

# Automated Pharmacy

Lajwanti Gupta, Kanishka Ingle, SharvariThombre, AishwaryalaxmiTambad

**Abstract**— This paper presents the new healthcare system that would change the way of curing the diseases, storing the records, buying the medicines. As we have seen most of the people visit the doctor for small-scale cure in which few of them can be cured at home itself using the home remedies. So our system provide the different functionalities which will digitalize the healthcare system. Optical Character recognition will help in scanning the prescription and providing the exact content on it. Electronic health record is the form of digital file record system which will contain the medical record of the patient. The Chatbot system will provide virtual assistance to the users. Here the patient's symptoms are predicted by pattern matching, by tracking what they describe. The patient is also provided with the map works with help of Google Maps API which will take them to the nearest located hospitals and medical stores. Further web service is also provided for purchasing the medical online, which all collectively help user to not go anywhere and get treatment for primary health related issues.

**Index Terms**— Healthcare Domain, OCR, Electronic Health Record (EHR), Virtual assistant (Chatbot), Google Maps API, Medication Profile.

## 1 INTRODUCTION

A major concern in India is that generally prescriptions are written by hand and most of the time such prescriptions are not readable by the pharmacist. This issue came into picture when several pharmacists gave a wrong medication due to poor understanding of the handwriting, which further caused health issues to them. Along with this is fast paced life of the people many of them tend to ignore the health related problems and avoid consulting to the doctor because they tend to have less time and few are not willing to go to the doctor. Let's imagine you have a family member as doctor, then it would be much easy. You would called them randomly and he would have consulted you according by asking your symptoms. But not everybody will have doctor in the family, so people will further tend to avoid visiting a doctor. But not anymore in the era of automation we have a system which is known as "Automated Pharmacy". As like Siri, we have Chatbot system for assistance, OCR for scanning the prescription, HER for keeping track of health records, Web portal for purchasing medicine online.

OCR is pattern recognition which has three main steps: observation pattern, segmentation and classification. It transformsthe document either alphanetsorhandwritten into machine encoded texts. A chatbot is a program which hosts conversation through auditory or textual methods. Using machine learning algorithms. EHR will provide the recording ofthehealth record issystem rather than on paper. This system will provide primary health services before visiting the doctor through virtual assistance.

• SharvariThombre is currently pursuing bachelor's degree on computer Science and engineering in shivaji university. Email: thombresharvari@gmail.com

• Aishwaryalaxmitambad is currently pursuing bachelors degree in computer science and engineering in Shivaji University, Email: tambadaishwarya@gmail.com

## 2 LITERATURE REVIEW

### 2.1 Review on OCR

A review process was adopted by surveying the few research for extracting and adapting character recognition technique. MAJIDA ALI ABED HAMID ALI ABED ALASADI [2005]. This manuscript considers a new approach to Simplifying Handwritten Characters Recognition based on simulation of the behavior of school of fish and flock of birds, called the Particle Swarm Optimization Approach (PSOA). We present an overview of the proposed approaches to be optimized and tested on a number of handwritten characters in the experiments. Our experimental results demonstrate the higher degree of performance of the proposed approaches. It is noted that the PSOA in general generates an optimized comparison between the input samples and database samples which improves the final recognition rate. Experimental results show that the PSOA is convergent and more accurate in solution that minimize the error recognition rate<sup>[4]</sup>.

Mohammed Z. Khedher, Gheith A. Abandah, and Ahmed M. Al-Khawaldeh 2005. This paper describe that Recognition of characters greatly depends upon the features used. Several features of the handwritten Arabic characters are selected and discussed. An off-line recognition system based on the selected features was built. The system was trained and tested with realistic samples of handwritten Arabic characters. Evaluation of the importance and accuracy of these selected features is made

- Lajwanti Gupta is currently pursuing bachelors degree in computer science and engineering in Shivaji University, India, Email: lajwanti Gupta21@gmail.com
- Kanishka Ingle is currently pursuing bachelors degree in computer science and engineering in Shivaji University, India, E-mail: inglekanishk@gmail.com

The recognition based on the selected features give average accuracies of 88% and 70% for the numbers and letters, respectively. Further improvements are achieved by using feature weights based on insights gained from the accuracies of individual features<sup>[1]</sup>.

Vijay LaxmiSahu, BabitaKubde (January 2013).<sup>1</sup> This paper explains that classification methods based on learning from examples have been widely applied to character recognition from the 1990s and have brought forth significant improvements of recognition accuracies. This class of methods includes statistical methods, artificial neural networks, support vector machines, multiple classifier combination, etc. In this paper, the characteristics of the classification methods that have been successfully applied to character recognition, and show the remaining problems that can be potentially solved by learning methods have been discussed<sup>[2]</sup>.

