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Analysis of Scanned Medical Prescription using Machine Learning

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Abstract:- This project proposes an end-to-end solution for the automatic detection and extraction of medication names from handwritten medical prescriptions by doctors. It does this by combining computer vision and deep learning techniques. The system consists of two primary components: a YOLOv5-based medication identification model that locates and crops drug names from prescription photographs, and a deep learning text recognition (OCR) model that extracts textual information from the cropped medicine name areas.

Keywords:- *Computer Vision, Machine Learning Model Based on Yolov5 for Medicine Name Extraction and Recognition Utilizing Optical Character Recognition (OCR).*

I. INTRODUCTION

In today's fast-evolving world of healthcare, technological innovations have become indispensable for improving patient care, increasing efficiency, and mitigating human error. The processing of medical prescriptions is one crucial area where technology can have a significant impact. A major advancement in this endeavor is the proposed project, a Medical Prescription Optical Character Recognition (OCR) system, which addresses important issues and transforms the way medical prescriptions are managed.

One could hardly exaggerate the significance of this technology. Medical prescriptions, which provide directions for the administration of drugs and treatment plans, are the cornerstone of the healthcare system. Unfortunately, there is room for error and inefficiency in the current prescription handling and interpretation process, which frequently relies on manual human input. Patients may face serious consequences if they misread a prescription, which could be caused by various factors such as illegible handwriting. These problems highlight the pressing need for a solid and trustworthy remedy.

Modern technologies, like YOLOv5 for object detection and deep learning models for text recognition, are incorporated into the Medical Prescription OCR system.

By using text recognition and data extraction, the technology makes prescription information easily accessible and comprehensible. Patients can gain a better understanding of their prescribed medications, including their chemical composition, dosage, safety precautions, and possible side effects, and healthcare professionals can quickly retrieve crucial information.

II. LITERATURE SURVEY

A. Medical Prescription Recognition using Machine Learning

The issue of misinterpreting medicine names arises from doctors' tendencies to scribble unreadable prescriptions due to their busy schedules these days. Sometimes before buying their prescribed medications, patients are curious to learn more about them. Recently, researchers have been looking for an effective way to handle this issue. However, due to the variety and poor handwriting of doctors, no technique has been able to fully recognize the names of medications. This brings us to machine learning, where new handwriting is recognized by the system by teaching it various handwriting styles for the same medication. This paper proposed a system that uses a mobile application that can recognize handwritten medicine names and returns to present a solution to the patient and the pharmacist.

The system uses pre-processing techniques such as image subtraction, noise reduction, and image resizing to identify the names of the medicines and their dosages for the collected data set. The pre-processed images will then go through additional processing [1], including classification and feature extraction using a convolutional neural network, and finally, low-accuracy optical character recognition applied to the medications in the post-processing stage to identify their names by comparing the outcome with the dataset containing all the medications. This will lessen the number of times drug names are distorted, helping pharmacists to reduce their doubts. After testing the suggested system on several real-world scenarios, the accuracy of the (CNN) model was 70%.

B. A Deep Learning-Based Intelligent Medicine Recognition System for Chronic Patients

Reading handwriting usually becomes a little difficult for one. Similarly, patients, the general public, and a small number of medical professionals find it extremely difficult to read a doctor's handwriting in a medical prescription. In certain situations, this leads to incorrect concerns or outcomes as a result of incorrectly decoding any medical prescription written by a doctor. The primary reason a patient cannot decipher a doctor's handwriting in a prescription is that physicians utilize Greek and other foreign medical abbreviations and terminologies that are incomprehensible to the average person. This paper describes how a Convolutional Neural Network (CNN) based on Long Short-Term Memory (LSTM)[2] is used to create a model that can differentiate between doctors'.

C. Intelligent Medicine Identification System Using a Combination of Image Recognition and Optical Character Recognition

The goal of this project is to create an automatic verification system that uses deep learning techniques to confirm the correctness of prescription dispensing. Pharmacies will be able to decrease errors that result in patients being prescribed the incorrect medication with the use of the suggested approach. Two models make up the system: one for text classification and the other for image classification.

The Histograms of Oriented Gradients (HOG) pattern recognition of the raw medication blister pack photos is used by the image classification model to interpret the features after the background is removed. It is made up of three components: logistic regression, linear regression, and convolution neural networks (CNNs). The text classification model matches the words to a bag of words by using text extraction to acquire the imprints that appear on the blister package. Two hundred different types of medication blister packs within plastic zip bags were gathered for the dataset. For the purpose of training the model, it contains 300 high-quality pictures of front-side medication blister packages for every kind of package taken in regulated lighting against a black backdrop. Based on the confidence of the two models, the majority vote is used by the automatic verification system.

The CNN image classification model with HOG[3] feature extraction has the highest accuracy, according to experimental results, with a 95.83 percent rate. According to in-text classification results, the technique that included text rectification, Keras-OCR[3], and Character Region Awareness For Text detection (CRAFT) yielded the highest accuracy, at 92%. The accuracy rate as a whole was 94.23%.

D. AI prescription recognition system:

Reading a doctor's prescription and handwritten is a challenge that most patients and some pharmacists face; a problem that in some cases leads to negative consequences due to a misinterpretation of the prescription. One reason doctors' prescriptions are so difficult to interpret is that doctors use Latin abbreviations and medical terminology that most people don't understand. This paper shows how artificial neural networks (ANN) are used to develop a system that recognizes handwritten recipes in English. Using a Deep Convolution Repetitive Neural Network to train this supervised system, input images are segmented and processed to recognize characters and classify them into 64 different predefined characters.[4] The results show that the proposed system provides good detection rates and 98% accuracy.

