



HEALTH PREDICTION FROM CLIMATE CONDITIONS USING ML

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ABSTRACT

Every country is in some sort of rivalry with its neighboring countries while coming to the border issues. This issue is very complicated in the case of India-Pakistan-China. While both china and Pakistan armed forces always try to capture the border ones of India, the India armed force tries to fend off them by placing multiple military zones near the hotspots of the border areas. While the army personnel are placed at the Border zones (most of the border zones are located at high altitudes and ever changing climatic conditions due to the seas and Himalayan regions at the border zones. At present if some of the military personnel are injured or else suffering from any health issues the only way to communicate is through the Communication phones. By implementing the Machine Learning model the whole process of reporting the health stats manually by the army personnel and the risk of comms unable to work can be bypassed automatically by the prediction algorithm. This algorithm can be even extended to predict the Health status of a person after a day if we can predict the weather conditions first hand using the weather reports.

1.Introduction

1.1 Introduction

Early identification of an contagious complaint outbreak is an important first step towards enforcing powerful ailment interventions and decreasing ensuing mortality and morbidity in human populations. In the majority of cases, however, epidemics are generally well under way before authorities are notified and able to control the epidemic or mitigate its effects. Both geographical and seasonal distributions of many infectious diseases are linked to climate, therefore the possibility of using seasonal weather forecasts as predictive signs in sickness early caution systems (EWS) has lengthy been a focal point of interest. During the 1990s, however, a number of things brought about expanded hobby on this field: significant advances in statistics availability, epide-miological modelling and facts technology, and the implementation of a hit EWS outdoor the fitness sector.

Climate variability at once impacts human behaviour, which in flip can decide disease transmission patterns. The robust seasonal sample of influenza infections in Europe, for example, is notion to mirror humans' expanded tendency to spend greater time interior at some point of wintry weather months (Halstead 1996). Also, the peak of gastro-enteritis in temperature improved countries in summer months can be related to changes in human behaviour (e.g. more parties and barbecues) associated with warmer temperatures (Altekruse et al. 1998).

2.Methodology

2.1 Proposed system

It's very important for us to focus on our border zones to protect our country and we establishes several military hot spots at different areas of our country. Many camps are present at greater longitudes like Himalayas, seas etc., Here, We propose a IOT device that records the readings of climate and the soldiers body temperature and pulse that provides a brief idea about what is the accurate condition of the weather and the soldiers health condition. This alerts the higher officials to protect soldiers life by providing a medical service and the it's also helpful that if any attacks occurs against the soldiers it informs the team which leads to an better management and save the country and our lives. It is necessary to take control of the army people because they are the reason for us to have a safe and happy life.

Advantages:

1. Helps the Military team to know environment at the border zones.
2. Informs the management team about the Climate change and soldier's health condition.

2.2 Existing system :

The army personnel faces very critical health issues near the borders. The temperature is very low at the border zones where the military hotspots are located because of seas and Himalayas existence and the environmental conditions are too critical for the army people's health and we are unaware of what's going on there. The at most methods to know about the soldiers and their health condition is through communication phones and it's not a constant way to follow because as there are at higher longitudes we may not get connected every time. This leads to disaster management and doesn't know what are the situations and how to approach further to protect our country from border disputes.

Disadvantage:

1. We don't know climate and health conditions of the military personnel
2. It's becomes easy to the opponent country to attack on us.

2.3 SYSTEM REQUIRMENTS :

A standardized accumulation of records which epitomizes the conditions of system. A business skilled, in few cases entitled system investigator, is answerable of dissecting the business demands of those customers and partners to benefit recognize business issues and offer arrangements. Inside the SDLC domain, normally plays out a contact work amidst the business side of undertaking and data innovation division, outer specialist organizations. Activities are dependent upon 3 sorts of necessities:

- **Business requirements:** It depict in business terms what should be conveyed or achieved to offer some benefit.
- & **Product requirements:** It portray properties of a framework or item
- & **Process requirements:** It depict exercises performed by the creating association.