## 2.2 A review on Chatbots

A survey on the techniques that can be useful in designing of the chatbot is made. The different techniques of few papers that can be used to design a chatbot are compared as follows. The proposed work presents the methods of teaching chatbots to process natural language text. It discusses about processing natural language using Recurrent Neural Network (RNN). These sequential sequence long short-term memory cell neural network (LSTM) is used to train the model. In addition, it also talks about the challenges of implementing a Recurrent Neural Network based chatbot. Disease diagnosis system using several machine learning algorithms is proposed. A detailed comparison of four Machine Learning algorithms to predict disease based on symptoms provided, is also presented in this paper.

A smart chatbot for customer care by using Software as a Service which analyzes the message of each application server. It helps the user to resolve the issue by providing a human way interactions using LUIS and cognitive services which are implemented on AWS public cloud. Admin feeds input to the machine so that machine can identify the sentences and taking a decision itself as a response to a question. The database used in the project is MySQL. The illustration and execution of SQL in the pattern matching operation is required.

## 2.3 A review on EHR model

EHRs began in the 1960s with the COSTAR system, developed by Barnett at the Laboratory of Computer Science at Massachusetts General Hospital,]. In COSTAR, the medical data for a patient visit are recorded on a paper-based encounter form and then transcribed into the computer system by clerical personnel. Subsequent efforts at Duke University and the Regenstrief Institute at Indiana University Medical Center have all given rise to robust EHR systems that contain data for thousands of patients. An ambulatory computer-based record at Boston's Brigham and Women's Hospital also provides a summary screen displaying a "patient-at-a-glance" with problem list, allergies, and medications. The automated

medical record in the Dutch system is based largely on the country's progress in four crucial areas. These are the development of a standard clinical vocabulary, effective methods for direct physician interaction with the computer-based system, support of key professional societies, and judicious use of government funding.

## 3 PROPOSED SYSTEM

In the current health system, the first step when you enter is to identify the patient before proceeding ahead. After that patient may be seen by the doctor and in this way step by step procedure carried out. Similarly our system has the steps and functionalities as follows:

### • Mobile application:

Designing of mobile application. Application contains a scanning option for prescription as well as scan derma, accessible immediately without any login. It also contains a voice assistance option after login. It provides a demographic health record of the registered users. An option to order generic medicines is also available. The user has a service that can appoint doctors according to convenience. The user gets the in depth details of the medicines with the dosage.

### • Website:

Search option is provided to search the medicines, doctors, pharmaceutical stores and hospitals nearby. Already provided prescriptions can be used to order medicines. Search of any medicine provides details such as price, side effects, concerns, dosage, approved countries and expiry alerts it represents the demographic data of the user. User health history can be seen. Substitutes of medicines are provided. Share information option readily accepts the reviews and experiences of the end users.

### □ Scanning Module:-

Prescription scanning is done using Optical Character Recognition (OCR) algorithm and cloud vision API. Handwriting Recognition is optimized.

### □ Service Module:-

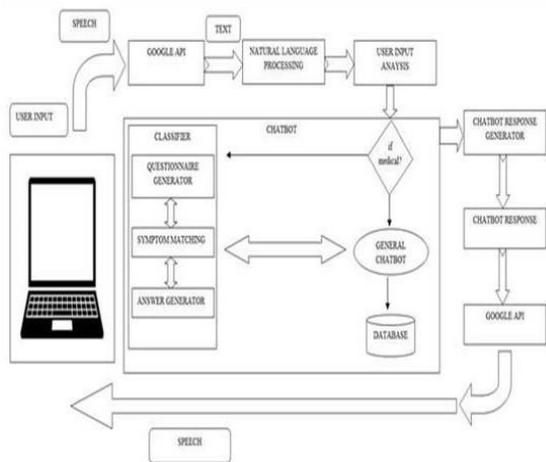
Our Software system provides the easy and efficient services so that any user can take benefits of our services. Any person unknown to the locality can easily access healthcare services by using our system.

Our system provides following services:

- **Online Pharmacy:** This service gives the ability to user to order online medicines and

healthcare. If the user resides in the remote location where medical stores are not available, then user can take benefit of this service. Some Medical stores sell the medicines at the higher cost, which in our case gives the genuine prices. Some people show unwillingness to visit the pharmacist so we provide online ordering.

