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# Handwritten Medical Prescription Recognition using CNN and Machine Learning

**Swasthika[1], Rithika C Jain[2], Sharanya[3], Shubhashree[4], Annappa Swamy D R[5]**

UG Student, Mangalore Institute of Technology and Engineering, Moodabidri, Karnataka, India[1,2,3,4]

Associate Professor, Department of CSE, Mangalore Institute of Technology and Engineering, Moodabidri, Karnataka, India[5]

**ABSTRACT:**A Medical prescription is a handwritten document written by doctors in the form of instructions that describes list of drugs for patients in time sickness, injuries and other disability problems. In most of the cases it is difficult to identify the doctors handwritten medical prescription for both patients and pharmacist, due to different style of hand writing. It may lead to negative consequences and may lead to sever health problems due to wrong recognition of prescription. Our proposed system will help in recognizing doctors handwritten prescription in less amount of time. Handwritten recognition can be achieved using Machine learning and CNN. The preprocessed images will be subjected to some processing, including classification, feature extraction using a convolutional neural network, and then, in the postprocessing phase, the application of an optical character recognition technique to the medicines with low accuracy to identify their names by comparing the results with a dataset that contains all the medicines. The output will display a list of digitalized versions of medicines, its composition and uses, and also recommends a list consisting of similar medicines in order of its market price.

**KEYWORDS:** Convolution neural network (CNN), machine learning (ML), Cosine similarity vector algorithm.

## I.INTRODUCTION

A Doctor prescribes medicines for the patient for their sickness or injury.A handwritten prescription is difficult to understand. Misread medicine names in doctor's medical prescriptions are frequently a consequence of either unreadable handwriting or a pharmacist's incapability to identify drug names in medical prescriptions. The National Academy of Science has estimated that at least 1.5 million people each year are being killed or sickened due to reading medical prescriptions incorrectly.Normally, doctors while writing medical prescription use common medical terminologies and Latin abbreviations, is usually extremely hard to be read and understood by a person who has no prior medical knowledge or background. It cannot be denied that it is very threatening when medicines are wrongly given to patients as it can lead to some major health problems because of the side effects that some medicines have over each other when taken at the same time, not only that but also the wrong medicine is taken over a long time without a need for it. Another issue is that patients purchase medicines blindly without knowing anything about the medicines prescribed for them and see if the side effects will be suitable for them will cause them any harm or discomfort. As a result, it is of the utmost importance to read the medical prescription precisely and correctly to avoid any detrimental consequences and impacts, thus finding a solution for this problem will be presented in the proposed system. The proposed idea has of course been implemented before but neither so popularly nor so successfully and sufficiently as most of the apps or approaches used Optical Character Recognition (OCR) technique and other techniques which solved the problem but not completely as OCR at some point cannot fully recognize characters written in bad handwriting or bad format. To improve the accuracy and to get the knowledge about the medicines a deep machine learning approach through the TensorFlow is used. TensorFlow is a free software library used for providing immense performance in the computation of numerical data. Flexibility of its architecture makes the computation deployment simple over different platforms like CPU, GPU, TPU and group of servers to mobile and edge devices. TensorFlow is used to build a Conventional Neural Network with the help of collection of datasets. In addition, CNN is used to perform intelligent calculating network for recognizing doctor's prescription accordingly.

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## II.LITERATURE REVIEW

Handwritten medical prescription recognition using Convolutional Neural Networks (CNN) and machine learning techniques has gained significant attention in recent years due to its potential in automating healthcare processes and improving patient care. There are lots of research going on for developing accurate machine learning model that can detect the handwriting with high accuracy.

**Medical Prescription Recognition using Machine Learning by Esraa Hassan, Habiba Tarek, Mai Hazem, ShazaBahnacy, Lobna Shaheen, Walaa H. Elashmwai [1]** They have proposed a system that uses Convolutional Neural Network (CNN) for feature extraction and classification purposes using backward and forward propagation techniques. The system also applies OCR techniques in the post processing phase to the medicines with the low accuracy in order to identify their names by comparing the result with the dataset that contains all the medicines. The system has training accuracy of 73% and testing accuracy of 50%.

