MEDICAL PRESCRIPTION RECOGNITION USING MACHINE LEARNING: A SURVEY

Neha Nayak[*1], Prarthana T[*2], Rohit Joshi[*3], Vaibhavi S[*4], Dr Swathi K[*5]

[*1,2,3,4]Under Graduate Student, Dept. Of Computer Science & Engineering, Jyothy Institute Of Technology Visvesaraya Technological University, Belagavi Bengaluru-560082, India

[*5]Associate Professor, Dept. Of Computer Science & Engineering, Jyothy Institute Of Technology Visvesaraya Technological University, Belagavi Bengaluru-560082, India.

ABSTRACT

Using machine learning to recognize handwritten medicine names and doses can certainly be a useful approach to addressing the problem of misinterpreting prescribed medicines. Pre-processing techniques such as attention, image subtraction, noise reduction, and image resizing can help improve the quality of the images and make them more suitable for OCR and other processing. One important consideration when developing this type of system is ensuring that it is accurate and reliable enough to be used in a real-world setting. In order to achieve this, it will be important to carefully design and evaluate the system, using a large and diverse dataset of handwritten medicine names and doses to train and test the system. It will also be important to consider factors such as user interface and usability, as the system will need to be easy to use and understand for both pharmacists and patients. Overall, this mobile application can recognize handwritten medicine names and doses using transformers and OCR for improving the accuracy and efficiency of prescribing and dispensing medications.

Keywords: Optical Character Recognition, Transformers, Mobile Application, Machine Learning.

I.   INTRODUCTION

Our application uses image recognition and OCR technology to identify the names and descriptions of prescribed medications from images of prescriptions. Our application can certainly be useful for patients and pharmacists, as it can help to reduce the risk of misinterpreting handwritten prescriptions and improve the accuracy and efficiency of prescribing and dispensing medications.

Optical character recognition (OCR) is a technology that enables the conversion of scanned or digital images of text into machine-readable text. It is often used to extract and repurpose data from documents, such as scanned paper documents, camera images, and image-only PDFs.

OCR systems use a combination of hardware and software to perform this conversion. The hardware, such as an optical scanner or specialized circuit board, is used to read or capture the text, while software is used to perform the advanced processing required to recognize and extract the individual characters and convert them into machine-readable text.

OCR technology has many practical applications, including improving the accuracy and efficiency of data entry, enabling text search and indexing of scanned documents, and enabling the creation of electronic copies of physical documents that can be edited and shared digitally. It is used in a wide range of industries, including healthcare, finance, and government.

II.   LITERATURE SURVEY

• The proposed system uses a combination of image processing techniques and machine learning algorithms to recognize handwritten medicine names from images of prescription notes. The system first applies pre-processing techniques such as image subtraction and noise reduction to improve the quality of the images. Then, it uses a convolutional neural network (CNN) to classify and extract features from the images. Finally, it applies optical character recognition (OCR) to identify the names of the medicines with low accuracy, and compares the results to a dataset of all known medicines to improve accuracy. The system has reportedly achieved an accuracy of 70% when tested on real cases.

• The proposed system aims to address the problem of doctors' handwriting being difficult to read, which can lead to misunderstandings and errors when filling prescriptions. The system will use machine learning

techniques, including convolutional neural networks (CNNs), recurrent neural networks (RNNs), and long short-term memory (LSTM) networks, to recognize and translate handwritten prescription notes written in various languages. The system will be designed as a mobile application that allows users to upload images of prescription notes, which will then be pre-processed and analyzed using deep learning techniques. The system will use Unicode to match words from different languages and will also utilize fuzzy search and market basket analysis to optimize the results from a pharmaceutical database and present them to the user in a structured format.

- The proposed Medicine Box system is a mobile application that uses a convolutional neural network (CNN) to recognize and translate handwritten medicine names from prescription notes. The system aims to address the problem of misinterpreting medicine names due to doctors' handwriting being difficult to read, which can lead to errors and harm to patients. The system uses the TensorFlow machine learning library and a custom repository to match partial strings with drug names. By providing a clear and readable digital text of the prescribed medicines, the Medicine Box system aims to decrease instances of misinterpretation and help both patients and pharmacists understand the prescriptions more easily.

- The proposed system is an online platform for recognizing and storing handwritten medical prescriptions. The system aims to address the problem of pharmacists having difficulty reading prescriptions and potentially dispensing the wrong medicine, which can have serious consequences for patients' health. To overcome this issue, the system uses signature verification techniques to recognize the handwriting of doctors and accurately interpret the names of the prescribed medicines. The system stores various features, including pen coordinates, time, and pen-ups and pen-downs, to improve recognition accuracy. It also includes new features that have been specifically proposed for this purpose. The system has been tested using a dataset of 24 medicine names from two users, and the results have been compared using the newly proposed features.

