

Patients Medical Report analysis using OCR and Deep Learning

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Abstract

Artificial intelligence is one among the booming technologies in the world. It gives scopes to many fields with its advancements. Data security, gaming, automotive industries, human resource, robotics, healthcare etc. In healthcare there are many different advancements that use AI to help doctors treat the patients. Our idea is to develop an AI that helps the patients to understand their medical report just by capturing the report as an image. There are few research works done that helps the doctors by analyzing the reports and suggesting good solutions. And also a few more research works that analyze the reports and store them in a database. These reports are processed and categorized based on its relevance so that doctors can make use of that to treat new cases. Our work is something that tells people what their report is all about without assistance from the doctor. We use Optical Character Recognition (OCR) to detect the text, involve them in a certain matching algorithm and show the results in descriptive texts and as an augmented reality (AR).

Keywords:

Artificial Intelligence, healthcare, medical report, Optical Character Recognition, Augmented Reality.

1. Introduction

The advancements in Artificial Intelligence in various fields particularly in healthcare made everyone wonder if AI will replace doctors with its intelligence. Practically it is not possible to replace doctors with AI but it can help doctors by assisting them to learn many things and create wonders in medical fields. AI helps the doctors analyze a patient's report and make a decision unifying doctor minds and machine using brain-computer interface, understand a concept in 3D models, to develop advanced radiology tools, minimizing the use of paper records by introducing electronic records and also its intelligence is used in many different ways to monitor each and every patient every second was discussed by Russell, Stuart J & Peter Norvig (2016).

Artificial Intelligence generally is a collection of technology. It helps many different technologies work together to produce unimaginable results. On the whole it is now becoming the brain of technology. Here in healthcare, machine learning (ML) is used along with artificial

intelligence in predicting what treatment will increase the success rate using the patient's vitals as input explained by Emrana Kabir Hashi, Md. Shahid Uz Zaman & Md. Rokibul Hasan (2017). Text based machine learning for mining domain explained by Aggarwal C.C (2018). Deep learning (DL) also works with artificial intelligence to share records of many different case data among doctors so that if any new cases are diagnosed the doctors can treat them with previous relevant cases discussed by Wenyuan Xue, Qingyong Li & Quyuan Xue (2019). Chandraraj Singh, Naveen Cheggoju & V R Satpute (2018) describes Data mining (DM) is also used with artificial intelligence for calculating diseases using classification methods and provides medicinal knowledge persons.

Though AI has its advancements in healthcare, it still lags in a way that any of its advancements will not help common people directly without doctor's assistance. All of its technologies give results that can only be understood by medical physicians or the medical organizations. So with the help of artificial intelligence (AI), optical character recognition (OCR) and augmented reality (AR) it is possible to make people understand their medical reports by themselves.

Augmented reality (AR) is one of the latest innovations that play a major role in various fields including gaming, medicine, automotive, entertainment, education etc. It provides a 'virtual visual treat' on the basic real-world. It works by the use of sensors such as camera, computer components and display units. Augmented reality plays an important role in medical growth and development. It helps in planning, practice and training of medical students for surgeries etc. Application of Augmented reality in the medical industry will bring huge value in practicing medicines. Recent survey on the applications and development of augmented reality in the medical field shows that it has begun its evolution and growth in neurosurgeries, cardiac surgeries and brain surgeries.

Our idea is to incorporate the above technologies and to develop an AI that helps the people by adding up a common sense of what medicine is. Optical character recognition is the technology that detects the texts from images. AI helps us to convert physical texts to digital texts

ie. in the form of electronic health records explained by M.B.Buntin et al (2017). These texts are then involved in certain matching algorithms to produce results. The results are shown to the patients as descriptive texts and as AR model. This helps the people understand what they are going through and get genuine treatments from the doctors as they know about the illness. Electronics based health care data records for countries like European were discussed and analyzed by R. S. Evans (2016) as well as S. Bonomi (2016).