**Doctor's Cursive Handwriting Recognition System Using Deep Learning by Lovely Joy Fajardo, Niño Joshua Sorillo, JaycelGarlit, Cia DenniseTomines, Mideth B. Abisado, Joseph Marvin R. Imperial, Ramon L. Rodriguez,Bernie S. Fabito [2]** They have used Deep Convolutional Recurrent Neural Network (DCRNN) to identify the text from the image of handwritten prescription and convert the cursive handwriting into the readable text. They have achieved 76% of training accuracy. The model built when deployed as a mobile application has given 72% of validation accuracy.

**Medical Handwritten Prescription Recognition Using CRNN by Roger Achkar, KhodorGhayad, Rayan Haidar, Sawsan Saleh, Rana Al Hajj [3]** They have used Convolutional Recurrent Neural Network (CRNN) for recognizing handwritten English medical prescriptions. The images are segmented and then processed to recognize and classify them into predefined 64 different characters. The proposed system has achieved an accuracy of 98%.

**Handwritten Character Recognition Using Deep-Learning by R. Vaidya, D. Trivedi, S. Satra and P. M. Pimpale [4]** They have developed a Handwritten Character Recognition system using the Convolutional Neural Network (CNN). They have used OpenCV for image processing and TensorFlow for training a neural Network. The system contains an android application as front end which is used by the user to upload the image. The image is sent to the backend server where the neural network runs to recognize the handwritten text and the result is sent back to the android application. The developed system has achieved an accuracy of 94%.

| No. | Paper Title | Author Name | Key Points | Remark |
|---|---|---|---|---|
| 1 | Medical Prescription Recognition using Machine Learning | Esraa Hassan, Habiba Tarek, Mai Hazem, ShazaBahnacy, Lobna Shaheen, Walaa H. Elashmwai, 2021 | The system uses CNN for feature extraction using backward and forward propagation techniques. It uses OCR technique in post processing phase. [1] | The system has achieved training accuracy of 73% and testing accuracy of 50%. |
| 2 | Doctor's Cursive Handwriting Recognition System Using Deep Learning | Lovely Joy Fajardo, Niño Joshua Sorillo, JaycelGarlit , Cia DenniseTomines, Mideth B. Abisado, Joseph Marvin R. Imperial, Ramon L. Rodriguez,BernieS. Fabito, 2019 | Algorithumused here is Deep Convolutional Recurrent Neural Network (DCRNN) for [2]. | Training accuracy is 74% and when deployed as a mobile application accuracy came out as 72%. |

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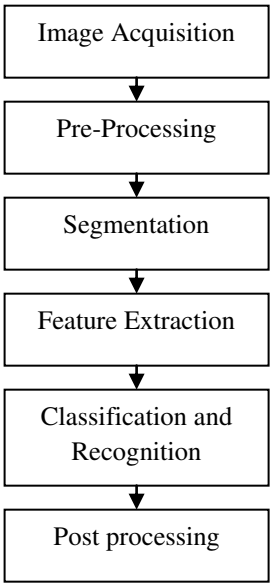
|---|---|---|---|---|
| 3 | Medical Handwritten Prescription Recognition Using CRNN | Roger Achkar, KhodorGhayad, Rayan Haidar, Sawsan Saleh, Rana Al Hajj, 2019 | Used Convolutional Recurrent Neural Network (CRNN) for recognizing handwritten English medical prescriptions. Segmentation of image is done and then they are processed recognize and classify them into predefined 64 different characters. [3] | Achieved the accuracy of 98%. |
| 4 | Handwritten Character Recognition Using Deep-Learning | R. Vaidya, D. Trivedi, S. Satra and P. M. Pimpale, 2018 | Developed android application as frontend. Backend server consists of Convolutional Neural Network (CNN). Also used OpenCV for image processing and TensorFlow for training a neural Network. [4]. | The developed system has achieved an accuracy of 94%. |

Collectively, these studies highlight the significance of machine learning techniques, particularly CNNs and deep learning architectures, in addressing the challenges associated with handwritten medical prescription recognition. While there is still room for improvement in terms of accuracy and scalability, the advancements made thus far offer valuable insights and pave the way for further research and development in this field. With continued efforts, the automation of prescription recognition can greatly enhance healthcare processes, reduce errors, and ultimately improve patient safety and care.