2.4 HARDWARE REQUIREMENTS

- RAM: 2GB and more
- Processor: I3 processor
- Hard Disk: 10 GB Minimum

2.5 SOFTWARE REQUIREMENTS

- Operating System - Windows / Linux / Mac (Any OS which supports Python)
- Software IDE - Python
- Opencv - To capture video
- Keras - To work on the captured video
- Numpy - To handle video operations,
- Pandas and Scikit learn - To handle video data-frames
- imutils - To identify the human faces

III. MODELING AND ANALYSIS

3.1 MACHINE LEARNING

Machine Learning is the field of concentrate that provides computers the capability to know beyond being unequivocally customized. ML is one of the major renewing advances which one will have always run over. It is apparent against the name, it provides the computer which forms it increasingly alike humans: The ability to learn. AI is adequately being used today, perhaps in a ton a bigger number of spots than one would envision

Types of Machine Learning:

Supervised learning is a task of extracting data of deriving a perform from labeled training data. It examines the preparation data and results an inferred function, that would be utilized for mapping advanced models. A standard situation would consider the computation to adequately choose the class names for covered occurrences. Essentially administered learning will be realizing where we educate or instruct the machine by manipulated data that is very much marked that infers a couple of data is starting at now marked with the correct answer. Beginning now and into the expected future, the machine is outfitted with another course of action of models so regulated knowing computation examinations the preparation data and gives the correct output from named data.

Unsupervised getting to know is an AI system, in which you do now no longer need to administer the system. Rather, we have to enable the model to take a shot at its own to find data. It more often than not manages the unmarked information. These learning algorithms enable you to perform progressively complex handling undertakings contrasted with regulated learning. Although, unsupervised learning can be progressively eccentric

contrasted and other regular learning techniques. Unlike previous learning, no educator is given that implies no preparation would be given for machine. In this manner, machine is limited to locate the concealed structure in unmarked information by our-self.

Semi-supervised learning is a category of machine learning errands and methods that likewise utilize unmarked data for getting ready – ordinarily a modest amount of named data with a super deal of unmarked data. This learning dive between solo learning & managed learning. Most data scientists had discovered which enabled information, when utilized related to a modest quantity of named information, can create impressive enhancement in learning exactness. Securing of specified information of a learning issue regularly needs a gifted manual operator or an in-person investigation. The expense related along the naming procedure along these lines may render a completely named preparing set infeasible, though securing of unmarked information is generally sensible. In such circumstances, semi-directed learning can be of extraordinary functional worth. This learning is additionally of hypothetical enthusiasm for AI and an architecture for manual learning.

Reinforcement learning (RL) is a region ML concerned about how experts in programming shall take actions in a domain in order to amplify a thought for combined award. This studying is one of three essential ML ideal models, close by supervised learning and unsupervised learning. It varies from supervised learning in that named input/output sets need not be displayed, and problematic activities need not be expressly redressed. Rather the centre is finding harmony between investigation and inspection.

DEEP LEARNING

Deep learning models, for example, profound neural systems, deep conviction systems, recurrent neural systems and convolution neural networks have been assigned to fields involving computer vision, regular language preparing, medical image analysis, recognition of audio, speech recognition, informal organization separating, bioinformatics, drug design, machine interpretation, material review and pre-packaged game projects, where they have delivered results equivalent for and now and again better than human expert

Python framework

Introduction to Django This book is about Django, a Web improvement system that frees you time and generates Web advancement a appeal. Utilizing Django, you can manufacture and keep up the great Web applications with negligible whine. At its best, Web advancement is an energizing, inventive act; even under the least favourable conditions, it thoroughly may be a dreary, baffling irritation. Django gives you an opportunity to focus on the fun stuff — the middle of your Web application — while encouraging the agony of the monotonous bits. In doing in that capacity, it gives significant level considerations of standard Web advancement structures, simple courses for progressive programming assignments, and clear shows for the high-quality way to deal with issues. Simultaneously, Django attempts to avoid your direction, giving you a chance to work outside the extent of the structure as required. The objective of this book is to make you a Django master. The middle is twofold. To begin with, we clarify, top to bottom, what Django does and how to fabricate Web applications with it. Second, we examine more elevated level ideas where suitable, responding to the inquiry "How might I apply these apparatuses viably in my own ventures?" By perusing this book, you'll become familiar with the aptitudes expected to grow ground-breaking Web destinations rapidly, with code that is perfect and simple to keep up.

