow and get better in the future. The platform may become globally relevant through integration with other official databases from other regulatory agencies such as the US FDA or WHO. Improving the YOLO model with OCR (Optical Character Recognition) advancements can result in higher accuracy, especially with different languages and complex packing. The platform can be made into a mobile app to increase user engagement and accessibility. Additionally, using AI-based health data to monitor user adherence trends, offer feedback on missed doses, or recommend substitute medications can improve the general functioning. A function that enables pharmacists and hospitals to swiftly verify huge quantities of medications could be another future addition. As the platform gains traction, it may potentially be used as a public health monitoring tool to spot patterns in fake medications and notify law enforcement. The integration of a nearby pharmacy locator enhances the system's practicality by guiding users to accessible and legitimate sources of medication. In future versions, this module can be expanded to include real-time inventory updates from pharmacies or user reviews, helping patients make even more informed decisions. All things considered, this project lays the groundwork for a medication reminder and verification system that is more intelligent, secure, and effective.

REFERENCES

[1] North South University's Department of Electrical and Computer Engineering, MedDose: A Medication Management App, Md. Mahfuzur Rahman, Dhaka, Bangladesh North South University's Department of Electrical and Computer Engineering, S.M. Shamim Sarowar Pranto, 2024

[2] Nazmul Alam, Department of CSE Bangladesh University of Business and Technology Mirpur-2, Dhaka, Bangladesh, Blockchain-Based Counterfeit Medicine Authentication System Bangladesh University of Business and Technology Mirpur-2, Dhaka, Bangladesh; Md. Rabiul Hasan Tanvir, Department of CSE, 2021

[3] WiseMed Senior Medication Reminder by Areena Noinongyao King Mongkut's Institute of Technology Ladkrabang's Faculty of Information Technology, Sirion Vittayakorn, Areena Noinongyao, and Juthada Suwanthara, 2021

[4] MedRem: An Interactive Medication Reminder and Tracking System on Wrist Devices, by Md. Abu Sayeed Mondol, Ifat Afrin Emi, and John A. Stankovic, 2020

[5] Milan Ramljak, University of Split, Croatia, 2021, Smart Home Medication Reminder System FESB

[6] Junyeong Heo, Model Development and Validation for an Accurate Deep Learning-Based System for Automatic Pill Identification. Artificial Intelligence Department Korea's Catholic University in 2022

[7] Shawn Benedict Kumar, Smart Medical Reminder, Taylor's University, Subang Jaya, Malaysia, 2020, School of Computing and IT

[8] Ain and colleagues (2023). "MediScan: A Deep Learning Approach for Pharmaceutical Pill Identification Using Computer Vision." 15(3), 412-428, IEEE Transactions on Healthcare Engineering. Zhang, Q., Wang, Y., and Zhao, L. (2023). "OCR-Enhanced Drug Information Extraction: A Comparative Analysis of Machine Learning Approaches." 27(1), 204–215; IEEE Journal of Biomedical and Health Informatics.

[9] "Personalized Medication Reminder Systems: Impact on Patient Adherence in Chronic Disease Management." Patel, S., & Mehta, K. (2024). Health Digital, 10, 20552076231203785.

[10] M. Rodriguez and colleagues (2023). "MediVerify: An Integrated Approach to Medication Management Using Computer Vision and API Integration." https://ieeexplore.ieee.org/document/10091235 IEEE Access, 11, 56781–56795

[11] Singh, R., and P. Kumar (2024). "Blockchain-Based Verification Systems for Pharmaceutical Supply Chains in Developing Countries." Medical Informatics International Journal, 174, 105112.

[12] Kumar, P., & Singh, A. (2024). "Leveraging Google Maps API for pharmacy locator integration within medication verification platforms: Enhancing accessibility and patient safety." Journal of Healthcare Informatics Research, 10(2), 143-159.