

ASTHAMA PREDICTION APP USING DJANGO

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ABSTRACT

Despite a wealth of research on the link between indoor air pollution and the prevalence of allergic diseases, real-time big data and model predictability limitations prevent public health and environmental policies from developing predictive evidence for developing a preventive guideline for patients or vulnerable populations. Although the initiative is still in its early stages, the recent rise in popularity of IoT and machine learning techniques may offer supporting technologies for real-time big data collection and analysis for more precise prediction of allergy disease risks for evidence-based intervention. In this study, we provide a machine learning-based algorithm for predicting asthma risk. Using Internet-of-Things resources, the technology is totally deployed on a smartphone as a mobile health application. Peak Expiratory Flow Rates (PEFR), which are well-known asthma risk factors, are typically monitored using external tools such as peak flow meters. In this study, we use PEFR to identify a relationship between indoor particulate matter and the weather outside. The results of the PEFR are then divided into three risk categories, such as "Green" (Safe), "Yellow" (Moderate Risk), and "Red" (High Risk), and contrasted with the best peak flow number that was reached by everyone. The link between indoor PM levels and meteorological data and PEFR values is mapped using a convolutional neural network (CNN) architecture. The root mean square and mean absolute error accuracy measures of the suggested method are compared to those of deep neural network-based methods. In comparison to other methods addressed in the literature survey, the proposed method performs better according to these performance measures. On the smartphone, the entire configuration is implemented as an app. The input data is gathered using a Raspberry Pi-based IoT device. The cost-effectiveness of this aid in predicting the likelihood of asthma attacks can be demonstrated.

I. INTRODUCTION

Episodes of wheezing, throat tightness, coughing, and shortness of breath are characteristics of asthma, a chronic condition characterized by inflammation of the airways. A sudden exacerbation of these symptoms, which can be fatal, is known as an asthma attack. Health is one of the predictive science fields with the least amount of study. People's quality of life can be enhanced by anticipating health hazards and incorporating them into lifestyle choices. Environmental health plays a key role in asthma attacks. Health is one of the predictive science fields with the least amount of study. People's quality of life can be enhanced by anticipating health hazards and incorporating them into lifestyle choices. Environmental health plays a key role in asthma attacks. Hence, reliable counsel for patients to seek appropriate care or take drugs to prevent being sick and to help them prepare their mobility strategy may be provided by excellent predictive modeling. In this experiment, the risk of asthma is predicted using a new neural network design. Here, a smartphone has been used to implement the asthma risk prediction model (edge device).

Characteristics [17], execute attribute extraction based on the input parameters [18] and finally apply the proper classifier used to categorize illnesses. A picture must be converted into digital form in order to be processed digitally so as to produce an improved image or extract valuable information from it. An image is used as the input and an image with the same characteristics is used as the output [19]. The majority of the input sampled two-dimensional signals used in image processing models correspond to a fixed signal processing strategy. It is a technology that is commonly utilized nowadays and has various uses in the commercial world [20]. Moreover, it is a developing field of study in engineering and computer science.

II. LITERATURE REVIEW

We found better asthma risk (category-wise) prediction when a deep learning model was used to examine the short-term accumulations of the PM records. In this study, the yearlong PEFR data of 14 pediatric asthma patients was matched with the real-time PM 10 and PM 2.5 concentrations. Additionally, we discovered that

predicting accuracy may vary based on patient characteristics and accumulation time. However, no attempt has yet been made to predict asthma risk based on a real-time, continuous monitoring of indoor air pollution by using a deep learning framework. Machine learning approaches are being applied now-a-days to identify asthma phenotypes or to predict asthma exacerbations based on the tele-monitored symptoms. This study can be considered as the first of its kind in demonstrating the potential of a deep learning approach as a tool to discover the relationship between indoor air quality and asthma risk and can prove to be useful for estimating the future risks of asthma exacerbations based on the characteristics of a specific patient. We collected PM and PEFR data every ten minutes, which resulted in 352,152 training samples for cluster 1 and 140,860 training samples for cluster 2, even though the sample size was not too large. The sample size which is used in building the neural network would be enough considering that just seven input parameters were employed in this investigation. The presented work is simply a workability study; further model development would be necessary using a larger number of samples and additional covariates, such as ambient air quality and patient-specific characteristics. The interpolation and clustering of PEFR recordings and its matching with the real time PM monitoring data is, of course, the study's primary weakness.