OpenCV is a massive open-supply library for laptop vision, gadget learning, and photo processing. OpenCV helps a huge type of programming languages like Python, C++, Java, etc. It can technique photos and motion pictures to perceive objects, faces, or maybe the handwriting of a human. When it's miles incorporated with diverse libraries, which includes Numpy that is a exceedingly optimized library for numerical operations, then the variety of guns will increase for your Arsenal i.e., whatever operations one can do in Numpy can be combined with OpenCV.

This OpenCV educational will assist you examine the Image-processing from Basics to Advance, like operations on Images, Videos usage of a large set of OpenCV-packages and projects.

NumPy is a library for the Python programming language, including aid for large, multi-dimensional arrays and matrices, along with very big collection of high-level mathematical functions to operate on these arrays.[5] The ancestor of NumPy, Numeric, was really constructed by Jim Hugunin with collaborations from so many different developers. In 2005, Travis Oliphant invented NumPy through way of assembling functions of the fighting num group into Numeric, with huge changes. NumPy is open source software program and has so much donors.

Scikit-Learn's new integration with Pandas

Scikit-Learn will make one of its biggest upgrades in recent years with its mammoth [version 0.20 release](#). For many statistics scientists, a normal workflow includes the usage of Pandas to do exploratory statistics evaluation earlier than shifting to scikit-study for gadget learning. This new launch will make the method simpler, greater feature-rich, robust, and standardized.

Pandas

In pc programming, pandas is a software program library noted for the Python programming language for statistics manipulation and evaluation. In particular, it offers data structures and operations for manipulating numerical tables and time series. It is free software released under the three-clause BSD license. The call is derived from the term period panel data", an econometrics time period for records units that encompass observations over more than one time intervals for the equal individuals. Its name is a play on the phrase "Python data analysis" itself. Pandas is importantly used for data analysis. Pandas permits importing data from numerous file formats such as comma-separated valuez, JSON, SQL, Microsoft Excel. Pandas permits diverse records manipulation operations inclusive of merging, reshaping, selecting, in addition to records cleaning, and records wrangling features.

Seaborn is a library for making statistical snap shots in Python. a library for making statistical graphics in Python. It builds on top of [matplotlib](#) and integrates closely with [pandas](#) data structures.

Seaborn allows you discover and apprehend your statistics. Its plotting capabilities accomplish on statistics frames and arrays holding whole datasets and internally carry out the necessary semantic mapping and statistical aggregation to generate informative plots. Its dataset-oriented, declarative API lets you pivot on what the contrasting elements of your plots mean, rather than on the attributes of how to extract them.

Seaborn is the handiest library we want to import for this easy example. By convention, it is imported with the short hand sns.

Behind the scenes, seaborn makes use of matplotlib to attract its plots. For interactive work, it's encouraged to apply a Jupyter/IPython interface in matplotlib mode, otherwise you'll have to name matplotlib, pyplot. show() while you need to peer the plot.

Folium builds at the records arguing power of the Python environment and the drawing brawniness of the leaflet, is library. Manipulate your records in Python, then envisage it in on a Leaflet map thru folium. Folium makes it easy to conjure up data that's been manipulated in Python on an collective leaflet map. It allows both the unbreakable of data to a map for choropleth visualizations as well as progressing rich vector/raster/HTML visualizations as markers on the map.

The library has a number of integral tilesets from OpenStreetMap, Mapbox, and Stamen, and supports custom tilesets with Mapbox or Cloudmade API keys. folium supports both Image, Video, GeoJSON and TopoJSON overlays.

Webbrowser part make known a great-stage combine to let showing Web-primarily based totally files to users. In most of the circumstances, sincerely calling the open() characteristic from this part have a tendency to do the true thing.

Under Unix, graphical browsers are wanted below X11, nevertheless text-mode browsers can be used if graphical browsers aren't to be had or an X11 show isn't having. If text-mode browsers are utilized, the calling activity will block till the user quits the browser.

If the adjoining variable BROWSER exists, it's deeply made clear to override the platform default catalogue of browsers, as an OS. Path step-separated inventory of browsers to tryout in lineup. When the expense of a catalogue element entail the string %s, then it's far interpreted as a literal browser command line for use with the argument URL substituted for %s; if the element does now no longer contain %s, it's far without a doubt explained because the call of the browser to launch.