## III.METHODOLOGY




### 3.1 Data collection

The data collection process is a crucial step. We have assembled it from the ground up. The data collection procedure included image acquisition, pre-processing, segmentation, feature extraction, classification, and recognition, followed by post-processing. The key features can be extracted from it using CNNs.

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### 3.2 Data Pre processing

Data In the pre-processing stage, undesirable data can be eliminated. To improve accuracy, an image may be resized, cropped, or had noise removed. Using a different dataset with a more effective one and one with more image clarity can also boost accuracy.

### 3.3Model Building

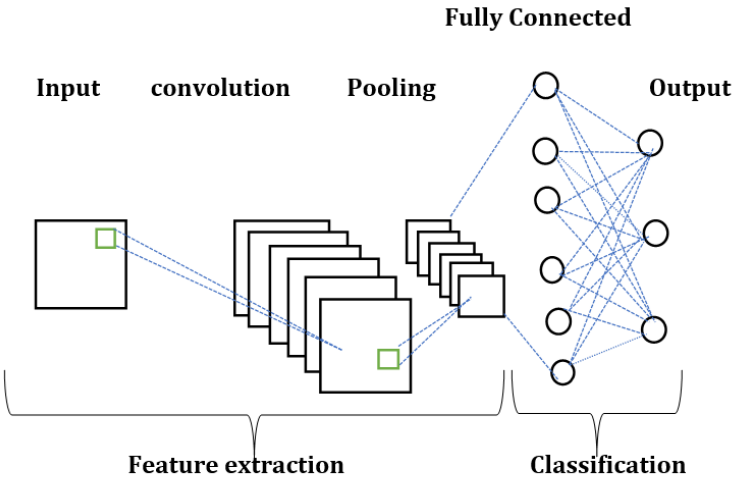


**Figure 1: CNN Layers**

There are other types of neural networks in deep learning, but for identifying and recognizing objects, CNNs are the network architecture of choice. Convolutional layers consist of multiple features like detecting edges, corners, and multiple textures, making it a special tool for CNN to perform modeling. A CNN is a kind of network architecture for deep learning algorithms and is specifically used for image recognition and tasks that involve the processing of pixel data.

3.3.1 Image acquisition:

A method where the system receives the image as input. More actions will be taken to finalize the image.

3.3.2 Preprocessing:

Pre-processing enables us to enhance the image's quality. Preprocessing works to standardise strokes and eliminate variances that could lower accuracy rates. In this method, the image's noise is eliminated, the greyscale image is converted to a binary image, the image is increased and decreased, and text line detection is performed.

3.3.3 Segmentation:

Line segmentation, word segmentation, and character segmentation are operations that break down an image of a string of characters into smaller images of individual symbols.

3.3.4 Feature Extraction:

A set of the character's attributes are extracted in the feature extraction step, and this extracted feature is then used to recognize the character while optimizing recognition rate with the fewest number of components.

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3.3.5 Classification and Recognition:

The height of the character, the quantity of horizontal lines, the widths of the character, the quantity of circles and pixels, the positioning of various elements, and the quantity of vertically oriented arcs are all retrieved from and defined at this stage. The neural network is used to classify and identify characters in photographs.

3.3.6 Post processing:

The postprocessing procedure is also important in order to enhance the raw result obtained from the processing response after the convolution process is performed between the original image and the gray-level template at different orientations. The binarization process provides a binary map of values that allows for a better visualization of vessels and background from the result image. However, due to high noise levels in the original image, some entropy values remain after the binarization process, which must be removed in order to have an enhanced final image result.The postprocessing step starts with the image binarization. This process is applied directly to the image acquired as a response after the convolution operation was terminated and the result image is calculated.After the binarization step, the result image contains single isolated pixels or groups of them that must be removed if a smoother image result is desired.

### 3.4Medicine Recommendation system

The recommendation system is supposed to recommend any medicine/drug on the basis of the search result. The main aim is to recommend any alternative/substitute to be used in place of searched medicine. Cosine similarity is the cosine of the angle between two vectors and it is used as a distance evaluation metric between two points in the plane. The cosine similarity measure operates entirely on the cosine principles where with the increase in distance the similarity of data points reduces. Cosine similarity finds its major use for character types of data wherein with respect to machine learning cosine similarity can be used for various classification data and helps us to determine the nearest neighbors when used as an evaluation metric in the KNN algorithm. Cosine similarity in the recommendation system is used with the same principle of cosine angles, where even if the similarity of the content is less similar it would be considered as the least recommended content, and for higher similarity of contents, the recommendations generated would be at the top. Cosine similarity is also used in textual data to find the similarity between the vectorized texts from the original text document.