- **Health Assistance:** Sometimes people are confused taking their health condition and unsure about how severe it is. Here we have 24x7 assistance of virtual doctor which gives better understanding and advices related to user's problem.
- **Health tracking intelligence module:** Our Trained Model keeps the medical track record and exclusively stores each user's data to their medical profile as like he will get all reports related to him on the screen.
- **Chatbot System:**



In the proposed system we have tried to enhance the ability of a chatbot from being used just as a tool of communication to predict disease based on symptoms provided as input. To achieve this, the system combines various machine learning algorithms. The system design is as follows:

□ *User Interact with Chabot*

The user starts a conversation with the chatbot by providing input through speech. The input is recorded through a microphone. It is just like starting a normal conversation with any human being. The conversation with the chatbot is completely voice based.

□ *Decision Making*

As soon as the chatbot starts the conversation with the user, the user is asked to choose from the options provided. Two options are provided: General Conversation and Medical Assistant. Based on the response from the user the chatbot decides if it has to continue a general conversation or to help the user for self-diagnosis.

□ *Response from chatbot*

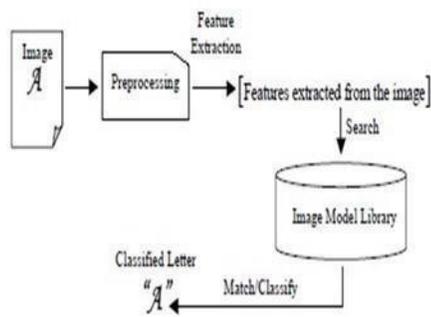
The response is generated based on the decision making in the previous stage. If the user needs help related to health the chatbot enters into a questionnaire. It starts asking about different symptoms and then finally predicts a disease. If the user does not need any help then the chatbot continues with the normal conversation. All the response from the chatbot is voice based.

• **EHR Overview:**

The Electronic Health Record includes healthcare notes on the life period of each individual that is created in a computer system is kept confidentially. The ehr is a secure, shared and they are accessed electronically by authorized health care providers. EHR's save hundreds of hours of time, reduce cost of care, while improving patient safety. An ehr are used for getting better decision on treatment and development of curative results and can gather better information for public health and researches.



• **OCR Model:**



OCR consists of many phases such as Pre-processing, Segmentation, Feature Extraction, Classifications and Recognition. The input of one step is the output of next step. The task of preprocessing relates to the removal of noise and variation in handwritten. Several area where ocr used including mail sorting, bank processing, document reading and postal address recognition require offline handwriting recognition systems, pattern recognition.

In The pre-processing phase, there is a series of operations performed on the scanned input image. It enhances the image rendering its suitable for segmentation the gray-level character image is normalized into a window sized. After noise reduction, we produced a bitmap image. Then, the bitmap image was transformed into a thinned image. **Segmentation** The Segmentation phase is the most important process. Segmentation is done by separation from the individual characters of an image.

Segmentation of handwritten characters into different zones (upper, middle and lower zone) and characters is more difficult than that of printed documents that are in standard form. This is mainly because of variability in paragraph, words of line and characters of a word, skew, slant, size and curved. Sometimes components of two adjacent characters may be touched or overlapped and this situation create difficulties in the segmentation task. Touching or overlapping problem occurs frequently because of modified characters in upper-zone and lower-zone. Segmentation is an important stage. Feature extraction: In this phase, features of individual character are extracted. The performance of a each character recognition system that depends on the features that are extracted. The extracted features from input character should allow classification of a character in a unique way. We used diagonal features, intersection and open end points features, transition features, zoning features, directional features, parabola curve fitting-based features, and power curve fitting-based features in order to find the feature set for a given character..

## 4 ALGORITHMS

Algorithm used are as follows

1. Sequence-to-Sequence Model

The seq2seq model consists of two RNN: an encoder and a decoder. The encoder takes a sentence as input and processes one word one at a time. The decoder generates words one by one in each time step of the decoder's iteration. After one complete iteration, the output is generated.

2. Apriori

The Apriori algorithm is used for finding frequent item sets in a dataset for Boolean association rules. The apriori principle can reduce the number of items sets we need to examine. The algorithm uses bottom up approach where frequent subsets are extended one at a time, known as candidate generation and group of candidates are tested against the data. It states that if an item set is infrequent, then all its supersets must also be infrequent. This means that if {pale eyes} was found to be infrequent, we can expect {pale eyes, cold} to be equally or even more infrequent, so in consolidation the list of popular item sets, we need not consider {pale eyes, cold}, nor any other item set configuration that contains pale eyes.

