International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-9 Issue-2, December, 2019

Cloud Based Predictive Model for Airborne Disease Based Healthcare Data

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Abstract: ***Nowadays, the airborne particles have major health impact when it spreads in human, plant and animal beings. Infectious diseases spreads from these particles which are exhaled directly into the air through the exertions of coughing, breathing, talking and sneezing etc. According to the report from World Health Organization (WHO), More than 30 infectious diseases have arrived to harm the health of people in the past years. There's no medical attention for several infectious diseases to take prevention and remedy. India have lack of healthcare data to take control of the endemic infectious diseases. This paper uses predictive model which is provide a preventive guidance and suggestions for predicted Airborne diseases through machine learning algorithms. Azure machine learning studio is a cloud based environment which provides machine learning algorithmic approaches to make an intelligent model based solution to solve the particular domain based problems. This proposed model will produce an efficient outcome and helps to take better protection from the infectious diseases.***

Keywords : Cloud computing, Health care Analytic, Machine Learning, Predictive Analysis, Disease prediction

I. INTRODUCTION

Infectious diseases are primal case to causes of death due to their inception and resolution. These diseases escalated by airborne pathogens which are transmitted through the air that can be spread by any form of aerosols, dust or liquids. Temperature and humidity are the distinct environmental conditions of airborne transmission. Infectious diseases can affect wherever people have contact with infected person and intermediate object. The mortality of airborne disease patients are increased per year. The Healthcare sector field having a huge quantity of healthcare data to analysis and make the operational decisions and the affordable access of this data can be used to extract serviceable knowledge. Machine Learning helps healthcare professionals to analyse and process the healthcare data to get an intelligent system. Machine Learning is when a system has been taught to learn the model with the help of algorithms to understand the data which are already provided. In the Healthcare industry, it plays a significant role in predicting the presence/absence of diseases. Manage, exchange and quick accessible of data, secured storage and integrating healthcare information are the risks raised for the healthcare providers.

Revised Manuscript Received on December 30, 2019.
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The cloud technology has the ability to ease the challenges faced by the healthcare industry. It provides resources as a service and offers the key characteristics like on-demand access, broad network access, resource pooling, rapid elasticity and measured services. Machine learning with cloud computing becomes much easier to handle and scale the problem scenarios for making better solutions. Microsoft Azure is a cloud computing platform that provides the cloud-based services tailored to the application development needs or even enhances on-premises application. Azure machine learning studio is a collaborative and web tool is used to develop, examine and implement predictive analytics solutions on the given data. Healthcare organizations can be focused on Predictive models to achieve substantial results because of its accurate predictions, perfect actionable insights, high efficiency and high quality of healthcare delivery.

In the section 2, related to health care study are given in detailed manner such as health service and predictive models. In the section 3, proposed a Cloud Based Predictive Model (CBPM) for Airborne diseases. In the section 4, airborne disease prediction expected outcome results are given. In the section 5, conclusion and future enhancement are listed.

II. RELATED WORK

The world's largest environmental health threat is considered to be air pollution. And also the main contributing factors for raising commonness of allergic airway diseases are global warming, climate changes, and air pollution. To manage or control the symptoms for prevention of the allergic airway diseases has changed over the years. Monitoring and evaluation, ethics for clean air policies and tracking progress, local and global authority rules are needed for the management of these diseases [1]. In general, cloud based systems are play a main role for solving Healthcare issues. To process and manage a Protected Health Information (PHI), it provides enhanced security, privacy services and advanced analytics capabilities [2],[3]. Cloud computing is a concept that provides massive computation capacity and huge storage space at a low cost [9]. Security and privacy are critical issues for health care providers, considering that the data stored and exchanged with them may contain very sensitive information. More precisely, digitized medical records are open to potential abuses and threats (data loss, leakage, theft, mistreatment, etc.) [10]. Cloud computing provides a flexible and suitable way for data sharing, which brings various benefits for both the society and individuals.National Institute of Standards and Technology (NIST) described that cloud computing offers procurable on-demand services of computer system resources like computing power and data storage.

