Online Job Portal for Job Seekers with PHP

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Abstract: The Machine Learning approach for various diseases has always proven as the best choice as it has a wide range of supervised and unsupervised algorithms. The use of adaptive information technology in areas such as data science and machine learning can help combat this epidemic. In this research work we made use of a widely known and dependent algorithm guide Support Vector Machine (SVM) for both classification and regression problems. This algorithm helps to make decisions quickly using hyper plane technique and it works on extreme boundary facts in order that the same searching records may be categorized further and the records can be placed into new records factors of the appropriate category. In this project, we incorporate predictions for future trends in continuous data. The goal of this study is to predict COVID -19 cases according to the climate and atmospheric trade and for weather forecasting using machine learning, Linear Regression and Variation of Functional Regression algorithms were used. Decision tree models was found to perform poorly in the prediction of COVID-19 cases considering particulate matter and atmospheric parameters as predictors. Model results suggests the possibility of predicting virus infection using machine learning. This will guide policy makers in proactive monitoring and control

Keywords - Machine Learning, Weather Forecast, COVID-19, Prediction, Climate Change, Artificial Intelligence, Support Vector Machine, Linear Regression, Graphical Representation, Tkinter GUI

I. INTRODUCTION

The use of machine learning for weather forecasting is a project that is most easily accomplished with high-accuracy algorithms. Still, it is only sometimes the best because you can only predict general weather patterns and numerical climate trends with machine learning. And well-known methods for neural networks like CNN can be used for things like climate forecasting. The scientists used some of the conventional methods in conjunction with the reprocessed statistics from the files in the warehouse to forecast the weather. Choice trees and rule-based total approaches are a few of them, among many others. A choice tree has plausible outcomes and risk of preponderance, just like a graph. The following ideas are used by the decision tree algorithm: CART, CHAID, and ID3, which is an Iterative Dichotomiser 3. The drawback of these conventional algorithms is that they reveal information that has already been processed rather than recently observed statistics. By no means can this type of decision-making stand up to the current and upcoming climatic issues. And such results have the potential to bias prediction and lower the standard of accuracy.

Rashed, E.A. et al [1], Authors advise utilising in-depth learning techniques to prevent the spread of the CoronaVirus while keeping a variety of aspects in mind, including information linked to meteorological facts. The models that have been suggested have been created using neural networks on both a long-term and short-term memory population. Through the use of open source data and the collection of meteorological data, Multiplied Layer and Paths have become skilled. The most recent version experimented with using several time periods, and the results were subsequently assessed with Cloud Forecast using Google.

In their study, Ogunjo et al.[2] employed previously collected information on COVID-infected individuals as well as assessing the climate at the time using PM2.5 and temperature using several machine learning techniques, including Decision Tree, K-means, and the use of support vector machines (SVM). Two of these were determined to be the most effective at forecasting COVID-19 cases.

The authors S. Ghafouri-Fard et al.[3] have proposed an analysis technique for several COVID-19 variations identifying the many respiratory patterns that can be seen in both sick and uninfected people, using which the authors can summarise the data and make predictions. The authors have linked respiratory infections, the distress syndrome, and their whole attention to SARS.

The authors D. Ivanov et al.[4] have given preliminary research information on the effects of COVID-19. The authors have covered the long-term and short-term effects of the COVID-19 outbreak on society and the populace in great detail. In these circumstances, SC strategies can be created using the study's findings.

The authors J. Sun et al.[5] have demonstrated the long-term cumulative collection of COVID-19 effects that have been recorded in China from the months of January and February. The goal of this study was to forecast the various atmospheric effects in each case. Over a week after the public report, this module was still able to predict outbreaks. They used publicly recorded, attested incidents from various parts of China to evaluate the model.

II. METHODOLOGY

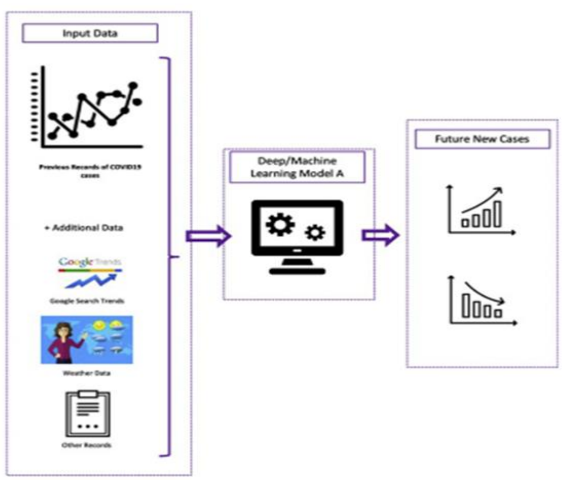

Fig. 2.1 The role of artificial intelligence approaches for prediction of COVID-19 spread

The suggested approach is to create an ML module that can predict whether patient cases will increase or decrease over the future days based on atmospheric changes (climate transformation) by using real-time information from climate forecasts to predict the trajectory of pandemics. SVM is producing more exact results after employing ML techniques like linear regression.

