Dr. Watson AI Based Healthcare Technology Project

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Abstract The aim of the design is to implement Artificial Intelligence in the Healthcare domain and find suitable results. This work is an AI based web application which enables four features 1. Medicine Prescriber 2. Diabetic Analyzer 3. Covid-19 Predictor and 4. AI based chatbot. Provide online solution for the patients like prescribing medicine based on the symptoms, Analyzing the blood sugar (Mg/Dl) and suggesting food diet based on the age and sugar level, Predicting Covid-19 Positive or negative according to the X-ray of the chest and AI based Chatbot which acts as a support agent guides the user in using this application and tells interesting facts on Covid-19. The UI design of the web application is crafted using Adobe XD. Machine learning and Deep learning techniques are used to predict results for these features, these Machine learning and Deep Learning models are deployed as Web application using a framework called Flask. IBM Watson Assistant which is used to create the chatbot, allows you to integrate conversational interfaces into any app, device, or medium, as well as add a natural language interface to the app to automating conversations with your customers.

Keywords Dr. Watson AI based healthcare technology · Medicine prescriber · Covid predictor · Diabetic analyser · Chatbot

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1 Introduction

Patients, doctors, and hospital managers' life are made easier by artificial intelligence, which performs activities normally performed by people in a relatively short time and at a fraction of the investment [1]. The AI sector, which was estimated at around $600 million in 2014 and is expected to hit $150 billion by 2026, is one of the world's fastest-growing sectors [2]. In the simplest sense, AI is something that whenever computers as well as any other machines can study, analyze, and decide things or take actions in the same way that humans can [3]. The use of machines to evaluate and act on medical information, usually with the purpose of predicting a specific outcome, is referred to as AI in healthcare [4]. AI in healthcare can improve patient outcomes through improving preventative care and livability, as well as producing more accurate diagnosis and treatment regimens. By data analysis from the government, hospitals, as well as other resources, AI can also anticipate and track the spread of contagious diseases [5]. As a result, AI has the potential to be a critical instrument in the fight against diseases and pandemics in global public health. Artificial intelligence in medicine uses Machine learning algorithms to search medical data for ideas that can assist increase health and treatment outcomes [6]. Clinical decision assistance and image analysis are now the most prominent uses of AI in medical contexts [7]. Clinical decision support tools assist practitioners in making therapy, medicine, mental health, and other patient-related decisions by providing quick access to relevant information or research. AI, unlike humans, does not require sleep [8]. Machine learning algorithms could be used to monitor the vital signs of critically ill patients and notify clinicians if specific risk indicators rise.

Artificial Intelligence is used to spot patterns in behaviour that lead to either high or low blood sugar levels in diabetes patients [9]. Continuous glucose monitors used by those with diabetes collect a huge amount of data that has previously not been used efficiently. Type 2 diabetes is observed to be more frequent than type 1. Type 1 diabetes affects more than one out of every ten persons, whereas type 2 affects the rest. With age, the percentage of diabetics rises. Diabetes affects approximately 10.5% of the general population. In the 65 and older age categories, the rate is as high as 27%. Here the AI analyse the blood sugar value and personalized healthcare recommendations like food diet. This project also focusses on predicting Covid-19 positive or negative according to the X-ray soft copy of the chest, this prediction is made based on the Deep learning technique where large amount of chest X-ray images dataset of soft copy of covid positive and negative images are trained [10]. An AI based virtual chatbot is developed using IBM Watson Assistant is a white label cloud service that enables business software developers to integrate an artificial intelligence virtual assistant into their product and brand it as their own. The IBM Cloud is used to deliver the service, which allows customers access to Watson AI. Here this chatbot is developed to tell facts on Covid-19 and guides the user in using this Web application.

2 Methodology

The entire Web application runs on a Framework called Flask, where this application contains four features. 1. Medicine Prescriber 2. Diabetic Analyzer They have a unique dataset for each feature and Machine Learning Models are created for each feature with their respective dataset. Here the libraries used to train the machine learning model are Pandas, NumPy, SciKit, Pickle. This Machine Learning model is created using Decision Tree classifier which by constructing a decision tree, the categorization model is created. Every node in the tree represents a test on a variable, and each branch falling from that node represents one of the property's possible values. Each branch represents one of the instance's class labels. The training set's instances are identified by routing them from the base of the tree to a leaf, based on the results of the tests all along way. Each node in the tree divides the instance space into consists of two subs based on an attribute test condition, starting with the root node. After that, a new node is produced by moving down the tree branch matching to the attribute's value. This cycle continues for the subtree rooted just at new node, until the training set's records have all been classified. The decision tree is normally built from the top down, with each step selecting the optimal attribute test condition for splitting the data. There are a variety of methods for determining the optimal reason to divide the records.

