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Recognition and Detection of Medical Term using Convolutional Neural Network

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ABSTRACT

The purpose of this review is to examineand assess the obstacles that have been encountered in the research and development of OCR systems for machin evision jobs in the processing of medical image modalities. In this regard, this study summarizes a planning appropriate of OCR ,identifies challenges in the design of character recognition models in medical image modalities, with special attention to text data in these images, and, finally, provides benefits of this technology in the health system, as well as possible future research directions.

KEYWORDS: Optical character recognition (OCR) ,medical image processing, deep learning, artificial intelligence, computer vision, medical image.

1. INTRODUCTION

In general, we notice that the people who require medicines the most, such as older persons, will be unable to understand medical terms. In such a case, OCR may be able to help. It can detect text using OCR without any language barriers. OCR is a technique for converting images (.jpeg,.jpg,.png, format and so on) into readable text documents. OCR is used in a variety of industries, including data entry, education, and security (password identification, number plate recognition, and so on). We employed this in the medical field in our work. [1] OCR applications use a variety of techniques, but most focus on one character, phrase, or group of characters at a time. Characters are then identified using one of two algorithms: OCR applications are fed samples of text in a variety of fonts and image formats, which are then compared and recognized by the characters in the scanned page. Feature detection: To recognize characters in a scanned document, OCR applications use rules based on the attributes of a single letter or number. For example, the amount of angled lines, crossing lines, or curves in a character could be used as a comparison feature. For example, the capital letter "A" may be stored as three diagonal lines intersecting in the middle with a horizontal line. When a character is recognized, it is transformed into an ASCII code that computer systems can utilize to perform additional operations. It can extract the name of the medicine using OCR and Text summarization and show information such as name, usage, dose, and so on the application [2]. We experimented with various OCR techniques and

evaluated their performance. Optical Character Recognition has an accuracy of roughly 80% in general. Text extraction is still an open research topic, with a lot of work being done in this area.

2. RELATED WORK

OCR is the ability of a machine of images of typed or printed text into machine-generated text, whether from a scanned document or image, or from any previously saved image. The accuracy of word recognition from backdrop images is a major challenge with OCR. Researchers from all over the world have been working to increase OCR's efficiency. Creating a library of necessary information and comparing post-OCR output to the database to identify required output is an efficient way. Character recognition is not a new issue; in fact, its roots may be traced back to systems that existed before computers were invented. The first OCR systems just weren't computers, but mechanical machines that could recognize characters at a snail's pace and with poor precision. M. Sheppard invented the GISMO reading and robot in 1951, which is considered the first work on contemporary OCR [1]. GISMO is capable of reading musical notation and also words on a printed page one at a time. It can only recognize 23 characters. A typewritten page can also be copied using the machine. In 1954, J. Rainbow invented a machine that reads uppercase typeset English characters one at a time. Due to inaccuracies and sluggish recognition speed, early OCR technologies were panned. As a result, little research was done on the subject throughout the 1960s and 1970s. Government institutions and huge enterprises such as banks, media, and airlines were the only ones to see changes. Because of the complexity of recognition, it was decided that three standardized OCR fonts should be created to make the process of OCR recognition easier. As a result, in 1970, ANSI and EMCA established OCRA and OCR B, which provided comparable recognition rates [2]. OCR has been the subject of extensive investigation for the past thirty years. Document image analysis (DIA), multi-lingual, handwritten, and omni-font OCRs have all resulted as a result of this [2]. Despite all of these advances, the machine's ability to dependably comprehend text is still significantly inferior to that of a human. As a result, current OCR research focuses on improving OCR accuracy and speed for a variety of document styles printed/written in unconstrained situations. For difficult languages like Urdu or Sindhi, there hasn't been any free software or commercial software accessible. In the recent decade, the number of mobile phone users has exploded all over the world. The rising adoption of mobile-based applications around the world is due to easy and affordable internet connectivity. As a result, mobile applications have proven to be an efficient means of communicating information. Another method to provide customers a tailored mobile experience is to include a preferred language in the app. This was accomplished using Google Translate or the building of language-specific databases. [4] The pharmaceutical industry has traditionally played an important part in the nation's development. However, several studies have revealed that the general public lacks understanding about prescription drugs (use, dosage, precautions, and adverse effects), therefore showing such information through a mobile-based application would be extremely beneficial [5].

