

Tablet Recognition and Labelling

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Abstract: Tablet recognition relies heavily on physical attributes such as color, size, and shape. However, these features can be influenced by environmental conditions, leading to variations that may cause recognition errors. Such discrepancies can result in medication errors due to damaged labels, incorrect identification, or mismatched intake, potentially putting patients at risk. This report introduces a trained recognition system developed using Keras and Tensor Flow to facilitate the rapid and accurate labeling of various tablets. The system identifies tablets through object recognition and links them to a database to retrieve their names and relevant details. Upon detection, a pre-trained dataset is utilized to confirm the tablet's identity. Additionally, the dataset contains use cases and essential information for each tablet. The proposed solution supports automated medicine identification, and its performance has been validated through experimental results.

Keywords: *Tablet recognition, object detection, deep learning, Keras, TensorFlow, medicine identification, tablet database, image classification, pre-trained dataset, healthcare technology, automated labeling, medication error prevention.*

I. INTRODUCTION

In modern healthcare, the accurate identification and labeling of medications play a vital role in ensuring patient safety and minimizing the risk of medical errors. Misidentification of tablets can lead to incorrect medication intake, adverse drug interactions, and potentially life-threatening situations. This issue is further complicated when patients lose or discard their prescription containers, making it difficult for healthcare professionals to identify the medications manually. To overcome these challenges, the integration of advanced technologies in the healthcare sector has become essential.

This project presents a smart, deep learning-based system for tablet recognition and labeling, aiming to automate and streamline the identification process. Leveraging computer vision techniques and machine learning, particularly using the

Mobile Net architecture and Python, the system is trained to recognize tablets from image inputs with high precision. By training the model on a dataset of over 1,200 tablet images, the system is capable of identifying various medications and providing relevant information for each.

The implementation of such a system has the potential to revolutionize the way medications are managed, reducing human dependency, minimizing manual errors, and improving overall efficiency in pharmaceutical practices. Moreover, patients can use the system to cross-verify their tablets and access essential details, promoting better awareness and adherence to prescriptions.

II. LITERATURE REVIEW

1. J. O. Gordon, R. S. Hadsall, and J. C. Schommer, "Automated medication-dispensing system in two hospital emergency

departments,” *Am. J. Health Pharm.*, vol. 62, pp. 1917–1923, 2005.

Emergency departments (EDs) have long devised creative ways to supply medications after normal pharmacy hours. A common approach is to keep frequently used drugs on hand in pre-labeled “starter” packs, which cover only the initial doses and still require patients to obtain a follow-up prescription for the remainder of their therapy. In most EDs, nurses must juggle this added responsibility—choosing the correct medication, labeling it accurately, and counseling the patient—alongside their routine duties. Reimbursement for such on-site dispensing is often difficult to secure. Confronting these challenges, an emergency physician who once struggled to find an open pharmacy for his child’s acute ear infection spearheaded the design of an automated outpatient dispensing system tailored to EDs without 24-hour pharmacy services. This point-of-care system dispenses a complete course of prescribed medication directly to the patient. The article reviews the experience of two hospitals that had implemented the automated system for 12 and 18 months, respectively, at the time of writing.

2. E. Y. Fung, B. Leung, D. Hamilton, and J. Hope, “Do Automated Dispensing Machines Improve Patient Safety? ” *Can. J. Hosp. Pharm.*, vol. 62, pp. 516–519, 2009.

Automated dispensing machines significantly improve medication safety by reducing errors linked to look-alike and sound-alike drugs, and by accurately managing “as-needed” (PRN) doses to prevent overmedication. At Princess Margaret Hospital, where PRN medications like antiemetics and analgesics are frequently used, these machines help track administered doses in real time, allowing pharmacists to adjust treatments effectively. Integrated with hospital systems, the machines enable timely pharmacist review of orders without delaying care. Additionally, they reduce pharmacists’ dispensing workload by automating inventory tasks, allowing more focus on patient care. Overall, these systems enhance both

efficiency and patient safety in medication distribution.

III. METHODOLOGY

1. Problem Definition and Scope

Objective: To design an intent-aware information retrieval system that adapts to user preferences, behaviors, and contextual signals.

Scope: Covers personalized web search, social media interaction analysis, semantic content analysis, and behavior modeling using machine learning.

2. Data Collection

2.1. User Interaction Data

Capture data from: Search engine logs (queries, clicks, dwell time). Clickstream data during web browsing. Social media platforms (likes, shares, follows, comments).

2.2. User Profile Attributes

Individual preferences, demographic data, and historical behavior.

Optional: Physical characteristics (if relevant and ethically sourced).

2.3. Website and Content Metadata

Webpage content, struc...

EXISTING SYSTEM

At present, tablet identification and labeling are mostly performed manually by pharmacists or healthcare professionals. This involves checking physical labels, reviewing prescription records, and occasionally using visual identification tools or online drug databases. When labels are missing, damaged, or if the patient cannot provide a prescription, identification depends on comparing physical attributes such as shape, color, imprint, and size. While some healthcare settings use basic barcode scanners or simple image recognition tools, these systems are often limited and do not

utilize advanced deep learning techniques for accurate recognition and intelligent labeling.