## 5 RESULT ANALYSIS

The proposed and implemented system has two main advantages:

- Cost
- Time

In the proposed system only open source technology is used and web application and mobile application both are available. So, due to this the whole system is cost effective according. Here we don't need to travel and visit the doctor just a mobile phone will provide us whole system. Also the system will scan the prescription rather than typing into it and give the exact written content which will be saving the time as well as the mistakes occurred during the handwritten prescription. Secondly, there is virtual assistant which will not only interact you but also guide about the medication after you input the symptoms.

## 6 CONCLUSION

This system has many features which will be very easy for users. The scanning and detection of contents of handwritten prescription is made possible. A chatbot design is implemented which can be used as tool for general conversation as well as self-diagnosis. With that, the self-diagnosis can be made more accurately with the help of providing the data as like heart rates, Body Mass Index (BMI) etc. The system is very useful in medical field for early detection and curing of the diseases. The user can take advantage of the application where every data is kept online and which provided real time experience.

## REFERENCES

- [1] Smaltz, Detlev and Eta Berner. "The Executive's Guide to Electronic Health Records", 2007.

- [2] Vijay LaxmiSahu, BabitaKubde Offline Handwritten Character Recognition Techniques using Neural Network: A Review International Journal of Science and Research(IJSR),IndiaOnlineISSN: 2319-7064 Volume 2 Issue 1, January 2013
- [3] GurpreetSinghChandanJyotiKumarRajneeshRaniDr.RenuDhir,"Feature ExtractionofGurmukhiScriptandNumerals:AReviewofOfflineTechniques" IJARCSSE Volume3,Issue1,January2013pp 257-263
- [4] Majida Ali Abed, Hamid Ali Abed Alasadi," Simplifying Handwritten Characters RecognitionUsingaParticleSwarmOptimizationApproach"EuropeanAcademic Research,Vol.I,Issue5/August 2013 pp-532-552
- [5] Argha Roy, Diptam Dutta, Kaustav Choudhury," Training Artificial Neural NetworkusingParticleSwarm OptimizationAlgorithm"IJARCSSEVolume3,Issue3,March2013pp43— 434
- [6] Amir BahadorBayat Recognition of Handwritten Digits Using Optimized AdaptiveNeuro-FuzzyInferenceSystemsandEffectiveFea-turesJournalofPattern RecognitionandIntelligentSystemsAug.2013, Vol. 1
- [7] iRxClinics,—DigitalPrescriptionWriting&SmartPenliRxClinics—Digitally Yours!Digitizedpatientrecord.[Online].Available: <https://www.irxclinics.com/>. [Accessed: 13-May-2019].
- [8] —Prescription app, e-prescribing, doctor's prescription software, prescription app for doctors. | [Online]. Available: <http://www.prescrip.in/Index.aspx>. [Accessed: 13-May-2019].
- [9] —E-PRESCRIPTIONleprescriptionsoftwareleprescriptionIndialeprescription benefits.[Online].Available: <http://www.igrandee.com/jsp/domain/health/product/eprescription.jsp>. [Accessed: 13-May-2019].
- [10] BhavikaR.Ranoliya,NidhiRaghuwanshiandSanjaySingh,"ChatbotforUniversity RelatedFAQs".IEEetrans.978-1-5090-5013,2017
- [11] KaiYu,ZijianZhao, XueyangWu,HongtaoLin,XuanLiu,"Rich ShortTextConversationUsingSemanticKeyControlledSequence Generation". IEEetrans. On ASL.,tobe published
- [12] Ankil Shah, Bhargav Jain, Bhavin Agarwal, Saurabh Jain, Simon Shim, "Problem SolvingChatbotforDataStructure".IEEetrans.978-1-5386-4649-6,2018
- [13] BayuSetiaji, Ferry WahyuWibowo, Department of Informatics Engineering STMIKAMIKOM Yogyakarta, Yogyakarta, Indonesia, 2166-0670/16 \$31.00 © 2016 IEEE "Chatbot Using a Knowledge in Database-Human- toMachine ConversationModeling".
- [14] ChatbotUsingAKnowledgeinDatabase,"Bayu Setiaji,FerryWahyuWibowo",20167thInternationalConferenceonIntelligent Systems, Modelling and Simulation.2016IEEE.
- [15] "NovelApproachforMedicalAssistanceUsing Trained Chatbot", DivyaMadhu, NeerajJainC, International Conference on Inventive Communication and Computational Technologies.
- [16] MAJIDA ALI ABED HAMID ALI ABED ALASADI Simplifying Handwritten CharactersRecognitionUsingaParticleSwarmOptimizationApproachEUROPEAN ACADEMICRESEARCH,VOL.I,ISSUE5/AUGUST2013ISSN2286-4822