- According to this system, Handwritten character recognition, especially for medical prescriptions, can be a challenging task due to the poor handwriting of doctors and the lack of domain knowledge among those trying to read the prescriptions. This can lead to misreading of the content, which can have serious consequences for the patient, including health issues and even threats to their lives. In order to address these problems, researchers have been working on developing optical character recognition systems, including using neural networks and knowledge bases, to more accurately read the content of medical prescriptions. These efforts have shown success in improving the accuracy of prescription identification and can serve as a foundation for further improvements in the field.

- The purpose of this research was to develop a system for accurately reading medical prescriptions, which can be challenging due to the sloppy handwriting of doctors and the lack of domain knowledge on the part of the reader. The research used optical character recognition (OCR) and a neural network approach for character recognition, as well as a knowledge base matching system to accurately output the result. The research was successful in improving the identification of prescriptions and has opened the door for further improvements in this area. It's worth noting that accurately reading medical prescriptions is important for the health and well-being of patients, as misreading a prescription can lead to health issues and even threats to their lives.

- The use of artificial intelligence (AI) and machine learning (ML) has the potential to improve efficiency and reduce waiting times in the outpatient pharmacy process. One way that AI and ML can be used in this context is to develop a system that can accurately recognize and interpret handwritten prescriptions, which can be a challenge due to the poor handwriting of doctors and the variety of handwriting styles. By using machine learning to identify different characters for specific medications, it may be possible to improve the accuracy of medication identification and reduce the risk of errors. A mobile application that can read handwritten medicine names and provide a readable textual version of the medication and dose can be a useful tool for both pharmacists and patients. By taking multiple prediction methods into account and analyzing the results of various data sets, it may be possible to develop a machine learning-based framework for healthcare that is effective in improving patient satisfaction and reducing waiting times.

- The proposed approach is intended to help recognize handwritten medical prescriptions written by doctors in developing countries, where many doctors are too busy to write digital prescriptions and the majority of

prescriptions are handwritten and lack legibility. The proposed approach involves the development of a dataset of handwritten medical terms and the use of data augmentation techniques to improve the recognition efficiency. A bidirectional long short- term memory (LSTM) network is used to recognize the handwriting, and the results show an average accuracy of 93.0% using the proposed method, which is 19.6% higher than the recognition result without data expansion. The proposed technology could be installed in a smartpen for doctors to recognize and digitize their handwriting in real-time, potentially reducing medical errors, saving medical costs, and promoting healthy living in developing countries.

The below list outlines survey of papers related to the topic in brief with possible gaps/limitations within the proposed system.

Papers	Title	Authors	Year Of Publication	Proposed System	Gaps
[1]	Medical Prescription Recognition using Machine Learning	Esraa Hassan, Habiba Tarek, Mai Hazem, Shaza Bahnacy, Lobna Shaheen, Walaa H. Elashmwai	2021	The proposed system uses a combination of image processing techniques and machine learning algorithms to recognize handwritten medicine names from images of prescription notes.	This system works on a very small dataset and has low accuracy.
[2]	Doctor's Handwritten Prescription Recognition System In Multi-Language Using Deep Learning	Pavithiran G, Sharan Padmanabhan, Nuvvuru Divya, Aswathy V, Irene Jerusha P, Chandar B	2022	The system uses machine learning techniques, including convolutional neural networks (CNNs), recurrent neural networks (RNNs), and long short-term memory (LSTM) networks, to recognize and translate handwritten prescription notes written in various languages.	This system cannot be used on all platforms.
[3]	Doctor's prescription recognition using deep learning	Dr E Kamalanaban, M Gopinath, S Premkumar	2018	The proposed Medicine Box system is a mobile application that uses a convolutional neural network (CNN) to recognize and translate handwritten medicine names from prescription notes.	Only the top few writers' dataset is used and the others are discarded.
[4]	Recognition of Handwritten Medical Prescription Using Signature Verification Techniques	Seerat Rani, Abd Ur Rehman , Beenish Yousaf , Hafiz Tayyab Rauf ,Emad Abouel Nasr , and Seifedine Kadry	2022	The recognition of handwritten Medical Prescription is done using Signature Verification. Machine learning models like SVM , Naïve bayes classifiers are used.	The size of the model is huge and takes time to give out results.