3. Covid Predictor, a large amount of chest X ray is used as dataset and trained using Convolutional Neural Networks (CNN) are plug neural networks that are used to assess visual images by data processing in a grid-like layout. CNN is selected to train a deep learning model since it trains the input images into many hidden layers and brings out the trained classified output. A ConvNet is another name for it. To discover and classify items in an image, a convolutional neural network is employed. An accuracy of 88.7% is attained in this deep learning model. This Deep Learning model is created using TensorFlow, Keras and OpenCV libraries modules. Pickle is a library which is used to save the machine learning and deep learning model and deploy those saved model as a web application using the framework called Flask. Flask is a python scripted language microframework for creating small websites, and creating Restful APIs in Python is quite simple. The UI of the web application is crafted using Adobe XD and built as a web application using front end frameworks like HTML, CSS, JavaScript, Bootstrap.

3 Implementation

The home page which contains the Logo and header menus, and a chatbot below. To view the features user, need to click Meet Dr. Watson! Button. The chatbot which helps the user to guide how to use these features and get interesting facts on covid-19. Dashboard screen is a graphic representation of all of the characteristics. Although it can be utilized in a variety of ways, its primary goal is to enable quick access
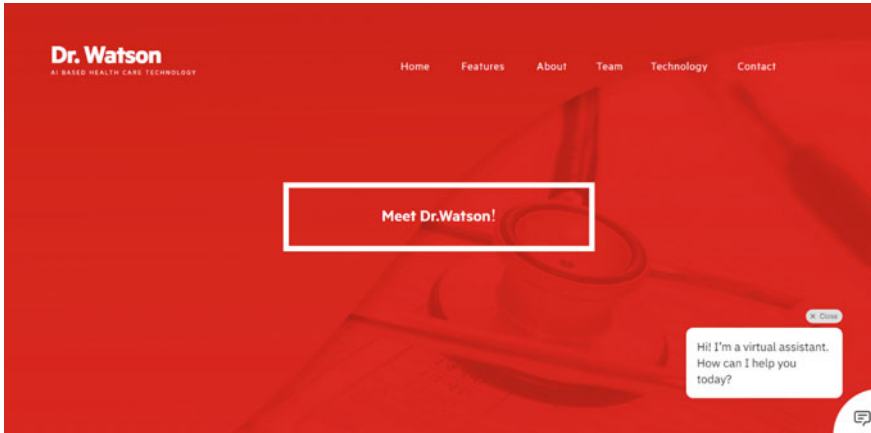
Fig. 1 Home page

to information. This enables user to view three features 1. Medicine prescriber 2. Diabetic Analyzer 3. Covid Predictor. Medicine prescriber feature allow user to enter their symptom and get medicine prescription. Diabetic analyser page which helps user in analysing their diabetic and get proper food diet based on their age and sugar level (mg/dl). The user can also download the result for future purpose.

Covid predictor feature predicts covid positive or negative based on the X-ray soft copy of chest. User is required to upload the soft copy of the chest X-ray and click submit to view the result. Team is a page where the team members names are mentioned in. to navigate to team simply click team button in header. Technology is a page where the technology used in this project are mentioned in a descriptive manner. To navigate to this page user simply need to click the Technology button in the header.

4 Results

4.1 Home Page

Select "Meet Dr. Watson" button and enter the Dashboard page (Fig. 1).

4.2 Dashboard Page

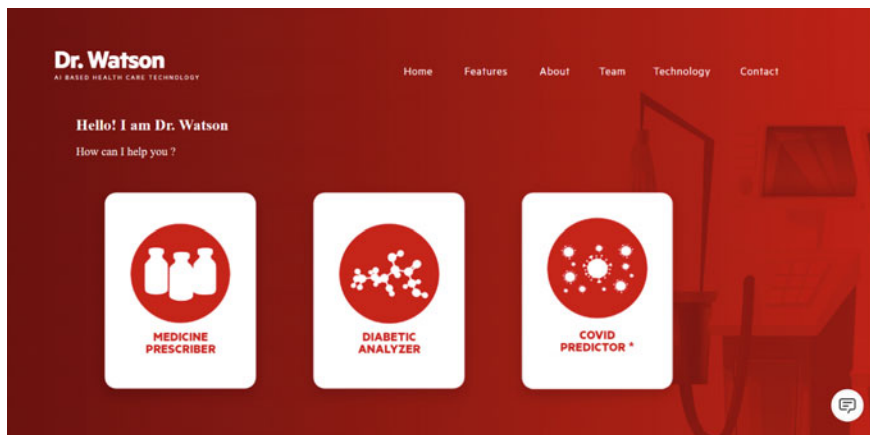Dashboard screen will help the user to get directed to the features (Fig. 2).