Pre-processing indicates to the transformations enforced to our data before foraging it to the algorithm. Data Pre-processing is a approach this is used to alter the uncooked information directly into a simple information set. In diverse words, at any moment the information is amassed from one of a set it's far accumulated in uncooked layout which isn't feasible for the analysis. For accomplishing more advanced outputs from the imposed version in Machine Learning functions the blueprint of the information needs to be in a correct way. Some distinct Machine Learning version wishes records in a distinct layout, for example, Random Forest set of rules does now not support null values, therefore to finish random forest algorithm null values would be managed from the original raw data set. Another aspect is that data set should be in a way that man Machine Learning and Deep Learning algorithms are assassinated in one data set, and best out of them is chosen.

Extremely Randomized Trees Classifier (Extra Trees Classifier) is a family of ensemble learning manner which aggregates the results of numerous de-correlated decision trees possessed in a “forest” to out it’s classification result. In perception, it is actually identical to a Random Forest Classifier and apart contradict from it in the style of planning of the decision trees in the forest.

Each Decision Tree in the Extra Trees Forest is constructed from the model training sample. Then, at each test node, Each tree is given with a random sample of k features from the feature-set from which every decision tree definitely select the suitable feature to split the data based on some mathematical criteria (typically the Gini Index). This random sample of features ahead to the genesis of miscellaneous de-correlated decision trees.

Heatmap is a graphical representation of data where the individual values contained in a matrix are represented as colors. It is a lump like glaring a data table from superior. It is legitimately favorable to show a normal view of numerical data, not to excerpt clear-cut data point. It is fully straight forward to make a heat map, as shown on the examples below. However be cautious to recognize the underlying mechanisms. You will probably need to normalize your matrix, choose a relevant colour palette, use clutch inquiry and thus permute the rows and the columns of the matrix to location commensurate ideals close to every disparate in caring with the stuff.

3.2 Models used :

XGBClassifier:

It is an fulfillment of acclivity boosting machines made by Tianqi Chen, now with beneficence from several developers. It accords to a extensive collection of tools under the Distributed Machine Learning Community or DMLC who are also the originators of the trendy mxnet deep learning library.

XGBoost is a software program library that you could download and extend in your machine, then get right of entry to from a number of interfaces.

- Command Line Interface (CLI).
- C++ (the language wherein the library is drafted).
- Python interface in addition to a version in scikit-learn.
- R interface in addition to a version with inside the caret package.
- Julia.
- Java and JVM languages like Scala and platforms like Hadoop.

Decision Tree Classifier

A decision tree is a flowchart-like tree frame at which point an focal node exemplifies feature(or attribute), the department serves a choice lead, and each one leaf node exhibits the outcome. The chief node in a decision tree is known as the root node. It grasps to divide on the intention of the characteristic importance. It detaches the tree in recursively method named recursive partitioning. This flowchart-like form admits you in choice taking. It’s visualization like a flowchart diagram which simply mimics the human layer logic. The decision trees are very ground to fathom and interpret.