III. METHODOLOGY

In this section, we discuss the suggested method for forecasting the probability of developing asthma. The data and deep learning network used to train the model are discussed. The suggested system's block diagram is shown in Figure 1. Peak expiratory flow rate (PEFR), which provides the labels for the model's training, indoor air pollution as assessed by PM_{2.5} and PM₁₀ data, and weather data are the inputs to the deep learning model. PEAK EXPIRATORY FLOW RATE (PEFR) A fast test to assess how much air is leaving the lungs is peak flow measurement. Peak expiratory flow rate (PEFR) or peak expiratory flow are other names for the measurement (PEF). Asthmatics are the majority of people who monitor peak flow. Peak flow measurements can reveal how much and how quickly air can be forcefully out from the lungs. Once the entire lung has been inhaled, the measurement should begin. You blow hard through a device's mouthpiece during the test. Most frequently, a peak flow meter (PFM) is employed. This is a little, plastic handheld device. A PFM can be used almost anywhere because it is portable and lightweight. It's crucial to consistently use the same PFM. Different brands and models of meters can produce different readings. The test may occasionally be carried out using a spirometer in a doctor's office or hospital. A handheld mouthpiece for this instrument is corded to a bigger electronic gadget. The following three peak flow zones are identified by color: Green: It denotes "go." 80% to 100% of your highest peak flow reading, or personal best, is considered the green zone. You should constantly be in this zone. The major airways in your lungs are functioning properly when your measurements are in this range. That implies that you can go about your daily business and fall asleep without incident. Yellow: This phrase denotes caution or a slowdown. 50% to 80% of your personal best is the yellow zone. This zone's measurements indicate that your big airways are beginning to constrict. Mild symptoms like coughing, exhaustion, breathing difficulties, or tightness in your chest could start to appear. Your regular activities or quality of sleep may be hindered by these symptoms. Red: It denotes "halt." Less than 50% of your personal best is in the red zone. If your readings fall in this zone, your big airways have severely narrowed. A medical emergency has occurred. Get assistance right immediately. You can be wheezing when breathing in and out, coughing, struggling to breathe, or having retractions (the muscles between the ribs are working hard to help you breathe). You can find it difficult to speak and walk.

IV. EXSISTING SYSTEM

A proposed model that has been utilized in the past to forecast the danger of chemicals existing in the area and determine whether they offer a high, medium, or low risk for asthma patients is the Intelligent Risk Alarm for Asthma Patients using Artificial Neural Network. The information is then split into two groups, the first of which is the training set, which contains 70% of the information needed to train the classifier to forecast the outcome. The second collection, known as the testing data set, contains 30% of the data used to test the classifier. The input layer, hidden layer, and output layer are the three layers of the proposed ANN. All of the chemical gasses used in the study, together with temperature and humidity is present in this input layer. The output layer, on the other hand, is the one with three values, each of which denotes a different type of risk. In other words, the values are centered on the different risk classifications, such as high, medium, or low risk. Each node

in the input layer is connected to every other node in the hidden layer using the weight matrix to connect the inputs from the input layer to the hidden layer of the ANN. Random selection is used to choose weight values between -1 and 1. Here, a watch with a MQ5 sensor that scans the atmosphere for pollutants is created. It will inform the worried patient that they have been exposed to excessive pollution levels when the danger becomes more imminent.

V. PROPOSED SYSTEM

The suggested convolutional neural network (CNN) architecture consists of four hidden layers, including two convolutional layers and two fully linked layers. In order to give superior learning of the input features, the first and second convolutional layers employ 64 feature maps. Each convolution layer's kernel is 11 bytes in size. In a single step, the first and second convolution layers are both convolutionized. The fully interconnected layers consist of 128 neurons. One neuron, all ReLU activation functions, and a linear activation function are present in the output layer. The final network has over 1.5 million learnable parameters. The CNN loss function, or mean squared error, was decreased using the Adam Optimizing Algorithm. We use an IoT to predict the danger of asthma in real time. We use a smartphone, sensors, and an IoT platform to predict the risk of developing asthma in real time. Using a Raspberry Pi, data from an air quality monitor is collected. The weather data is sourced from an online open-source data provider. The data collected by the Raspberry Pi and the meteorological data are both stored on a secure server. After that, the smartphone makes use of this data. The smartphone app that is included with the trained neural network model receives the model's input data from the server and predicts the likelihood of developing asthma.

VI. ALGORITHM

Real-time algorithm for describing the proposed system
Input: PM2.5, PM10, outdoor temperature, humidity.

Output: Safe, Moderate or High asthma risk prediction. Data processing stage on the Raspberry Pi:

Collect PM2.5, PM10 using SDS011;

Collect weather data using Openweathermap; Data hosting the input features to server;

Real-time stage on the Smartphone: while App ON do

Collect data from Web; CNN prediction;

if PEFR > 80% then

Safe; else if 50% < PEFR < 80% then Moderate risk;

Else

High risk

end end;

SOFTWARES USED:

ANDROID STUDIO (BACKEND): The IDE that is

required for creating Android apps is called Android Studio. Tools from Android Studio are available to increase your productivity when developing Android apps.

