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Generation of Doctor's Digital Prescription using Speech to Text Algorithm

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ABSTRACT: Due to big data progress in biomedical and healthcare communities, accurate study of medical data benefits early disease recognition, patient care, and community services. When the quality of medical data is incomplete the exactness of the study is reduced. Moreover, different regions exhibit unique appearances of certain regional diseases, which may result in weakening the prediction of disease outbreaks. In the proposed system, it provides machine learning algorithms for the effective prediction of various disease occurrences in disease-frequent societies. It experiments with the altered estimate models over real-life hospital data collected. To overcome the difficulty of incomplete data, it uses a latent factor model to rebuild the missing data. It experiments on a regional chronic illness of cerebral infarction. Using structured and unstructured data from the hospital it uses Machine Learning Decision Tree algorithm and Map Reduce algorithm. To the best of our knowledge in the area of medical big data analytics, none of the existing work focused on both data types. Compared to several typical estimate algorithms, the calculation exactness of our proposed algorithm reaches 94.8% with a convergence speed which is faster than that of the CNN- based unimodal disease risk prediction (CNN-UDRP) algorithm.

KEYWORDS: Big data analytics, machine learning, healthcare

I. INTRODUCTION

In these times of crisis, the world is facing right now, it has become difficult to step out of our houses. At these times many healthcare institutions have shut down due to the fear of the COVID-19 pandemic. It is observed that there is a growing need of obtaining first-class medical assistance to be available at the comfort of our homes. We have thus decided to come up with an Android application "MediQ"(i.e. medical at a click) that helps users access medical assistance without stepping out of the house or carrying out unnecessary visits to the doctor. We are aiming to give first-class medical assistance for generic diseases that is affordable as well as efficient for mass people. [14] We are combining various domains in the IT sector such as IoT, Machine Learning, Android Applications, etc. The initial stage will be taking down various symptoms from the user through a user interface. All this data will be uploaded to the cloud for the doctor to access. We have taken due care for the privacy of every patient. The data will be combined i.e. data of the first and second stage and disease prediction will take place with the help of map-reduce and big data analytics. The second stage will be consulting the doctor. The users will be given the freedom of choosing a doctor from the list. The doctor will then consult the patient and generate a text prescription from speech. We will be using various algorithms such as KNN etc. The text prescription will be sent as an SMS or email to the patient as well as uploaded on the cloud for future use if required.

A. Need

Our proposed system is performing the work in the Healthcare sector. As we know we are facing so many difficulties in the healthcare sector. Now the whole world is facing trouble in finding the cure for COVID19 (CORONA virus). Because of the lockdown, we face so many difficulties in getting medical facilities. As we are building the system which helps us to get the prescription depending on the symptoms given by the user. We don't need to travel to hospitals as the system will help to get your health checkup at your doorstep.

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The analysis accuracy is reduced when the quality of medical data is incomplete. Moreover, different regions exhibit unique characteristics of certain regional diseases, which may weaken the prediction of disease outbreaks. However, those existing works mostly considered structured data.

B. Basic Concept

Speech/Voice is the basic, common, and efficient form of communication method for people to interact with each other. Today speech technologies are commonly available for a limited but interesting range of tasks. Communication among human beings is dominated by spoken language, therefore it is natural for people to expect voice interfaces with a computer.[6] This can be accomplished by developing a voice recognition system: speech-to-text which allows the computer to translate voice requests and dictation into text.

The motive behind this project is to design an accurate and user-friendly application that generates medicine prescriptions by taking voice as input and operates on a given symptom by a user

II. PROPOSED ALGORITHM

We aim at developing a software app that will enable patients to effortlessly communicate with doctors for medical assistance. This app will aim to reduce the mistakes that happen daily because of misinterpretation of handwritten prescriptions.

The system consists of 3 modules:

- Speech to text
- Text Formatting
- Digital signature

A. *Proposing the theme to overcome the already studied idea*

Proposing the theme to overcome the already studied idea Design an app to write formatted prescriptions based on dictation from the doctor. The app should provide a facility to sign the prescription and also send it to the patient directly on his phone and email id. The method of storing the medical records (EHR) should follow relevant compliance laws like HIPAA.