We initially predict using SVM if the patients will increase or not by taking into account characteristics like temperature, humidity, and wind speed. We use the temperature, humidity, and wind speed measurements that the atmospheric forecast department provides for previous and upcoming days to train our model. We first use historical data for a specific day, evaluate the various characteristics for that day, including temperature, humidity, and wind speed, check for a positive patient count for that day, and then train our model in accordance with those findings.

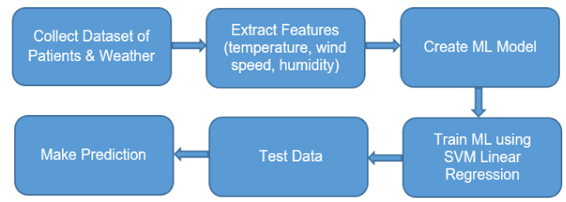

Fig. 2.2 System Architecture

A dangerous virus that has claimed countless lives throughout the world is the COVID-19 pandemic sickness. Based on symptoms specified by the WHO and CDC, ML approaches were used to determine whether people are afflicted by the virus. On the basis of x-ray pictures, ML is also employed to diagnose the illness. For instance, it is possible to tell if a patient has a COVID-19 infection from their chest pictures. Future events are predicted and anticipated using a variety of ML approaches. Support Vector Machine and Logistic Regression are two ML methods used for prediction. For prediction or forecasting, the model with the highest accuracy is picked during the model review phase.

Support Vector Machine (SVM): It is a supervised algorithm mainly used for classification and regression problems. The SVM models works on hyperplane method which leads to high accuracy of the project and successive results can be obtained.

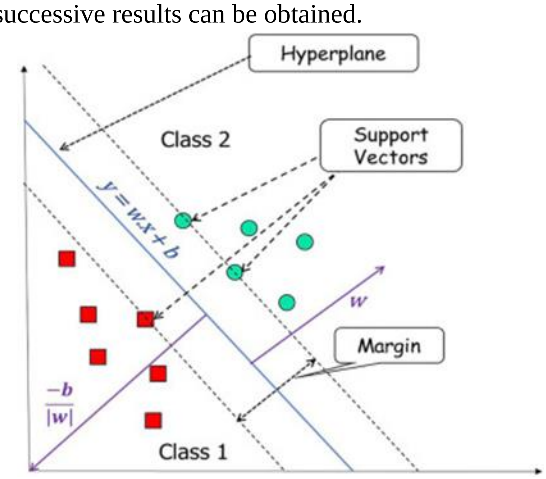

Fig. 2.3 SVM Classification Technique

Logistic Regression Algorithm: It is a well-known and trusted algorithm in terms of weather forcasting problems as works similar to SVM and gives the output in the form of true and false pattern or we can say in 0 and 1 format, but its speciality is that it can also predict the middle value that lies between 0 and 1. It has the ability to work on probabilities and classify new data using continuous discrete dataset.

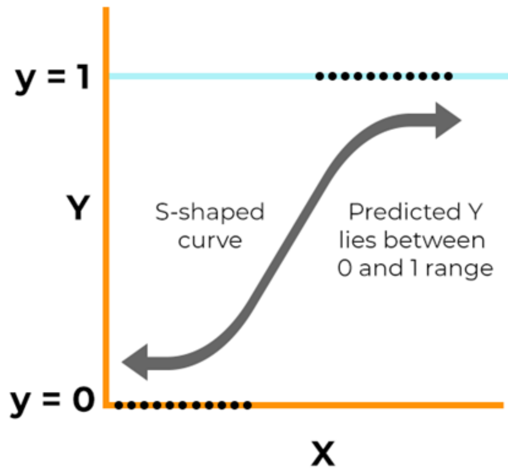

Fig. 2.4 Logistic Regression Working

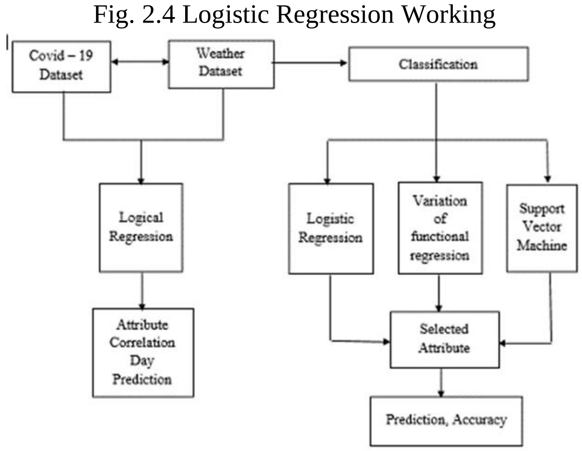

Fig. 2.5 Proposed System Architecture

First, we put the COVID-19 collection and the weather dataset. Then, using logistic regression, we cleaned the data. Next, we moved on to the classification section, where we looked at the modules like humidity, temperatures, and wind speed from the previous few days in order to forecast the upcoming COVID cases in a visually appealing manner.