PYTHONANYWHERE: Python programs may be easily written and executed in the cloud thanks to PythonAnywhere. You can use any current web browser to launch a console session or write your programs in a web-based editor.

FLASK SERVER: A flask server is a collection of one or more computers that are packed together and solely dedicated to running software applications over the internet. It is server software that can handle HTTP requests on the public internet, private LANs, and private WANs.

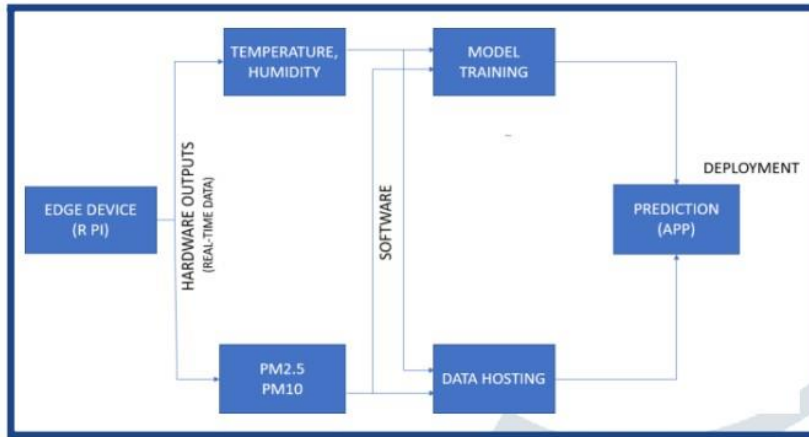
XML (FRONTEND): A markup language and file format for storing, sending, and recreating arbitrary data is called Extensible Markup Language (XML). It outlines a set of guidelines for document encoding in a way that is both machine- and human-readable. The simplicity, generality, and Internet-wide usability of XML are prioritized in its design objectives.

PYTHON for ASTHMA PREDICTION

Python is a popular high-level, general-purpose programming language. Python can be used on a server to

create web applications. It is used in machine learning, web development, desktop applications, and many other fields

BLOCK DIAGRAM:



VII. RESULT AND DISCUSSIONS

Since the algorithm is now accurate and precise the disease detection is more stable and correct.

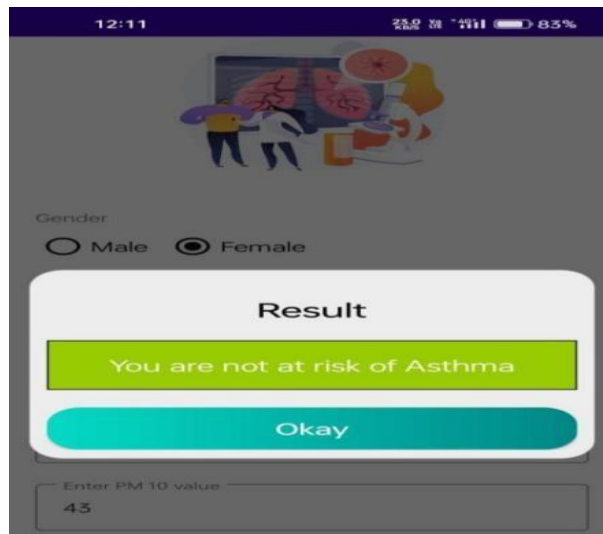


Figure 2: Sample images taken for prediction

VIII. CONCLUSION

In this study, we developed a convolutional neural network based algorithm for predicting the risk of developing asthma. The PEFR readings are forecast using straightforward PM and weather information. Using unbiased assessments, the proposed method's performance enhancement is seen. This affordable gadget consists of sensors, an IoT platform, and an edge device. Using various IoT resources, the entire tool is implemented on a smartphone as an m-health application. The technique can be used to accurately forecast a patient's risk for getting asthma. ML methods are a potential way to achieve excellent performance in asthma exacerbation prediction, and more ML methods should be tested in the future. Although many models were developed, few of them were applied in practice. Therefore, improving the generalizability of prediction models in large separate datasets is crucial. Practicability is another critical factor. Simple models with a few predictors and using predictors that are easy to access could improve prediction models' practicability. Moreover, bundling ML algorithms to software or system would benefit in translating research into practice applications. Besides, randomized control studies are warranted to evaluate whether these models could benefit asthmatic patients by preventing asthma exacerbations.

IX. REFERENCE

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