It render the computing services over the Internet. Cloud computing is a model for empowering convenient,ubiquitous, on-demand access to a shared pool of resources that can be released and provisioned with less computing and management power [11]. Data mining is the process to analyze and determine the hidden facts from different perspectives in order to gain a new knowledge. In Medical diagnosis applications also have this approach [4]. And also has the process to extract and categories the data into various types and forms to predict the future data trend that is Classification. This model is used to predict the occurrence of disease on the basis of parameters according to the data [5],[6]. This model is used to predict the occurrence of disease on the basis of parameters according to the data. There are many models are used to evaluate the data and effectively provide a predictive factor of the particular disease [7]. During air transportation, the spread of infectious diseases is increased. To determine the extended value of virus infectious diseases, the multiscale models of pedestrian movements were applied [8]. The aim of this study is to compare the predictive abilities between the machine learning classification approaches for differentiating the potential airborne diseases.

III. CLOUD BASED PREDICTIVE MODEL

The Aim of this paper, providing Smart Medicare solutions for predicting the airborne diseases from the dataset provided using Azure Machine Learning Studio. The dataset is gathered from multiple sources to classify the potential airborne diseases. In the proposed system, the dataset has the data types of each column based on the accommodated values it has and put it into Azure Machine Learning studio workspace. In Azure Machine Learning, can effectively create and deploy predictive models an analytic solution and also the experimentation of disease prediction is made. When collecting data it must contain enough features so that only it will be useful to predict the disease correctly and train the data model. To get more meaningful features from the data, the data model will be cleaned and simplified using data pre-processing. For measuring the accuracy of the predictions, the Machine Learning algorithms are applied to the trained model. In Machine Learning, Supervised learning has inferred the set of problems using labeled data. The Supervised learning algorithms are used to analyze and model the relationships and dependencies between the target prediction output and the input features. After that, the formation of data and the visualized report will be generated. Using the visualization only the proper disease prediction will be analyzed.

A. CBP Model

In the figure represents the system architecture of the proposed Medicare solution. The solution can provide precluding suggestions for airborne diseases on the basis of inputs provided by the user like symptoms or their medical problems. The user got an access to this solution once he provides authenticated information which is then verified by the Cloud authentication service. By using high-level security and privacy services, the facts processed in this application is managed efficiently. This system can enhance the cloud services for seamless interactions throughout the application. For this predictive model, the huge quantity of healthcare data is used. The dataset is collected from many sources of airborne disease patients. And then the dataset is processed and cleaned for getting essential features from data using Azure Machine Learning Studio. The selected attributes from this data model are used for testing modules. For testing modules, Support Vector Machine (SVM) and Linear Regression algorithms apply to the training module to identify the patterns and examine the disease. These are Supervised Machine Learning algorithms. Using SVM, the data model is will be processed for classification. SVM makes use of less computation power to produce a significant accuracy. And then, Linear Regression is used to make a prediction model for the response values of an observed data set and explanatory variables. After that, the results are collected, compared to analyze and diagnose the airborne diseases. Based on this predicted disease level, suggestions and guidance for the necessary measures and precautions to cure the airborne diseases are provided to the user.