3. TYPES OF OPTICAL CHARACTER RECOGNITION SYSTEMS

During the last few years, OCR research has gone in a variety of ways. The numerous types of OCR systems that have arisen as a result of these studies are discussed in this section. These systems can be classified depending on image capture mode, character connection, font constraints, and so on. The text recognition system is classified in Figure 1. Handwritten recognition & machine printed character recognition are two types of OCR systems based on the type of input. The former is a much easier problem to solve because letters are usually of consistent size and their places on the page can be predicted.[3]. Due to the user's diverse writing style and different pen movements for the same character, handwriting recognition system is a difficult task. On-line and off-line systems are the two types of systems that can be found. Whereas the users are writing the character, the former is done in real-time. They are less complicated since they can capture temporal or time-based information such as speed, velocity, the number of strokes made, the direction in which the strokes are written, and so on. Furthermore, because the pen's trace

is only a few pixels broad, no thinning procedures are required. The offline identification systems work with static data, i.e. a bitmap as input. As a result, performing recognition is quite challenging. Many online systems have been offered since they are easier to create, have high accuracy, and can be used to input data on tablets and PDAs [4].

4. APPLICATIONS OF OCR

OCR allows for a wide range of applications. OCR has been used for mail sorting, bank check reading, and signature verification since its inception [5]. Furthermore, organizations can employ OCR for automated form processing in situations where a large amount of data is available in printed form. Processing utility bills, passport validation, pen computing, and automatic number plate identification are some of the other applications of OCR [6]. Helping blind and visually challenged persons read text is another useful application of OCR.

5. METHODOLOGY

OCR is a multi-phased activity. The following are the phases: Image acquisition is the process of capturing an image from an external source, such as a scanner or a camera. Preprocessing: After the image has been captured, various preprocessing operations can be carried out to increase the image's quality. Noise removal, thresholding, and image basis line extraction are some of the different preprocessing approaches. Character segmentation is the process of separating the characters in an image so that they may be submitted to a recognition engine. Connected component analysis and projection profiles are two of the most basic methodologies. However, in more complicated cases, such as when the characters are overlapping/broken or there is significant noise in the image, Advanced character segmentation algorithms are utilized in these instances.

Feature extraction: After the characters have been divided, they are processed to extract various features. Characters are recognized based on these characteristics. Moments, for example, are one form of feature that may be retrieved from photos. The retrieved features should be computationally efficient, with minimal intra-class variation and maximum inter-class variance.

Character classification: This stage assigns different categories or classes to the features of the segmented image. Character classification approaches come in a variety of forms. Structural classification approaches identify characters using distinct decision rules based on information collected from the visual structure. To classify the characters, statistical pattern classification approaches use probabilistic models and other statistical methods.

Processing: The results, especially for complicated languages, are not always accurate after classification. To improve the accuracy of OCR systems, post-processing techniques can be used. To repair flaws in OCR output, these systems use natural language processing, geometric, and linguistic context. To boost accuracy, a post processor can use a spell checker & dictionary, as well as reinforcement learning like Markov chains and n-grams. A post processor's time and space complexity should be minimal, and its use should not result in the creation of additional errors.

Image Acquisition: The first step in OCR is image acquisition, which entails collecting a digital image and putting it into a format that can be processed by a computer. This can include both picture quantization and compression [8]. Binarization, which involves only two levels of picture, is a specific case of quantization. In the vast majority of circumstances, the binary image is sufficient to describe the image. Lossy or lossless compression can be used [9] provides a summary of different image compression algorithms.

Pre-processing: After picture acquisition, pre-processing is used to improve the image quality. Thresholding is a pre-processing technique that seeks to binarize a picture based on a threshold value [9]. The value of the threshold can be specified at the local or global level. A variety of filters, including average, min, and max filters, can be used. Different morphological operations, such as erosion, dilation, opening, and closing, can also be carried out.