E. Medical Handwritten Prescription Recognition Using CRNN

Most doctors write in an illegible handwriting, which makes it hard for the general public and certain chemists to read the prescriptions they have written. They won't be able to write the prescription calmly and meticulously since they will be overworked and dealing with hundreds of patients every day. Their penmanship is hence unreadable. This might lead to reports or prescriptions with short forms and cursive writing that is difficult for the average person or chemist to read, which could lead to misspellings of prescribed drugs. But since we all live in a place where there is a variety of regional languages, some people are used to writing prescriptions in those languages.

It greatly increases the difficulty of content analysis. Therefore, the goal of this project is to create a tool that can translate doctor handwriting into any language using a recognition algorithm. This system will be transformed into a completely functionally independent application. Before processing the picture for training, the application will pre-process the prescription image as soon as the user uploads it by doing word segmentations and image pre-processing. And for each language that we need the model to recognise, it will be completed. Additionally, CNN, RNN[5], and LSTM are examples of deep learning techniques that will be used to create the detection model.

which the model is trained with. Unicode will be utilised to match words from different languages that are written in the system. In addition, market basket analysis and fuzzy search are used to provide an optimised final result from the pharmaceutical database that is presented to the user in a structured output.

III. METHODOLOGY

A. System Architecture

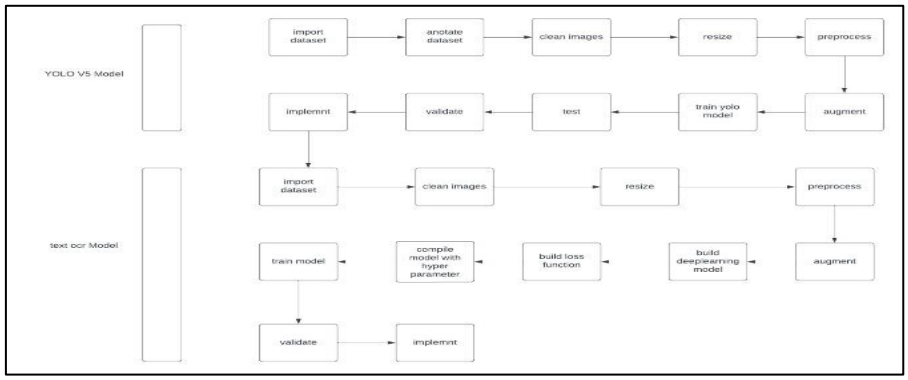

Fig. 1: System Architecture

- *Data Gathering:*
  Assemble a heterogeneous collection of medical prescription pictures with varying handwriting, layout, and content. Make sure that prescriptions address a variety of illnesses and drug kinds.

- *Data Annotation:*
  Add bounding boxes around the names of the medications and other important prescription information to annotate prescription photographs using the LabelImg program. Accurately identify and classify every annotation.

- *Training the YOLOv5 Model:*
  Using the annotated dataset, train the YOLOv5 object identification model to find and identify medication names on prescriptions. Iterate the training procedure repeatedly until you attain a high enough degree of accuracy.

- *Dataset of Handwritten Text:*
  To train the text recognition model, compile a dataset containing handwritten text. A range of handwriting varieties and styles should be included in this collection.

- *Training of Text Recognition Models:*
  Using the handwritten text dataset, create and train a deep learning model for text recognition. It should be possible for the model to reliably identify and extract text from prescription photos.

- *Data preprocessing:*
  Perform data preprocessing steps for recipe images, including resizing, denoising, and padding to improve image quality and facilitate accurate text recognition.

- *Front-end and back-end development:*
  User-friendly web application development using Flask, HTML and CSS. Implement user registration and authentication. Create an intuitive user interface for uploading recipes and displaying results.

- *Integration:*
  Integrate the YOLOv5 object recognition model and text recognition model into the website to automatically interpret recipe images.

- *Information screen:*
  Display the extracted prescription information, including drug names, dosages, chemical information, precautions and possible side effects, in a clear and understandable form in the user interface.

- *Empower patients:*
  Assist patients in locating pharmaceutical companies that offer prescription medications at reasonable costs.

- *Testing , Validation:*
  Ensure system accuracy, dependability, and usability by conducting thorough testing and validation. For the purpose of evaluating system performance, compare it to actual prescriptions.

- *Documentation and User Training:*
  To assist patients and healthcare providers in interacting with the system in an efficient manner, create thorough evaluate user documentation and training materials.

- *Data Privacy , Security:*
  In order to protect sensitive medical information while interacting with the system and to guarantee compliance with data privacy regulations, implement strong data privacy and security measures.

- *Performance Optimization:*
  Continue to improve the system's scalability and performance to efficiently manage rising prescription volumes and user counts.

- *User Support and Maintenance:*
  In order to fix issues, solicit user feedback, adapt to evolving healthcare standards and laws, and maintain the system, ongoing user support is required.

From data collection and model training to system integration and user support, this methodical approach describes the steps involved in creating the Medical Prescription OCR system. In order to accomplish its specified goals and scope, it guarantees that the project moves forward methodically.

IV. CONCLUSION

To sum up, the Medical Prescription OCR system connects the dots between manual prescription administration in the past and contemporary, effective, and patient-focused healthcare procedures. This initiative is an example of how technology may enhance patient safety, expedite medical procedures, and include patients in their care. technology has the potential to change the way prescription drugs are managed as technology advances from development to practical use, paving the way for a healthcare system that is more effective and patient-friendly.

Various techniques of handwriting recognition such as OCR, cursive handwriting interpretation and prediction have been accurately used in the machine learning model to improve the process of interpreting medicinal names.

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