[5]	Medical Prescription Identification Solution	WRAD Wijewardena, N D Kodikara	2021	This system uses a neural network approach for the character recognition process and a knowledge based matching to accurately output the result.	This system can read only a line at once and not the whole prescription.
[6]	Handwritten Recognition using Transformer for Medical Prescription Application	Zobeir Raisi, Mohamed A. Naiel, Steven Wardell, Paul Fieguth and John Zelek	2019	Transformer-based architecture is used for handwritten text recognition since it preserves the spatial information within 2D images.	Dataset used is not consistent with their domain.
[7]	Comparison Of Various Machine Learning Algorithms For Recognizing Text On The Medical Prescriptions	Sandhya P, Rama Prabha K.P, Jayanthi.R, V. Sujatha, Asha N, M B Benjula anbu malar	2022	A proposed approach for recognizing handwritten. Medical prescriptions involves several steps, including image scanning, pre-processing, and training a convolutional neural network (CNN) for feature extraction. The results are then compared to a database of drug names using optical character recognition (OCR) to identify low-accuracy medicinal names.	Limited exploration of algorithms.
[8]	An online cursive handwritten medical words recognition system	Shaira Tabassum, Nuren Abedin, Md Mahmudur Rahman, Md Moshiur Rahman, Mostafa Taufiq Ahmed, Rafiqul Islam, Ashir Ahmed	2022	A bidirectional long short- term memory (LSTM) network is used to recognize the handwriting. it uses data augmentation techniques to improve the recognition efficiency.	This system only gives output for the trained data and cannot give output for any new data.

III.   EXISTING SOLUTION

Handwriting prescription recognition using artificial intelligence and machine learning involves training a computer system to recognize and interpret handwritten text from medical prescriptions.

There are several approaches to recognizing handwriting in prescriptions using artificial intelligence and machine learning.

Optical character recognition (OCR): OCR is a method that uses machine learning algorithms to recognize and extract text from images and documents. OCR can be used to recognize handwriting on prescription documents, although it may not always be effective due to the variability in handwriting styles.

Handwriting recognition using neural networks: Neural networks are a type of machine learning algorithm that can be trained to recognize patterns in data. They can be used to recognize handwriting by training the neural network on a large dataset of handwriting samples.

Handwriting recognition using convolutional neural networks (CNNs): CNNs are a type of neural network that are particularly effective at image recognition tasks. The CNN can be trained on a large dataset of handwritten prescriptions, using techniques such as supervised learning or unsupervised learning to identify patterns and features in the data

Handwriting recognition using recurrent neural networks (RNNs): RNNs are a type of neural network that are designed to process sequential data, such as handwriting. They can be used to recognize handwriting by training the RNN on a large dataset of handwriting samples.

Once the system has been trained to recognize and extract relevant information from handwritten prescriptions, it can be used to automate the process of filling and dispensing prescriptions. This can help to reduce errors and improve patient safety, as well as streamlining the prescribing process for healthcare providers .Overall, the success of handwriting prescription recognition using machine learning depends on the quality of the training data, the effectiveness of the feature extraction and classification algorithms, and the ability to handle variations in handwriting styles and errors in the written text.

IV.   PROPOSED SOLUTION

To address the issue of interpreting handwritten medical prescriptions, we develop a mobile application using android studio as the integrated development environment. The main goal of this application is to provide a solution for both patients and pharmacists to accurately interpret these prescriptions and avoid any potential misunderstandings or errors. In order to achieve this, we implement a machine learning model using python and train it on various data sources, including Kaggle and UCI. We adopt the transformer model, a state-of-the-art approach for text recognition, to accurately identify the medication listed on the prescription. In order to improve the performance of the model, we have also conducted pre-processing on the data using various python libraries.

In order to ensure seamless integration, we utilize django for the backend of the application and firebase for storing and managing the data. Once a user logs into the app, they have the option to scan or upload an image of their prescription. The app will then process the image using the machine learning model and display the recognized medication and its associated information for the user to easily read and understand. We believe that this solution has the potential to significantly reduce instances of misunderstandings or errors in medication and improve patient satisfaction with the healthcare system.

V.   CONCLUSION

The problem of interpreting handwritten medical prescriptions is a significant issue that can lead to medication errors and negative consequences for patients. To address this problem, we have developed a mobile application that utilizes machine learning techniques to accurately recognize the medication and dosage prescribed. By implementing a transformer model and probability matching with a medical database, the app is able to provide a clear and readable digital version of the prescription for both the pharmacist and the patient. This not only improves the accuracy of medication dispensed, but also helps to reduce confusion and potential health risks for the patient. Overall, the use of technology and machine learning in the healthcare industry has the potential to greatly improve patient safety and satisfaction.

VI.   REFERENCES

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