2. Literature review

Wisam A. Qader & Musa M. Ameen (2019) presents a methodology to detect diseases from assessment reports after health examination. Here in order to develop the operating characteristics of the naive Bayes classifier we use optical character recognition which is normally convert hardcopy examination accounts into editable text formation data then for feature selection procedures formed by model called bag of words as well as for classification methods developed by naive Bayes. The operating characteristics in terms of validity of the proposed methodology are very good and it can be helpful for analyzing illnesses from medicinal examination reports. Our proposed methodology is accomplished by committed trained barriers of various medical datasets. With the help of identical data sets, our suggested algorithm is compared with the following four algorithms like Support Vector Machine (SVM), k-Nearest Neighbors (k-NN), Naive Bayes (NB) and Decision Table (DT) classifiers. Compared with other classifiers methodology of four system our projected procedure displayed higher accuracy. With the help of mixing of bag of words and AdaBoost methodologies our projected method compute the designation of the illnesses from examination accounts of the patients by R.E. Schapire (2013). G.Mohanraj, et al (2020) explained improvement of vaccination factor for kids using a hybrid deep learning model. Raja ravi sekar and Ilanchezhian (2015) analyze the different segmentation level techniques. AdaBoost algorithm is an ensemble method or technique that is used in machine learning which uses distributed decision tree algorithm for generating the results were discussed by Venkatesh M, Raj V & Suresh Y (2020). The decision is made based on the weights of the data in datasets.

Formula to calculate weight:

$$W(x_i, y_i) = \frac{1}{N}, i = 1, 2, 3, \dots, n \quad (1)$$

Subsequently, we consider a specimen image of the illness that can be accessible in addition to the illness with the designation to the doctor and the patient. For patient's point of view, the demonstration of image is very significant, since patients are not acquainted by the medicinal languages and illness names. Based on the very good operation characteristics as well as authenticated outcomes after testing, our projected methodology can be used in the

medicinal region. Raja ravi sekar and Ilanchezhian (2015) explain the segmentation using interactive images with region as well as boundary.

1. P. Bhandari et al (2016) propose a method to predict diseases by mining the unused datasets in the database and also J.Akilandeswari & G.Sumathi (2020) explained the data mining for query recommendation applications using improved fuzzy weighted-iterative association rule. Adriana Mihaela Coroiu, Alina Delia Calin & Maria Nutu (2019) propose a system that assists physicians to perform diagnosis with a patient's medical records. A. Iyer, S. Jeyalatha & R. Sumbaly (2015) suggests a way to diagnose diabetics with patterns found in data through decision tree algorithms and classification techniques.

3. Proposed System

Doc-Eye is the solution that we brought to make advancement in the medical field in a way that helps people understand their own medical report by themselves without any assistance from a doctor. The workflow of the application is given below,

Step 1 : On checking for camera permission, the user will be asked to capture or upload their medical report.

Step 2 : Using Optical Character Recognition(OCR) technique the words are detected and converted to digital texts.

Step 3 : These digital texts are compared to dataset in the firebase database by performing Decision Tree Algorithm.

Step 4 : On finding a perfect match, the result is shown as descriptive texts to the users.

Step 5 : Next the user will be given an option to visualize a 3D model based on their result.