Fig. 2 Dashboard page

4.3 Medicine Prescriber

This feature prescribes medicine based on the user symptoms. The decision tree classifier algorithm predicts the best suitable medicine for the symptoms and allow the user to download and print the medicine as a medical prescription (Fig. 3).
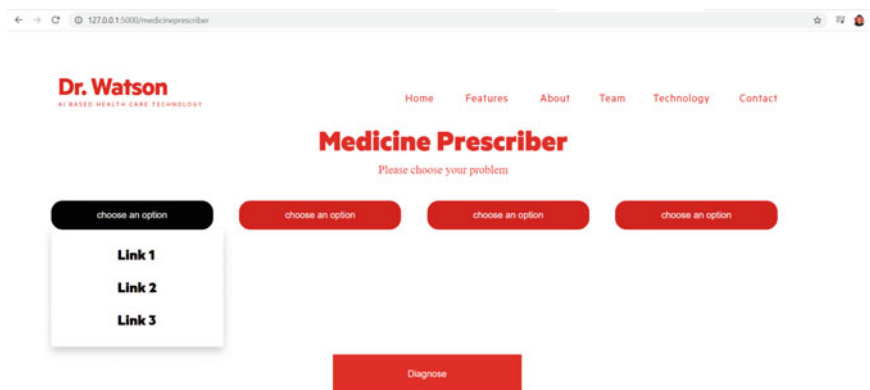

Fig. 3 Medicine prescriber

4.4 Diabetic Analyzer

This feature analyses the user input which is their age and blood sugar level (mg/dl) of before food and after food and make predictions using the machine learning algorithm and provide the diabetic condition status and suggest proper food diet based on the user input. The user can download and print that food diet to kept a note of it (Fig. 4).

4.5 Covid Predictor

This feature allows user to upload the chest X-ray softcopy and check whether Covid positive or negative, when the softcopy of the chest X-ray scan which is provided as a user input the Convolutional Neural Network model predicts best suitable results. An accuracy of 88.7% is attained in this work, enables user to experience a fast response (Fig. 5).

4.6 Watson Assistant Chatbot

This feature guides the user to use this web application and acts as a support agent for this application and also capable of answering questions related to Covid-19. These Covid facts are trained based on the World Health Organization (WHO) data using Natural Language Processing (NLP) (Fig. 6).