Character Segmentation: Before moving on to the classification phase, the image is split into characters. As a result of the classification phase, segmentation can be done explicitly or implicitly [11]. In addition, the other stages of OCR can aid in image segmentation by supplying contextual information.

Character Feature Extraction: At this stage, numerous character features are extracted. Characters are distinguished by these characteristics. An important research issue is how to choose the proper characteristics and the total amount of features to use. Various sorts of characteristics can be employed, including the image itself, geometric features (loops, strokes), and statistical features (moments). Finally, principal component analysis and other approaches can be employed to minimize the image's dimensionality. The process of putting a character into the right category is known as classification. The systematic approach to categorization is based on picture component connections. To classify the image, the statistical approaches rely on the usage of a discriminating function. Bayesian classifiers, decision tree classifiers, neural network classifiers, and closest neighbor classifiers are examples of statistical classification systems [10]. Finally, there really are classifiers that use a syntactic method to assemble a picture from its sub-components, which assumes a grammatical approach.

Post-processing: There are several ways that can be utilized to increase the accuracy of OCR findings once the letter has been classified. Using more than one classifier for picture classification is one of the ways. It's possible to employ the classifier in a cascade, parallel, or hierarchical method. The classifiers' outputs can then be mixed in a variety of ways. Contextual analysis is another option for improving OCR results. The image's geometrical & document context can help reduce inaccuracies. Lexical processing using Markov models and dictionaries can also aid improve OCR results.

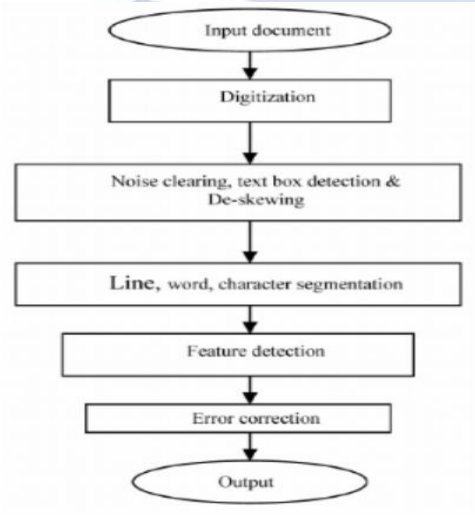

Fig 1: Flowchart of proposed method

6. RESULT

The indexing of medical records using the approach we have suggested, which combines textual description and visual description, is the first stage of our investigation. In fact, we used computerized medical annotation to show the value of our technique. The primary goal of an OCR system built on a grid architecture is to process electronic document formats that were previously only available in paper formats more effectively and efficiently. Compared to other available character recognition techniques, this increases the accuracy of character recognition during document processing. Here, OCR technique derives the words' meanings. As a result, our suggested approach performs better when evaluating the answer scripts. When compared to the current system, the text is identified and extracted in this instance more quickly. Comparing similarities between answers retrieved and reference summaries provided into the database is also more accurate, performing with an accuracy rate of 85%.