## IV.RESULT


**Figure 2: Word and digit recognition output**

The output of our suggested solution shows a list of digitalized drug names in the input's intended sequential order. The composition, price, and usage of the medications are included in the digitalized medication list.There is also a list of

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comparable medications that are suggested depending on price.The system will be able to recognize individual words. It will serve as proof that the training was conducted properly.The system will display phrase recognition in addition to word recognition. It will also serve as proof that the system was properly instructed.

## V.CONCLUSION

The paper's conclusion highlights the significance of medical prescription recognition for its crucial role in reducing the issue of users misinterpreting drug names.Through this research, a machine learning solution was developed. Using the CNN model as a classifier and feature extractor, the system will be trained using different types of handwritings for each medicine in order to be able to recognize new handwriting for the medicine.The output of our proposed system shows a list of digitalized medicine names in the sequential order that was specified in the input, along with information about the medicines' composition and its uses.There are still challenges to overcome, such as variations in handwriting styles and scalability. With continued advancements, handwritten medical prescription recognition using CNN and machine learning has the potential to revolutionize healthcare practices, leading to enhanced efficiency, reduced errors, and better patient outcomes.

## REFERENCES

[1] E. Hassan, H. Tarek, M. Hazem, S. Bahnacy, L. Shaheen and W. H. Elashmwai, "Medical Prescription Recognition using Machine Learning," 2021 IEEE 11th Annual Computing and Communication Workshop and Conference (CCWC), NV, USA, 2021, pp. 0973-0979, doi: 10.1109/CCWC51732.2021.9376141.

[2] L. J. Fajardo et al., "Doctor's Cursive Handwriting Recognition System Using Deep Learning," 2019 IEEE 11th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment, and Management (HNICEM), Laoag, Philippines, 2019, pp. 1-6, doi: 10.1109/HNICEM48295.2019.9073521

[3] R. Achkar, K. Ghayad, R. Haidar, S. Saleh and R. Al Hajj, https://ieeexplore.ieee.org/document/8862004 "Medical Handwritten Prescription Recognition Using CRNN,"In (2019).

[4] R. Vaidya, D. Trivedi, S. Satra and P. M. Pimpale, "Handwritten Character Recognition Using Deep-Learning," https://ieeexplore.ieee.org/document/8473291 2018 Second International Conference on Inventive Communication and Computational Technologies (ICICCT), Coimbatore, India, 2018, pp. 772-775, doi: 10.1109/ICICCT.2018.8473291.

[5] E. Kamalanaban, D., Gopinath, M., & Premkumar, S. (2018). Medicine Box: Doctor's Prescription Recognition Using Deep Machine Learning. International Journal of Engineering & Technology

[6]M. Y. W. Teow, "A minimal convolutional neural network for handwritten digit recognition," 2017 7th IEEE International Conference on System Engineering and Technology (ICSET), Shah Alam, Malaysia, 2017, pp. 171-176, doi: 10.1109/ICSEngT.2017.8123441.