III. MODELING AND ANALYSIS

Suppose we are given the following positively labeled data points in R2

$$\left\{\begin{pmatrix}3\\1\end{pmatrix},\begin{pmatrix}3\\-1\end{pmatrix},\begin{pmatrix}6\\1\end{pmatrix},\begin{pmatrix}6\\-1\end{pmatrix}\right\}$$

and the following negatively labeled data points in R2

$$\left\{\begin{pmatrix}1\\0\end{pmatrix},\begin{pmatrix}0\\1\end{pmatrix},\begin{pmatrix}0\\-1\end{pmatrix},\begin{pmatrix}-1\\0\end{pmatrix}\right\}$$

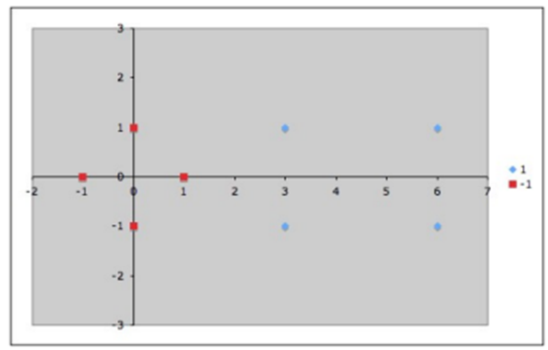

Fig 3.1: Blue diamonds are positive examples and red squares are negative examples.

We would like to discover a simple SVM that accurately discriminates the two classes. Since the data is linearly separable, we can use a linear SVM (that is, one whose mapping function Φ() is the identity function). By inspection, it should be obvious that there are three support vectors (see Figure 3.1):

$$\left\{s_1=\begin{pmatrix}1\\0\end{pmatrix},s_2=\begin{pmatrix}3\\1\end{pmatrix},s_3=\begin{pmatrix}3\\-1\end{pmatrix}\right\}$$

In what follows we will use vectors augmented with a 1 as a bias input, and for clarity we will differentiate these with an over-tilde. So, if s1 = (10), then s˜1 = (101). Figure 2.3 shows the SVM architecture, and our task is to find values for the αi such that

α1Φ(s1) · Φ(s1) + α2Φ(s2) · Φ(s1) + α3Φ(s3) · Φ(s1) = −1

α1Φ(s1) · Φ(s2) + α2Φ(s2) · Φ(s2) + α3Φ(s3) · Φ(s2) = +1

α1Φ(s1) · Φ(s3) + α2Φ(s2) · Φ(s3) + α3Φ(s3) · Φ(s3) = +1

Since for now we have let Φ() = I, this reduces to

α1s˜1 · s˜1 + α2s˜2 · s˜1 + α3s˜3 · s˜1 = −1

α1s˜1 · s˜2 + α2s˜2 · s˜2 + α3s˜3 · s˜2 = +1

α1s˜1 · s˜3 + α2s˜2 · s˜3 + α3s˜3 · s˜3 = +1

Now, computing the dot products results in

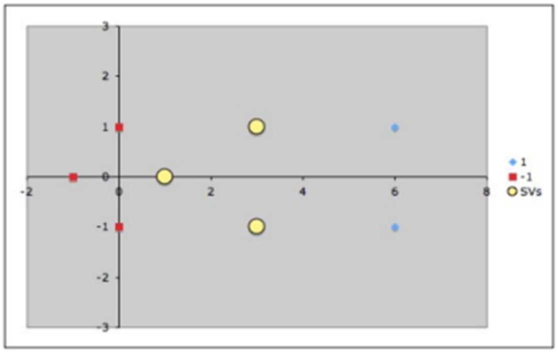

Fig. 3.2: The three support vectors are marked as yellow circles.