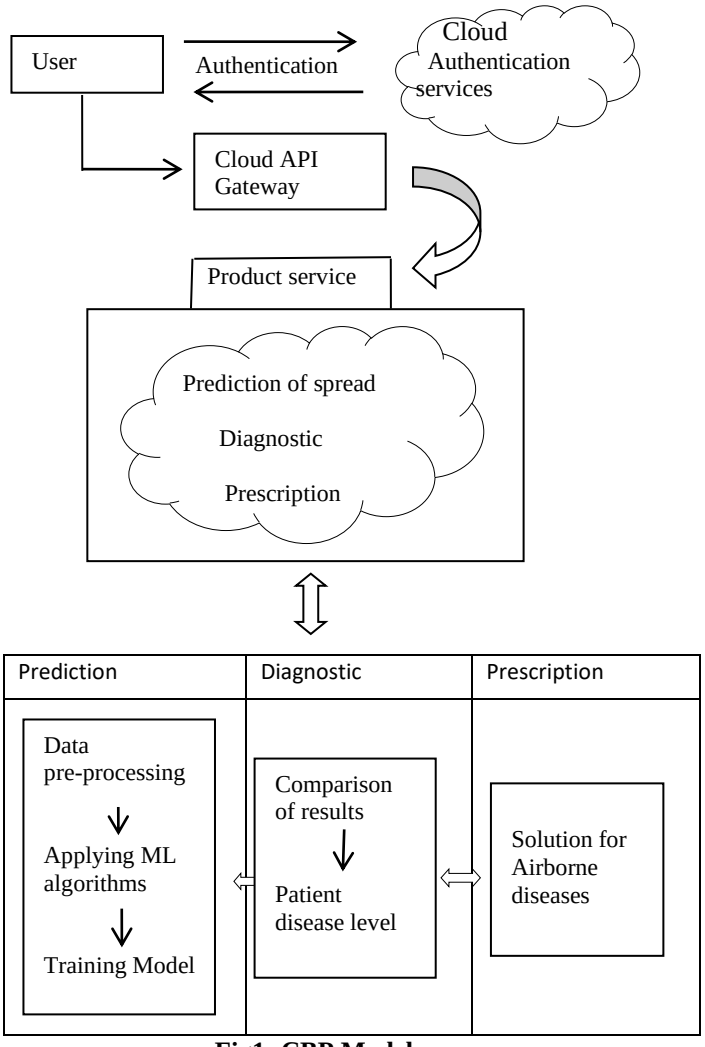

Fig1: CBP Model

B. Algorithmic approach

Input

Variable X, X is a healthcare data of Airborne diseases.

Output

Predict Airborne disease level.

Data attributes

Patient_id,age,gender,body_temp,height,weight,headache,appetite,cough_count,Breath_prob,runn_nose,vomit,chest_pain,rash,diarrhea

Step 1: Declare the variable.
Step 2: Initialize the input data to the variable X.
Step 3: Make a split on x as follows to perform prediction
Train model ⟵70 % of X
Test model ⟵30 % of X
Step 4: Perform Data pre-processing on X (data cleaning, missing value treatment and scaling)
Step 5: Perform classification to create a train model
Apply SVM classification algorithm,
if (X != null)
class ⟵ Airborne diseases (SARS, Pneumonia, Tuberculosis, Measles)
else
print ”Check the data”
Step 6: Make prediction on the trained model
Apply Linear Regression to get prediction model,
y = b0 + b1* x
y ⟵ Predicted response value
b0 ⟵ Time variants
b1 ⟵ Climate changes
x ⟵ trained model
If(y != null)
print (y)
else
goto step 4.
Step 7: End

IV. RESULT ANALYSIS

The overall accuracy of the predictive model is evaluated based on the performance of the applied algorithms. Based on this, the score value is calculated and provides better prediction results.

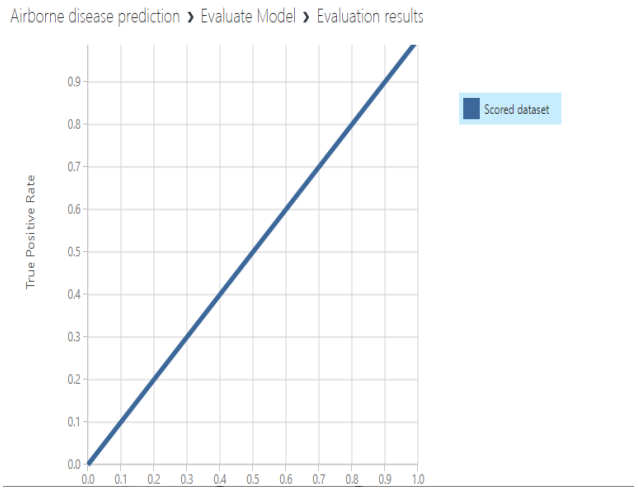

Fig. 2. Evaluation result for Airborne disease prediction

Fig.2 represents the evaluation result of the airborne disease prediction model. The performance of the airborne disease prediction model is evaluated using the effective model of Receiver Operating Characteristic (ROC) curve. It demonstrates a scored model between a true positive rate and false-positive rate.