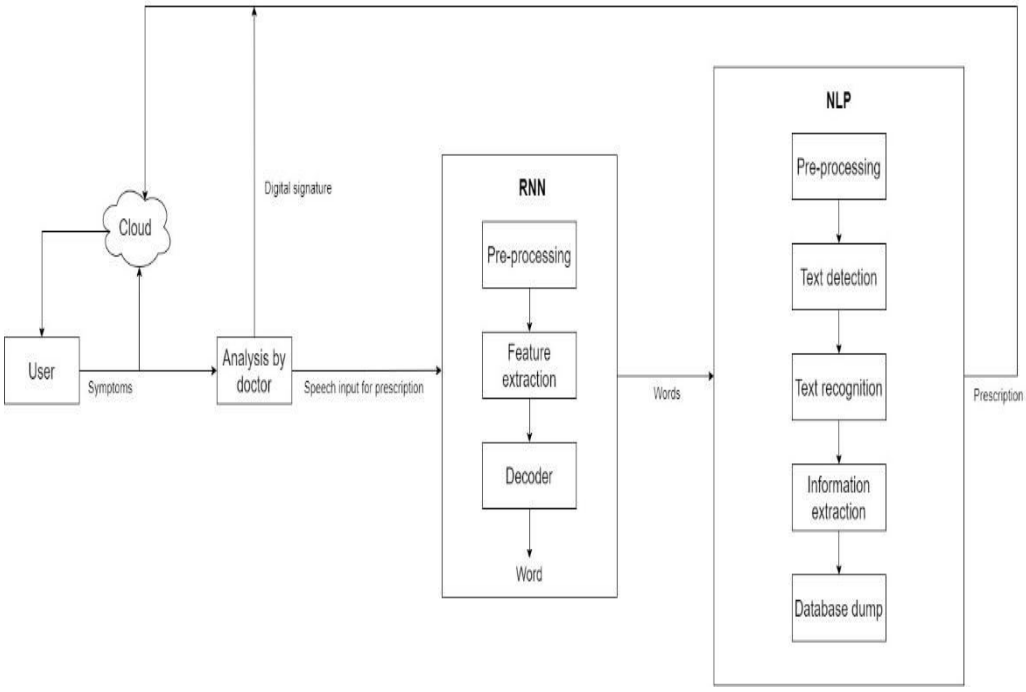

Fig. 1. System Architecture

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B. *Methodology for solving this proposed thing*

Level 1: Map Reduce

Machine Learning (ML) delivers methodologies, approaches, and apparatuses that can help to resolve analytically and predictive hitches in a miscellany of medicinal areas. ML is being used for the inquiry of the wild of controlled edges and their mixtures for forecast, e.g. forecast of illness development, removal of medicinal information for consequence investigation, treatment guidance and provision, and for the overall enduring organization. [5] ML is also being used for statistics examination, such as the discovery of proportions in the data by right commerce with flawed data, clarification of incessant data used in the Strenuous Care Unit, and brainy troubling subsequent in real and ordered nursing. It is contended that the successful presentation of ML attitudes can help the tally of computer-based structures in the healthcare setting providing chances to ease and enhance the exertion of medical boffins and eventually to recover the competence and excellence of medicinal repair. Below, it précises some main ML requests in medicine. Machine Learning learns the data and produces the result.

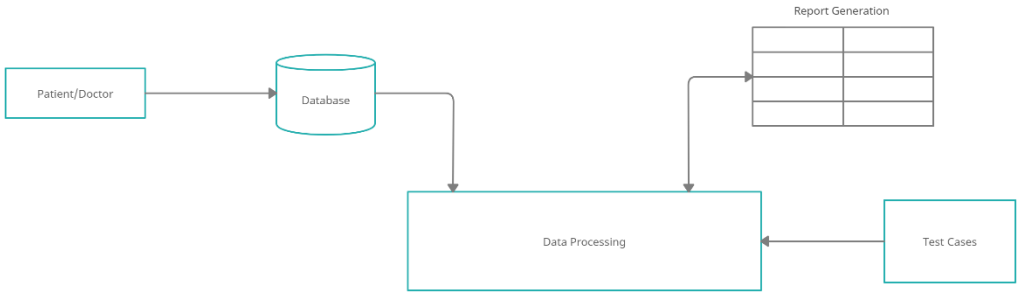

Fig.2.Map Reduce

Map Reduce is an essential constituent of the Apache Hadoop software plan. Hadoop allows hardy, feast dispensation of huge shapeless facts sets crosswise product processor bunches, cutting-edge which each bulge of the bunch covers its packing. [2]Map Reduce assists two crucial tasks: It tracts out slog to innumerable nodes within the group or map, and it classifies and reduces the consequences from each node into a consistent response to an inquiry. IBM Bluemix rebranded IBM Cloud in 2017, is a cloud Platform as a service (PaaS) developed by IBM. It supports several programming languages and services as well as integrated DevOps to build, run, deploy and manage applications on the cloud. Bluemix is based on Cloud Foundry opens technology and runs on SoftLayer infrastructure. Bluemix supports several programming languages including Java, Node.js, Go, PHP, Swift, Python, and can be extended to support other languages such as Scala through the use of build packs.

Level 2: Speech to Text Conversion:

a. Voice Input:

With the help of a microphone, audio is input into the system, the pc sound card produces the equivalent digital representation of received audio.

b. Digitization:

The process of converting the analog signal into a digital form is known as digitization, it involves both samplings and quantization processes. [21]Sampling is converting a continuous signal into a discrete signal, while the process of approximating a continuous range of values is known as quantization.

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c. Acoustic Model:

An acoustic model is created by taking audio recordings of speech, and their text transcriptions, and using software to create statistical representations of the sounds that make up each word. It is used by a speech recognition engine to recognize speech. The software acoustic model breaks the words into phonemes.

