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A Novel Medical Chatbot with Alzheimer's Disease Detection Using Deep Neural Network

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Abstract

The healthcare sector is one of the largest focus areas in the world today. Individuals are becoming increasingly susceptible to lifestyle diseases. Hospitals and clinic are the most widely used place by the patients to consult doctor and get treated. People consider it as the most reliable means to check their health status. But in this way of approach for treatment the patients need to wait for a long time to consult the doctor which makes them more sick . In order to avoid such situation we came up with the idea of medical diagnosis chatbot in which user can interact with the Artificial Intelligence chatbot , to analyze the disease based upon the symptoms and with the MRI scan report.

Keywords

DNN, imagenet, inceptionV3, machine learning, mobilenet, MRI scan images.

INTRODUCTION

The main goal of the system is to create a medical chatbot in which the user can interact with the AI and diagnose the disease based upon the symptoms .The chatbot will be available at any time and the user can utilize it at any point of time when there is a requirement for it .Sometimes the chatbot may diagnose the disease wrongly because the symptom alone is not sufficient for it to analyse the disease In order to avoid such situation we came up with the idea of medical diagnosis chatbot in which the user can interact with the AI chatbot , to analyse the symptoms, risk factors and prevention of specific disease and can also detect the severity of Alzheimer's disease by uploading the MRI scan report. Here, we use the machine learning approach to built the chatbot.

MOTIVATION

The primary goal is to develop a prediction system which will allow the users to check whether they have Alzheimer Disease, the user need not visit the doctor unless he/she has Dementia or Alzheimer Disease, for further treatment.The secondary aim is to develop a web application that allows users to diagnose their disease based on the symptoms they have.This system will be available at any time and the user can utilize it at any point of time when there is a requirement for it.The accuracy of the prediction will be high and the time limit for the prediction will be low compared to the existing system.

LITEARATURE SURVEY

Uddin, M.Z., Dysthe, K.K., Følstad, has done research To automatically detect depression symptoms in text for decision support in health care is important. In this work, a multimodal human depression prediction approach has been investigated based on one-hot approach on robust features based on describing depression symptoms and deep learning method, RNN. Using the proposed approach,91% and 92% mean prediction performance has been achieved on datasets.It is only based upon the prediction of depressive symptoms.It is based on only specific disease like depression and only has the text feature,designed in French language.

Arriba-Pérez, F., García-Méndez, S., González-Castaño, F.J. et al. has done research on Automatic detection of cognitive impairment in elderly people using an entertainment chatbot with Natural Language Processing capabilities.In this work, to reduce caregivers' effort and the whitecoat effect, we have proposed a novel conversational system for entertainment and therapeutic monitoring of elderly people.It relies on nlp techniques for chatbot behaviour generation and user-transparent automatic assessment, by combining ,distracting (user-centred) with attention-demanding questions (embedded cognitive tests).It achieved a accuracy of 90%.It is designed only for text feature for elder people in norwegian language.

Junxiu Liu, Mingxing Li, Yuling Luo, Su Yang, Wei Li, Yifei Bi, has done research on Alzheimer's disease detection using depthwise separable convolutional neural networks, A novel DSC network-based method for detection of AD is proposed in this paper. The conventional CNN method is first used to detect AD, and the classification accuracy rate reached 78.02% in a three-way classification scenario (AD, MCI and normal). Then, an AD detection method combining DSC and CNN is proposed. Compared with the CNN, the model parameters of the proposed method are reduced by 87.94% and the computing cost is reduced by 84.25%, where the classification accuracy rate remains moder- ately the same.It has only image feature and low rate of accuracy.

Arjaria, S.K., Rathore, A.S., Bisen, D. et al. has done research on Performances of Machine Learning Models for Diagnosis of Alzheimer's Disease. The machine learning algorithms used in this paper are standards and successfully applied in classification problems. Along with classification

algorithms, different feature selection and dimension reduction techniques are used for diffing out more relevant features than others for decision making and thus reducing the training time of the classification algorithms. In this study, Top-rated four features namely CDR, SES, nWBV, and EDUC are identified for decision making for AD that map sufficiently accurate correlation with the class labels and an approximately 90% accuracy.It has a low accuracy and only 3 classes of disease.