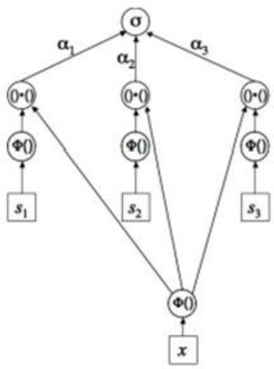

Fig 3.3 The SVM Working

$$2\alpha1 + 4\alpha2 + 4\alpha3 = -1$$
$$4\alpha1 + 11\alpha2 + 9\alpha3 = +1$$
$$4\alpha1 + 9\alpha2 + 11\alpha3 = +1$$

A little algebra reveals that the solution to this system of equations is α1 = −3.5, α2 = 0.75 and α3 = 0.75. Now, we can look at how these α values relate to the discriminating hyperplane; or, in other words, now that we have the αi how do we find the hyperplane that discriminates the positive from the negative examples.

$$\begin{aligned}\tilde{w} &= \sum_i \alpha_i \tilde{s}_i \\ &= -3.5\begin{pmatrix}1\\0\\1\end{pmatrix} + 0.75\begin{pmatrix}3\\1\\1\end{pmatrix} + 0.75\begin{pmatrix}3\\-1\\1\end{pmatrix} \\ &= \begin{pmatrix}1\\0\\-2\end{pmatrix}\end{aligned}$$

$$\left\{s_1 = \begin{pmatrix}1\\0\end{pmatrix}, s_2 = \begin{pmatrix}3\\1\end{pmatrix}, s_3 = \begin{pmatrix}3\\-1\end{pmatrix}\right\}$$

$$\begin{aligned}\tilde{w} &= \sum_i \alpha_i \tilde{s}_i \\ &= -3.5\begin{pmatrix}1\\0\\1\end{pmatrix} + 0.75\begin{pmatrix}3\\1\\1\end{pmatrix} + 0.75\begin{pmatrix}3\\-1\\1\end{pmatrix} \\ &= \begin{pmatrix}1\\0\\-2\end{pmatrix}\end{aligned}$$

Finally, remembering that our vectors are augmented with a bias, we can equate the last entry in ˜w as the hyperplane offset b and write the separating hyperplane equation y = wx+b with w =(1,0) and and b = −2. Plotting the line gives the expected decision surface.

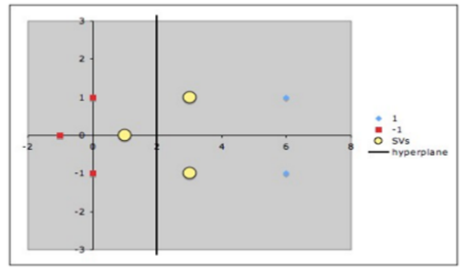

Fig. 3.4: The discriminating hyperplane corresponding to the values α1 =−3.5, α2 = 0.75 and α3 = 0.75.

V. CONCLUSION

In order to compare the information of both positive and negative patients collected from various datasets and online sources, we used several machine learning algorithms, including Most Proximate Neighbour (kNN), supporting vector machine, and arbitrary Forestry (RF) in this study. We were trying to predict the COVID-19 cases based on the current weather and climate. Additionally, the SVM algorithm's final output was completely lame, so SVM became our default algorithm at the conclusion.

IV. RESULTS

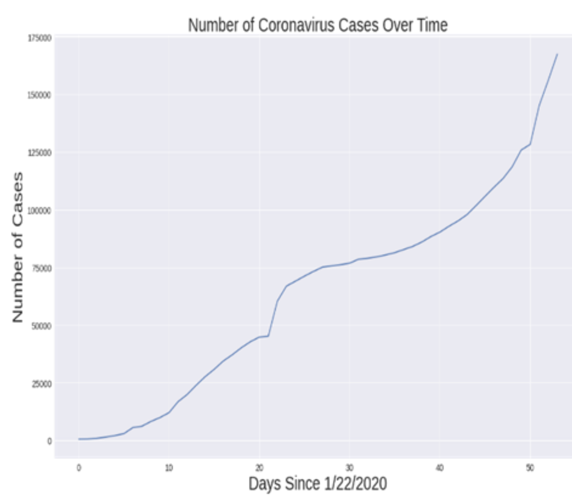

Fig. 4.1 Number of actual cases in past days

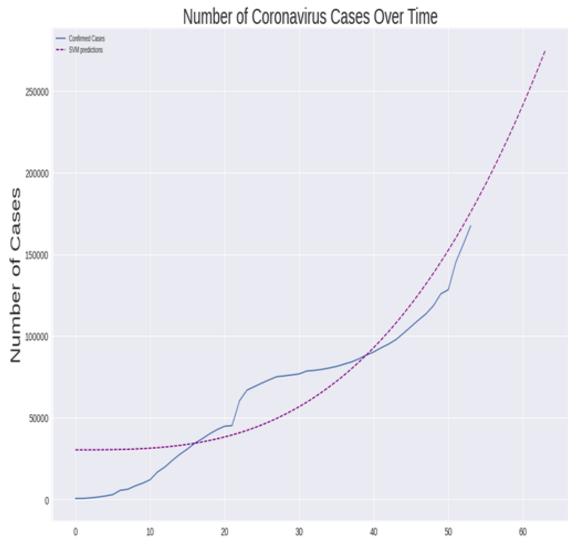

Fig. 4.2 Number of predicted cases in upcoming days

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