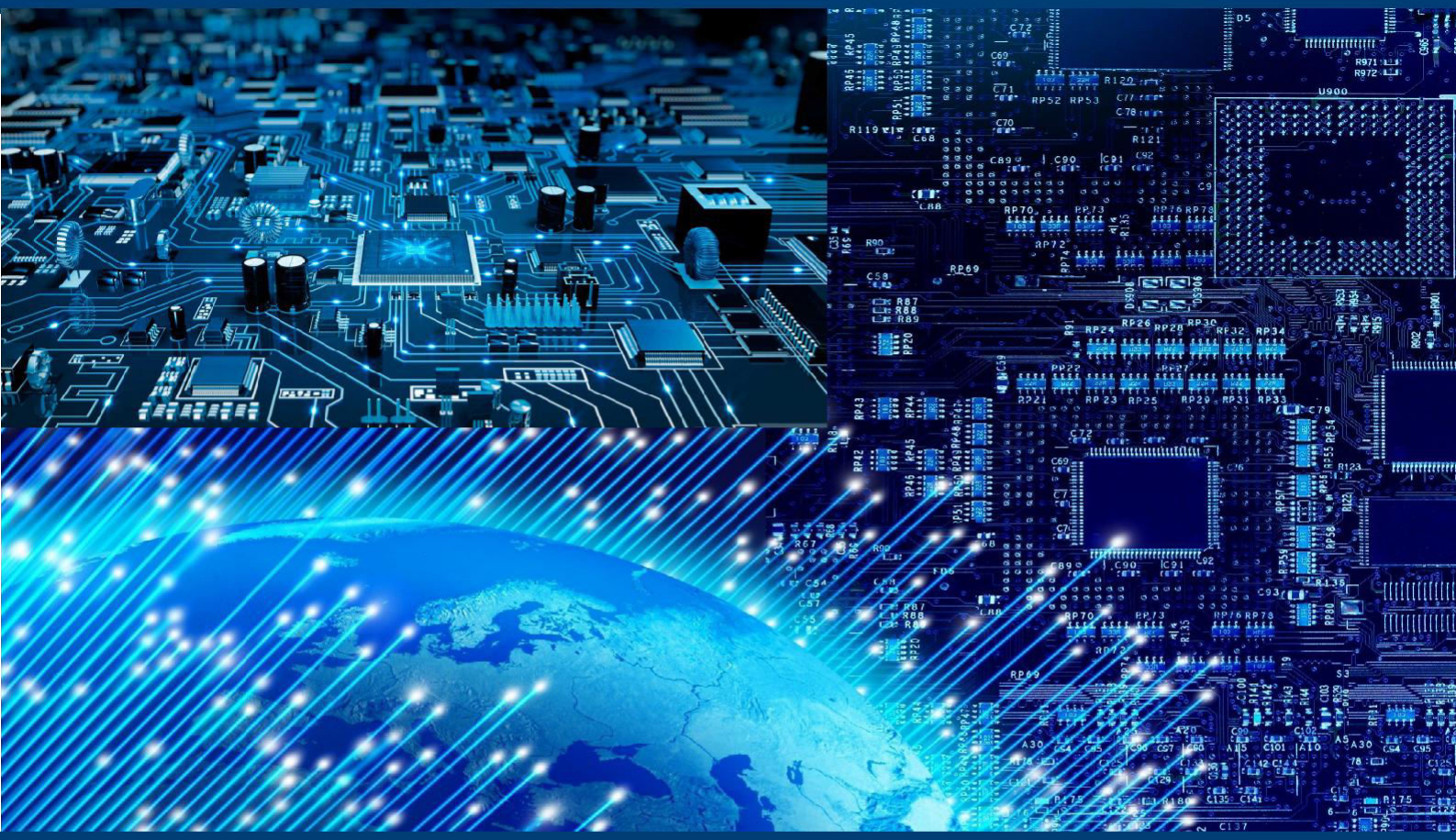
[7] A. Nikitha, J. Geetha and D. S. JayaLakshmi, "Handwritten Text Recognition using Deep Learning," 2020 International Conference on Recent Trends on Electronics, Information, Communication & Technology (RTEICT), Bangalore, India, 2020.

[8] P. S. Dhande and R. Kharat, "Character Recognition for Cursive English Handwriting to Recognize Medicine Name from Doctor's Prescription," 2017 International Conference on Computing, Communication, Control and Automation (ICCUBEA), Pune, India, 2017.

[9] L.Xuetal. https://ieeexplore.ieee.org/abstract/document/8771222/ "Recognition of Handwritten Chinese Characters Based on Concept Learning". In (2019).

[10] D. Kulathunga, C. Muthukumarana, U. Pasan, C. Hemachandra, M. Tissera and H. De Silva, "PatientCare: Patient Assistive Tool with Automatic Hand-written Prescription Reader," 2020 2nd International Conference on Advancements in Computing (ICAC), Malabe, Sri Lanka, 2020.

[11] R. B. Alday and R. M. Pagayon, "MediPic: A mobile application for medical prescriptions," IISA 2013, Piraeus, Greece, 2013, pp. 1-4, doi: 10.1109/IISA.2013.6623682

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