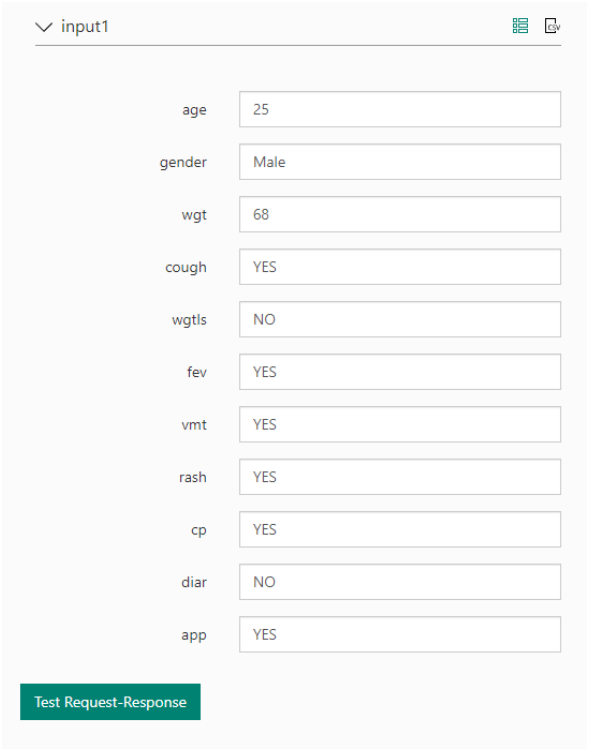

Fig.3. Test Request-Response

The above figure shows the test request-response process of the predictive model. Based on this only the input values are analyzed and assesses the score probabilities.

Fig 4, represents the result of airborne disease prediction. The evaluated scored labels and probabilities are displayed using the given inputs.

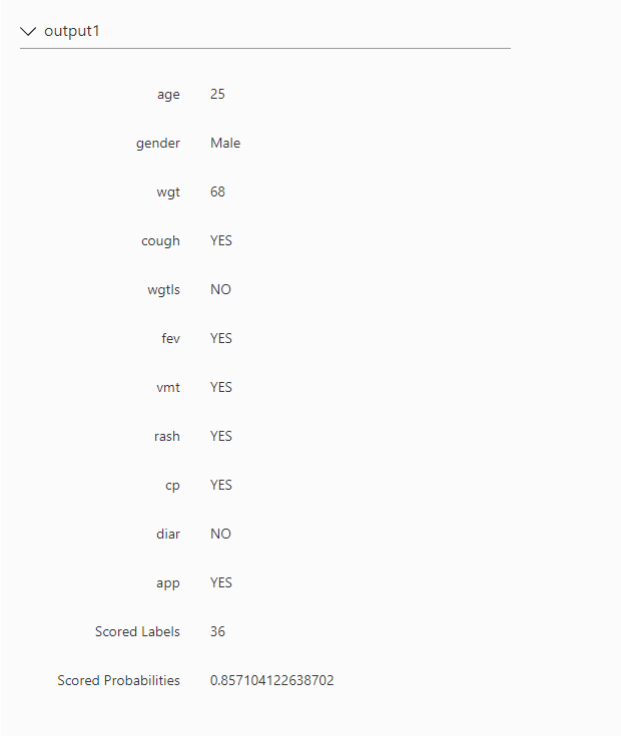

Fig.4. Result of Airborne disease prediction

V. CONCULSION AND FUTURE WORK

In this paper, presents a conceptual approach to predict Airborne diseases and provides predictive model to a user know about the facts to take necessary precautions. It makes a scalable medical prediction scheme for cloud computing environments. This paper implies that the predictive model is best suited for cloud medical applications. It will be more helpful to healthcare providers to know and get better safeguard opinion related to Airborne infectious diseases. the proposed system produced the probability results of airborne diseases. Based on this have to make an immediate preventive action for taking care of people's health. In the future, it will be more applicable to machine learning to get better intelligence system with the help of cloud environments.

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