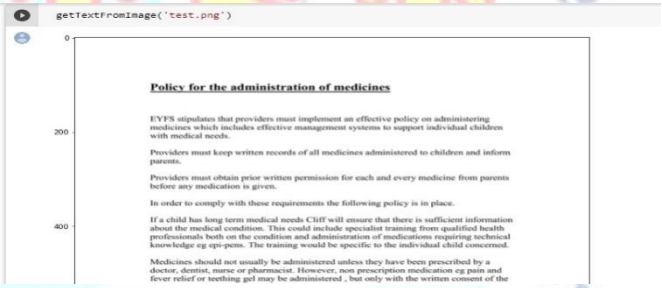

Fig2.InputDocument

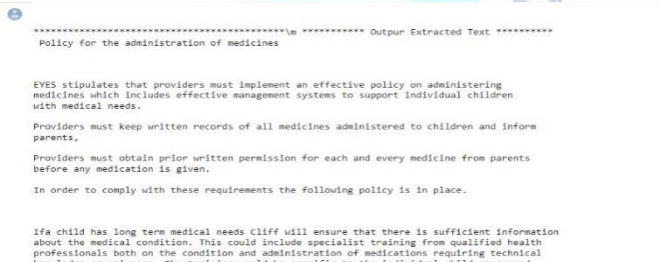

Fig 3. Output OCR Document

BioNLP/NLPBA 2004 shared corpus for the experiment. In this experiment, we compare the performance of RNN and CRFs with word embedding. For the baseline, only n-Gram (unigram, bigram, trigram) features of CRFs are utilized. The Jordan-type RNN and Elman-type RNN are compared, and at the same time, Word2Vec, GloVector, and CCA of the CRFs are also compared [11].

We use the F1 score as the performance measurement. The F1 score is calculated by the following expression:

F1score=2∗precision*recall/precision + recall

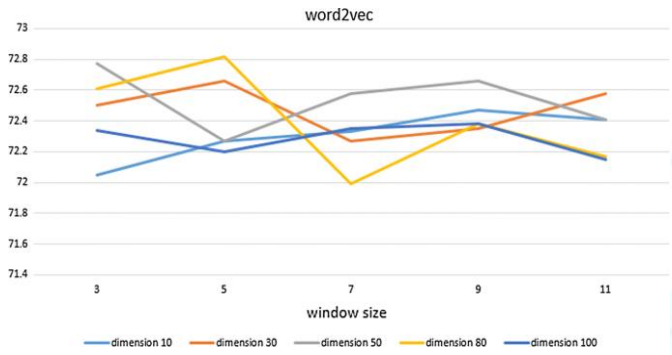

Fig 4:

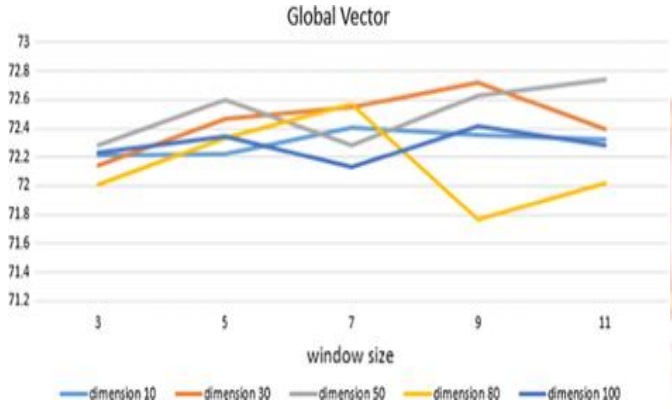

Fig 5:

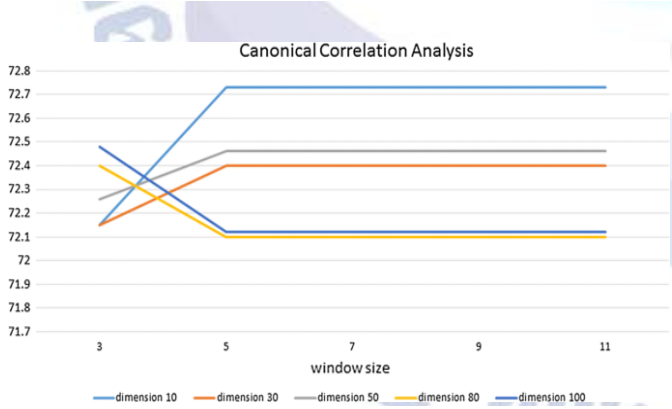

Fig 6:

Figures 4, 5 and 6 show the experimental results of each word embedding method with various dimensions and window sizes.

7. OUTPUT

The following are the results of my work which is carried out during processing the work.