LIMITATIONS IN THE EXISTING SYSTEM

In the traditional way of approach Hospitals and clinic are the most widely used place by the patients to consult doctor and get treated, people consider it as the most reliable means to check their health status. But in this way of approach for treatment the patients need to wait for a long time to consult the doctor which makes them more sick .In the existing system the accuracy level is very less. In that system the disease recognised by the chatbot is not much accurate, because the disease is predicted only based upon the symptoms sent by the user, so that it may diagnose the disease wrongly. In those existing system there is only text feature and it is designed only for specific languages like French, norwegian and for specific domains. In the existing system the technique used was CNN , it has less number of layers than DNN so the prediction is less accurate.

PROPOSED SYSTEM

Input

Dataset is collected from the Kaggle. It contains MRI scan image of the patients having alzheimer. MRI scan images help us to clearly segment and study the image with fine detailing. The symptoms, risk factor and prevention of various diseases have been collected from the people for the chatbot.

Process

Initially, the libraries are imported and the dataset is loaded into the system. Dataset is then cleaned and pre-processed. TensorFlow is used. It is an end-to-end open source platform for machine learning. Keras is also used as it is a high-level neural network library that runs on top of TensorFlow. Dataset is split into training and testing data. Epoch, an arbitrary cutoff, generally defined as "one pass over the entire dataset", used to separate training into distinct phases, which is useful for logging and periodic evaluation. When using validation data or validation split with the fit method of Keras models, evaluation will be run at the end of every epoch. Finally after scaling the data, a prediction model (mobilenet) is built and can be used to identify whether a person is affected by Alzheimer disease or not.

Output

The performance of the model is evaluated based on precision, accuracy rate. Confusion matrix for the test data is done. Confusion matrix is a performance measurement for machine learning classification problem where output can be of more classes. It is a table with 4 different combinations of rows and columns which is been predicted with actual values. The patient can able to identify whether he/she has been affected by Alzheimer disease or not using this prediction model .The patient can able to analyze the symptoms , risk factor and prevention method of specific disease.