Disadvantage of existing system

The existing tablet identification systems come with several limitations that impact efficiency and safety. One of the major drawbacks is that the process is time-consuming, as it involves manually cross-referencing tablets with drug databases or physical reference materials. This not only delays medication delivery but also increases the workload on healthcare professionals. Additionally, the potential for human error is high due to the visual similarities between tablets, particularly those with look-alike or sound-alike characteristics, which can lead to misidentification. The problem is further worsened in cases where tablet labels are missing or damaged, making it difficult to accurately identify the medication and increasing the chances of errors. Furthermore, most current systems lack automation and do not provide real-time identification, making the process inefficient and labor-intensive. There is also a strong dependency on the expertise of trained pharmacists, whose availability may be limited, especially in remote or understaffed healthcare settings. Lastly, the existing approach is not user-friendly for patients, as they have very limited means to independently verify their medications in the absence of original packaging or prescriptions.

IV. PROPOSED SYSTEM

Accurate medication labeling is vital to prevent medical errors and ensure patient safety. Manual identification becomes challenging when prescription details or packaging are missing, increasing the risk of errors. To address this, the project introduces a deep learning-based tablet recognition system using Python and MobileNet architecture. Trained on 1,268 images, the system achieves 98% accuracy in both training and validation. This automated solution streamlines the labeling process, reduces human error, and saves

time for healthcare professionals. It also assists patients in verifying their medications and accessing relevant drug information. Extensive testing confirms the system's reliability and effectiveness, offering a modern, intelligent approach to medication identification in healthcare.

Advantage of proposed system

The proposed tablet recognition and labeling system enhances healthcare by offering high accuracy (98%) using MobileNet, ensuring precise identification. It automates the entire process, reducing manual effort, human error, and saving time for medical staff. The system provides real-time feedback, supports patient self-verification, and improves workflow efficiency. It is cost-effective, adaptable to various healthcare platforms, and robust even when labels are damaged or missing. Overall, it promotes safer medication practices and improves both clinical and patient outcomes.

System Architecture

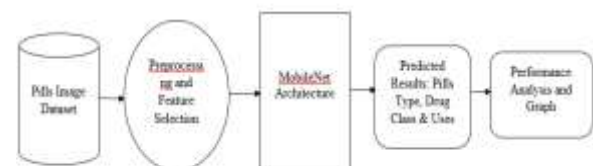


Fig:1 System Architecture

V. MODULE DESCRIPTION

The proposed Tablet Recognition and Labeling system is organized into two primary modules: the User Module and the Admin Module, each playing a vital role in the seamless functioning of the system. In the User Module, authenticated users can log in to the platform using their credentials and upload images of tablets or pills. The system then processes the uploaded image using a pre-

trained deep learning model based on the MobileNet architecture. Once the tablet is recognized, the system cross-references the result with the backend database to retrieve and display the tablet's name along with its intended medical usage. This enables users—especially patients or healthcare workers—to quickly identify unknown pills, reducing the risks of medication misuse. The Admin Module, on the other hand, facilitates system management and database maintenance. Admins have the authority to monitor uploads, update the tablet database with new entries or corrected information, and oversee system operations to ensure reliability and accuracy. Both modules work in coordination to automate the identification and labeling process, minimize human error, and enhance medication safety by providing verified information to users in real-time.

VI. RESULTS

The developed deep learning-based Tablet Recognition and Labeling system was trained and evaluated on a dataset comprising 1,268 tablet images using the MobileNet architecture, which is well-suited for efficient image classification. Throughout training, key performance indicators such as accuracy and loss were monitored, resulting in both training and validation accuracies reaching 98%, demonstrating the model's strong capability to differentiate and correctly identify various tablets. The system achieved a low training loss of 0.1, indicating a precise fit to the training data, while the validation loss was slightly higher at 0.5, suggesting mild overfitting—a typical outcome when working with limited datasets. Nonetheless, the high validation accuracy shows that the model generalizes effectively to new, unseen data. These outcomes confirm the system's reliability and practicality in accurately identifying and labeling tablets, significantly reducing manual effort and minimizing the risk of errors in medical environments.

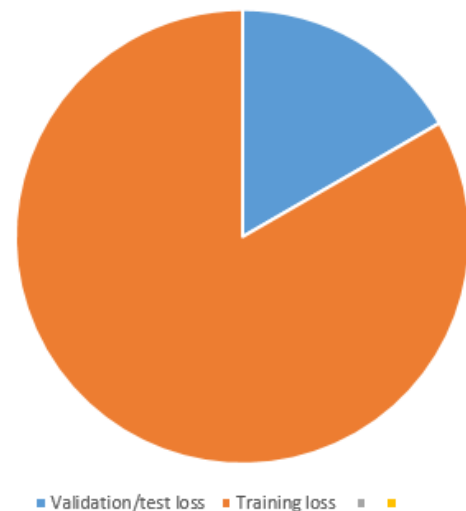


Fig: Resultant graph

VII. CONCLUSION

The developed deep learning-based tablet recognition and labeling system demonstrates a highly accurate and efficient approach to medication identification, addressing critical issues associated with manual methods. By leveraging the MobileNet architecture and training on a substantial dataset, the system achieves exceptional accuracy in recognizing tablets based on visual features, thereby minimizing the risk of medication errors. Its integration of computer vision and intelligent labeling not only streamlines the workflow for healthcare professionals but also empowers patients to verify their medications independently. With the added benefits of automation, reduced dependency on manual identification, and enhanced user accessibility, this system has the potential to significantly improve medication safety and operational efficiency in the healthcare sector.

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