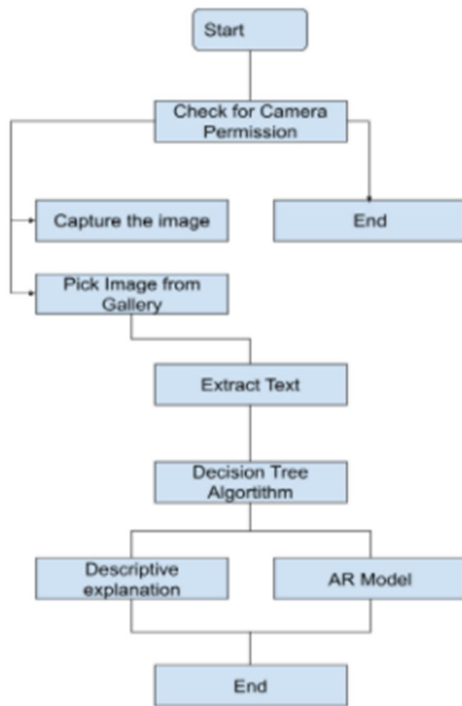


Fig 3.1 Flow Diagram

4. Methodology

4.1 TextConversion

Users can capture the report or upload the image from the gallery, the image is shown for the verification. At this point the system allows to crop the specified description of the report. The cropped text is then converted to digital text with the help of Optical Character Recognition OCR. Tesseract is the OCR engine that is capable of handling white-on-black text consequently.

4.2 Firebase:

The digital texts are then fed to firebase where it undergoes several comparisons to find its match. In firebase the data is stored in the structure of the tree. We use the text as a keyword and proceed with finding its match. There are n number of data stored in firebase database from which the match is found by using decision tree algorithm. On finding the match the users are shown with descriptive texts of what they are suffering from and also they will be given an option to visualize AR ie. On focusing the plane surface through the camera, the application will generate the AR model. This can also be used for education purposes.

4.3 Augmented Reality:

Augmented Reality is one of the representations of the concluded decision. In order to clarify the details to the users, they can opt for AR demonstration. The visual representation of a specified 3 dimensional image for every disease is displayed to the user. Augmented Reality is incorporated in android studio with Sceneform SDK. Sceneform is basically a 3D framework which is used to build ARCore apps for android. When the user clicks the AR button, the specified camera for augmented reality opens in the ArFragment present at activity layout. ArFragment is the simplified way to use the Sceneform by creating Scene view, it manages the ARCore session.

ArSceneView gives built-in Sceneform UX animation that showcases users the motion of mobile phones to activate AR experience. The obj asset file gets imported, where the Sceneform plugin updates the app gradle about the entry of imported 3d model. After executing the complete session, the required 3d model is being displayed on the plane surface.

5. Results and discussion

- The user will have to give permission to access the camera at first.

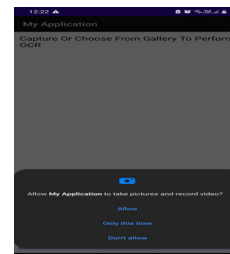


Fig 5.1 Camera Permission

- On giving permission the user will have to scan their report.



Fig 5.2 Home Page

- After scanning the report the key word is fed to the firebase database where the match is found.

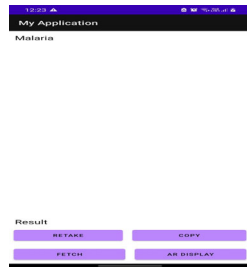


Fig 5.3 After OCR

- On clicking the Fetch button the user will be shown with descriptive information about the disease.

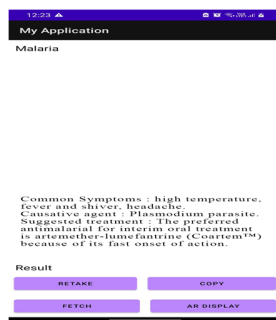


Fig 5.4 Result Page

6. Conclusion and Future Enhancement

Medical report analysis is one of sensitive work as it is related to human's life. Hence this application aims to generate more accurate results. More studies and development is focused to make this application useful. The proposed method is to scan the report and feed the detected keyword to the dataset. Decision tree algorithm plays its role to make more accurate predictions. Moving further the user will be shown with the information about the disease they are suffering from.

The experimental results have shown us more accuracy in detecting the text. The OCR technique that we used to detect the text and convert them to digital has shown us 95% accuracy. The data retrieval from the database based on the fed keyword has shown 98% accuracy.

Adding more futures to AR models and generating more accurate results in a faster way will be our future work in this product. We also aim to make the medical students

use this application to learn more with multiple patient reports.

2. References

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