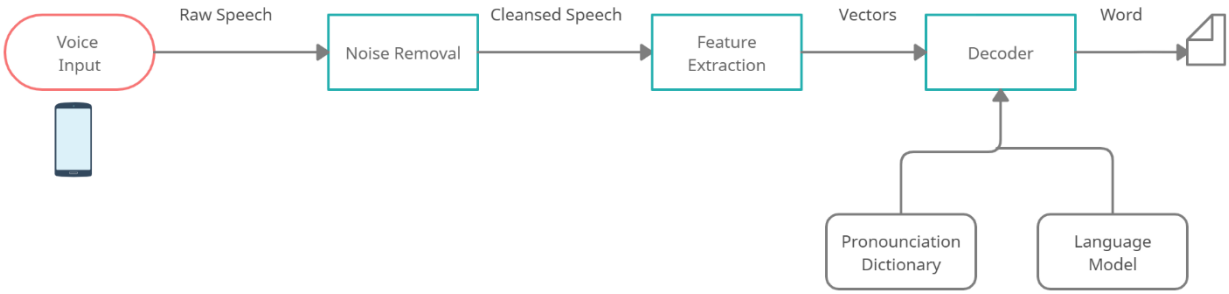

Fig. 3.Speech to Text Conversion

d. Language Model:

Language modelling is used in many natural language processing applications such as speech recognition to capture the properties of a language and predict the next word in the speech sequence. The software language model compares the phonemes to words in its built-in dictionary.

e. Speech engine:

The job of the speech recognition engine is to convert the input audio into text; to accomplish this it uses all sorts of data, software algorithms, and statistics. [18] Its first operation is digitization as discussed earlier, that is to convert it into a suitable format for further processing. Once the audio signal is in the proper format it then searches for the best match for it. It does this by considering the words it knows, once the signal is recognized it returns its corresponding text string.

Level 3: Text Processing

The block architecture for the proposed system is as shown in the figure. It is mainly divided into three phases of implementation. The first phase is generally known as the training phase. The second phase is testing and the third phase is the generation of prescriptions.

The training phase is accomplished by the implementation of feature extraction. Here given symptoms to be used are trained. All the extracted features are stored in a database for further use.

In the testing phase feature are extracted for symptoms spoken by an unknown user. The third phase consists of medical data for reference, and the Predefined Format for proper formatting of prescriptions is introduced. [18] By fetching the data from the Medical database and inputs from the doctors the Electronic Medicine Prescription will be generated.

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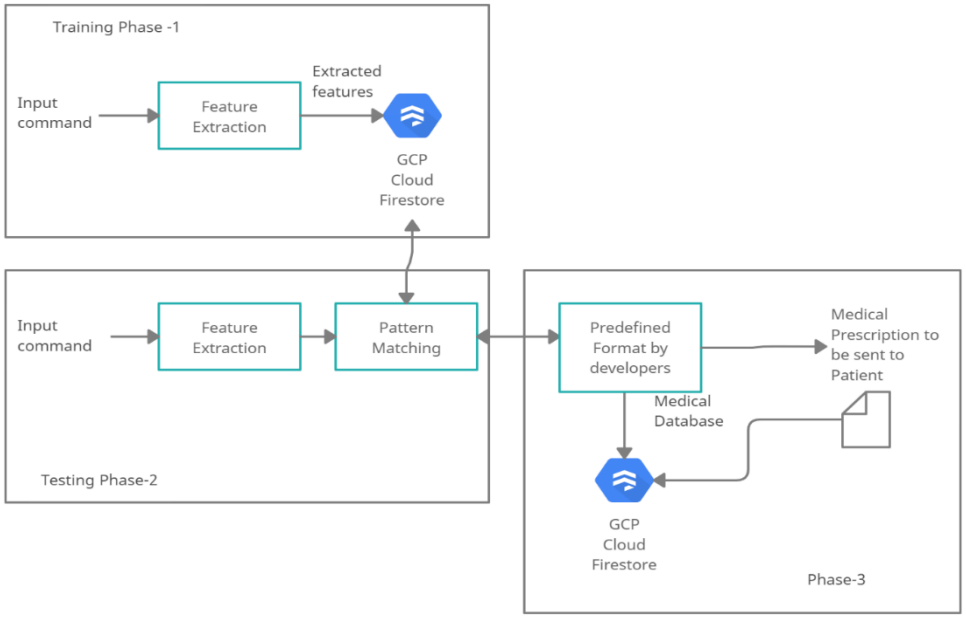

Fig.2.Text Processing

III. CONCLUSION AND FUTURE WORK

The main motivation of this paper is to provide an insight into the speech-to-text module and patient-to-doctor communication online. Also, the risks caused by doctor's handwriting while writing out prescriptions will reduce to a larger extent. We aim on using RNN and NLP algorithms for speech-to-text and text processing respectively. Different algorithms can be used in the future to carry out some tasks to achieve higher accuracy.

The future scope of the project includes adding a feature of looking for the nearest medical stores for the patient so that medicines can be accessed from home. Also booking various appointments for medical tests online and collecting samples for tests from homes of patients. A medical band reading heartbeat and temperature recordings can also be induced so that the doctor has access to the patient's live readings, which will increase the accuracy of the application.

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