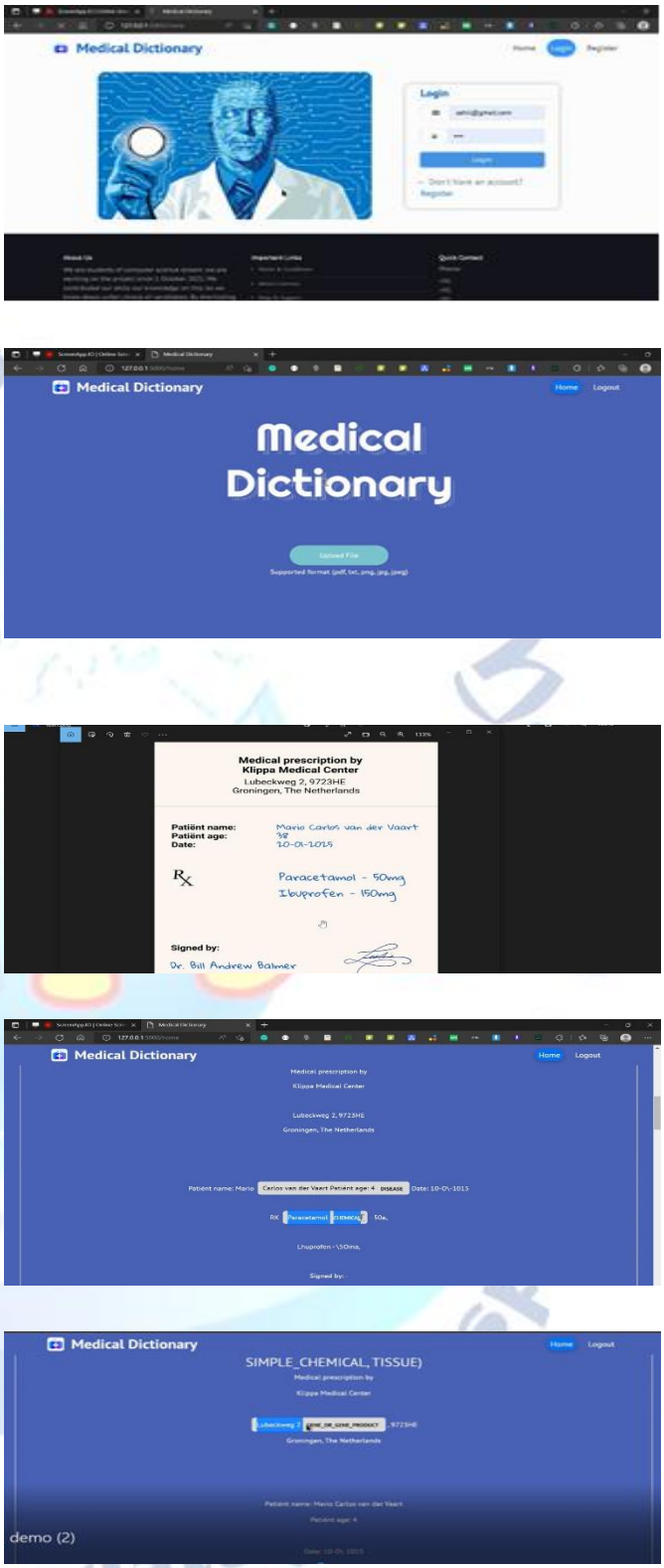

Fig7:Outputscreenofsystem

8. CONCLUSION

An overview of several OCR approaches is offered in this publication. OCR is a multi-phased procedure that includes acquisition, pre-processing, segmentation, feature extraction, classification, and post-processing. This paper goes over each stage in great detail. As a

future project, an efficient OCR system could be constructed using a mix of these strategies. The OCR system can be utilized in a variety of real-time applications, including number plate recognition, smart libraries, and other real-time applications. The classification of medical data is a delicate area of research. It has to do with how people live. As a result, the research conducted in this area must be precise and have high rates of accuracy. It is clear that additional research and development in this area is necessary. The suggested method in this study uses the test results from a medical check-up as input and uses OCR to extract the text from the medical reports. It then selects features using the Bag of Words (BOW) algorithm is a method to extract features from text documents and does classification. The databases included various patient test results from medical procedures. When it is trained and evaluated against various datasets that included medical testing, the outcome is obtained. In order to establish a method for accurately identifying diseases using medical check-up test data and their interpretation, this research concludes by employing OCR.

Conflict of interest statement

Authors declare that they do not have any conflict of interest.

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