5 Conclusion

Health care is progressively expanding into the house, involving a mix of individuals, a variety of jobs, and a wide range of instruments and technologies; it also occurs in a variety of residential settings. Rising health-care costs, rising numbers of seniors, rising prevalence of chronic disease, improved sustenance rates of various illnesses, injuries, as well as other conditions, massive groups of returning veterans from war with serious injuries, and a broad range of new technologies are all driving this migration. The quality and cost of the health care provided as a result varies greatly in terms of safety, efficiency, and efficiency as well as performance and price.
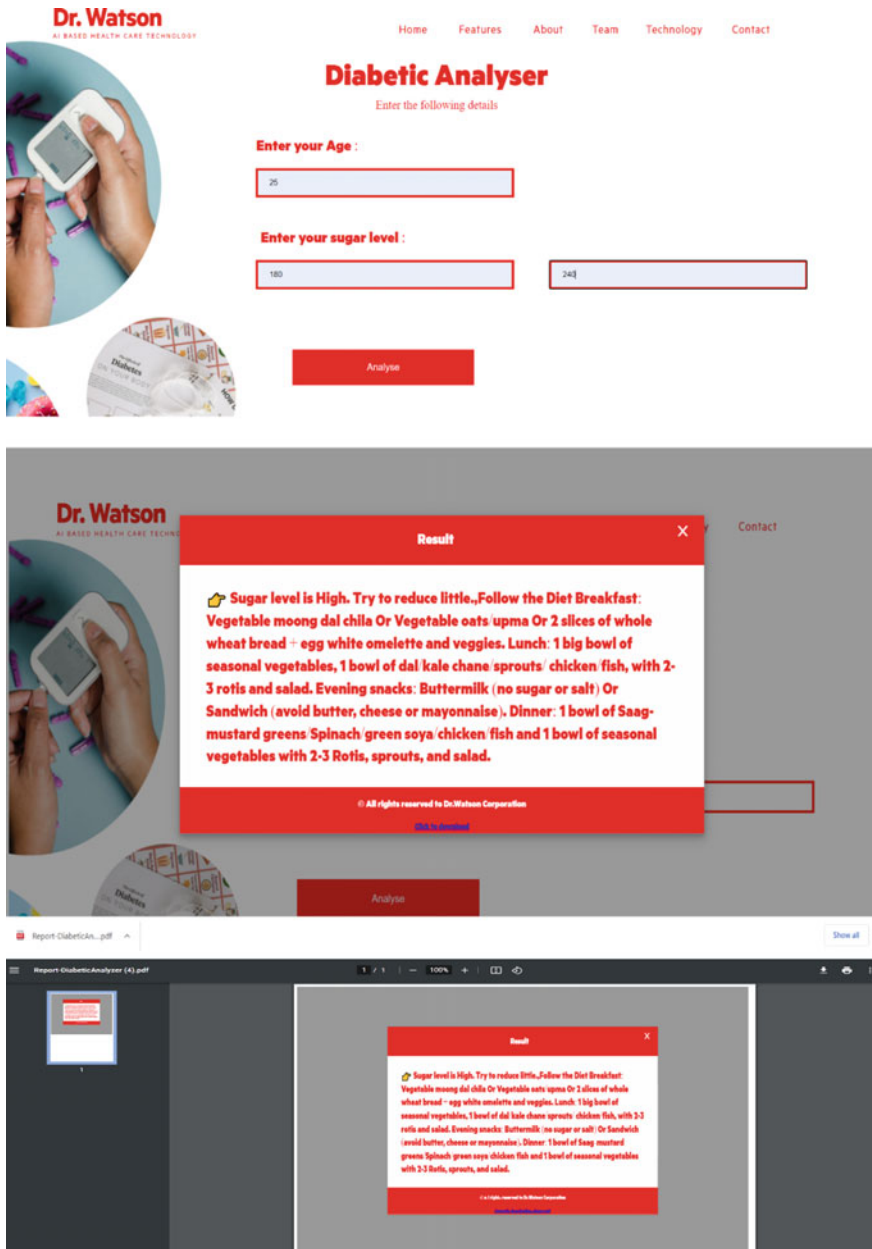
Fig. 4 Diabetic analyzer
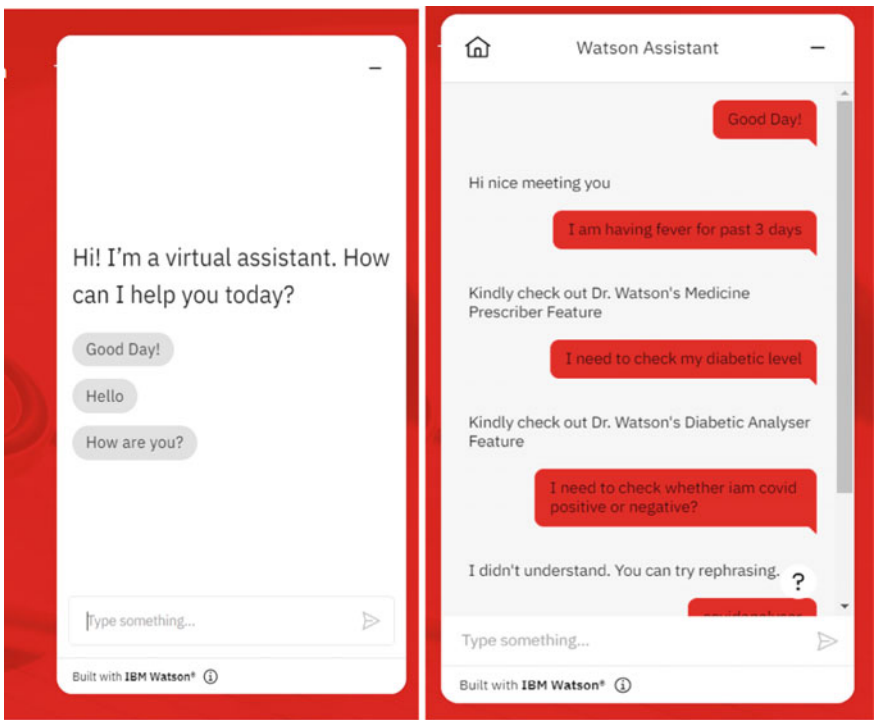
Fig. 5 Covid predictor

Fig. 6 Watson assistant chatbot

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