DESIGN DIAGRAM

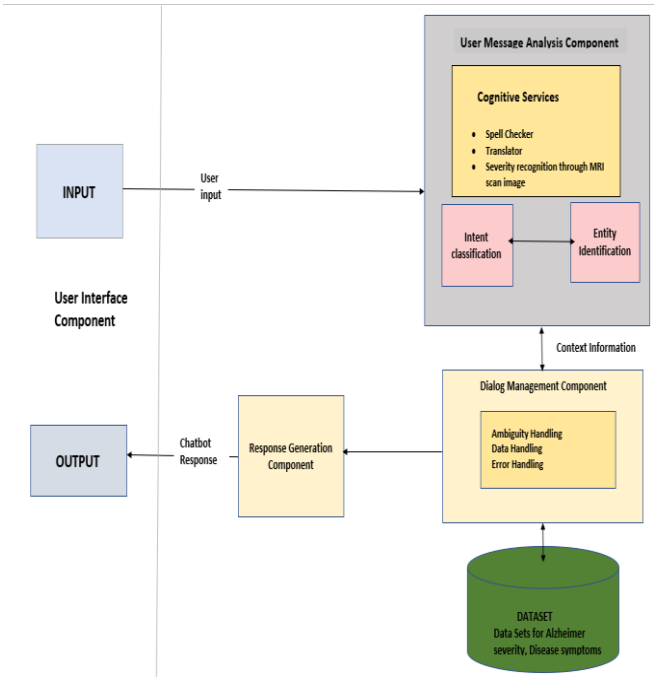

Figure 1. Detailed design diagram of a novel chatbot system

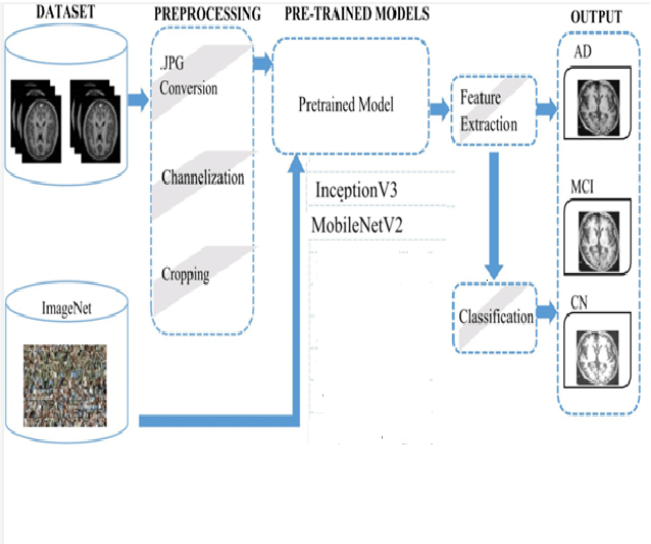

Figure 2. Process flow diagram for the alzheimer's disease detection

RESULT ANALYSIS

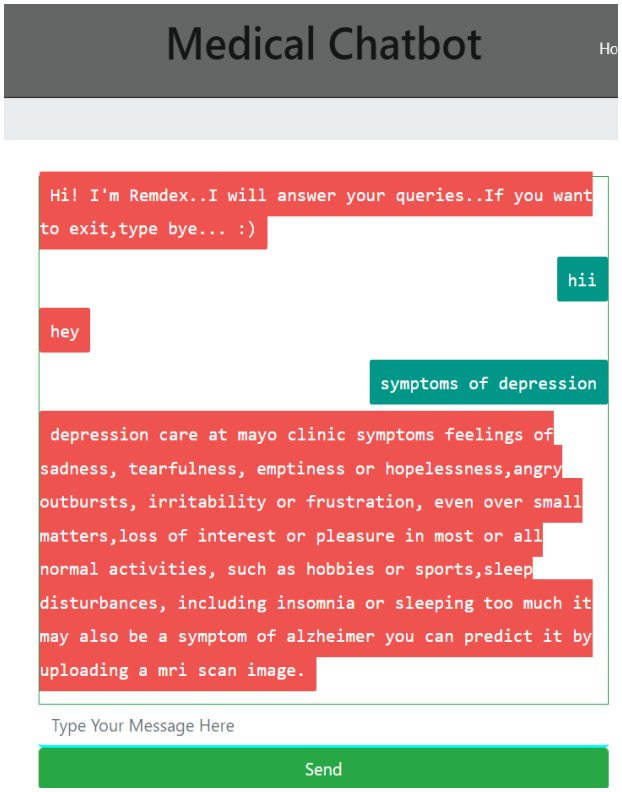

Figure 3. Chatbot for disease prediction

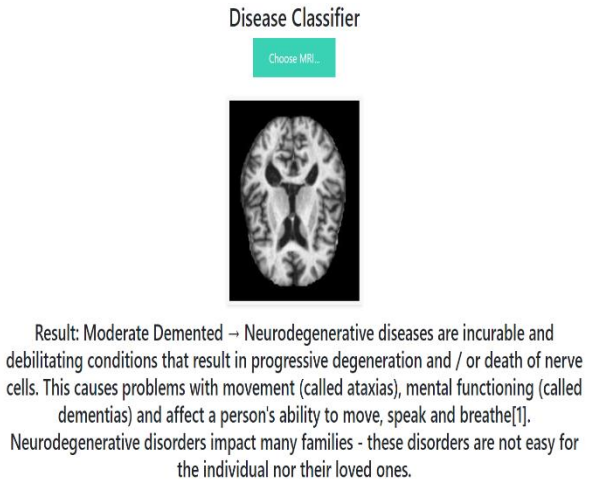

Figure 4. Alzheimer disease detection

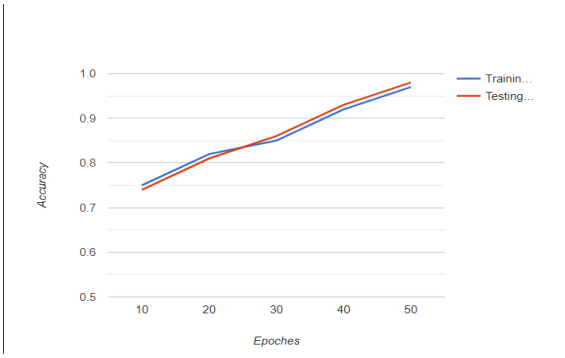

Figure 5. Accuracy graph for disease detection

CONCLUSION

In this system the people can able to diagnose the severity of disease easily from their respective locations. Here the application is developed to provide the response in a short period of time. In this system, it can able to function as a virtual doctor. It is highly difficult for working people to go to hospitals for their regular check-up. In such cases, this system is of great importance because it offers diagnostic support with a simple push of a button . The user interacts with the Prediction Engine by filling a form which holds the parameter set provided as an input to the trained models. This research has resulted in the development of a DNN-based pipeline to successfully identify multi-class Alzheimer's disease using brain MRI scan images and analyse the symptoms, risk factors and prevention of specific disease.

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