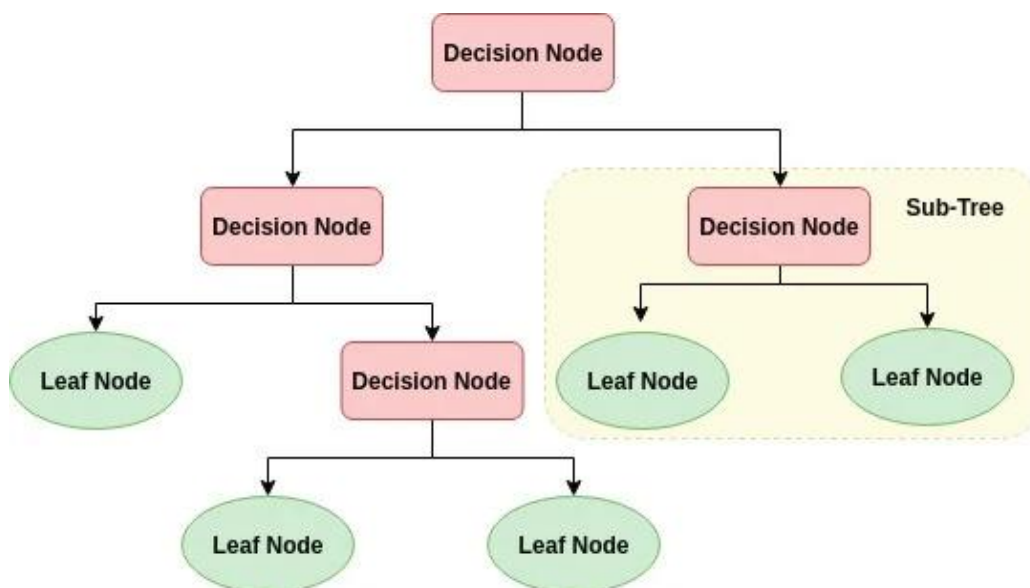


Fig. The Decison Tree Classifier

SVM Classifier

Support vector machines (SVMs) are very strong yet flexible supervised machine learning algorithms which are used both for classification and regression. But generally, they are used in classification problems. In 1960s, SVMs are the first bear anyhow after they were given subtle in 1990. SVMs have their exclusive approach of employment as correlated to other machine learning algorithms. In recent times, they are excessively popular because of their qualification to bail variety of continuous and categorical variables. An SVM version is broadly a illustration of assorted lessons in a hyperplane in multidimensional space. The hyperplane shall be activated in an iterative demeanor by SVM so that the error can be minimized. The goal of SVM is to partition the datasets into classes to catch a maximum marginal hyperplane (MMH).

Random Forest Classifier

It is chorus algorithm. In successive one or posts we shall disclose such algorithms. *Ensembled algorithms* are those which incorporates more than one algorithms of equivalent or different family for distributing objects. For example, going for organizing walks forecast over Naive Bayes, SVM and Decision Tree after which taking vote for actual end scrutiny of sophistication for check object. example, Random forest classifier spawns a invoice of decision trees from any case chosen subset of training set. It then accumulates the majorities from various decision trees to finalize the supreme class of the test object.

GaussianNB Classifier

Adopting the Bayes theorem the naive Bayes classifier works. The naive Bayes classifier concludes all of the prospects are unbiased to each one variety. Even if the potentialities rely consequent to every different or simultaneous the life of the selection talents. Naive Bayes classifier acknowledges every spectacle to independently subsidizes to the probability that the user buys the Mac Book. A Gaussian Naive Bayes group of rules is a uncommon array of NB account of rules. It's categorically used when the lineaments accept continuous values. It's also affected that all the visages are following a Guassian distribution i.e., Normal distribution.

3.3 SYSTEM TESTING

Software testing is a fundamental segment of programming quality affirmation and addresses a conclusive review of detail, coding and structure. The extending detectable quality of programming as a system part and systematic costs related to a product dissatisfaction are persuading factors for we masterminded, through testing. Testing is the path toward executing a program with the expectation of finding an error. The arrangement of tests for programming and other fabricated things can be as trying as the fundamental structure of the thing itself.

STRATEGIES FOR TESTING

Testing involves a lot of exercises that could be arranged in a cutting edge & led deliberately. A technique for testing the programming part should settlement ground-level tests that are imperative to affirm that a little source code portion has been precisely executed similarly as significant level tests which endorse critical structure limits against customer requirements.

Software testing is one component of the test and confirmation. Check suggests the game plan of activities that assurance that the item effectively results as explicit limit. Endorsement suggests a substitute game plan of activities that assurance that the item that have been assembled is discernible to customer necessities.

The fundamental goal of programming is trying to reveal blunders. To satisfy this goal, a progression of test levels unit, mix, approval and framework tasks are arranged and determined. Every test step is practiced through a progression of a precise test methods which aid a structure of experiments.

Unit testing:

This testing system considers a module as a solitary unit and checks the unit at interfaces and talks with various modules as opposed to jumping into subtleties at proclamation level. Here the module will be treated as a disclosure, which will take some information and create yield. Outputs for a given course of action of data, mix is pre-determined and are delivered by the module.

System Testing

Here all the endorsed individual modules will be gathered to make the greater structure and tests are done at the system level to guarantee that all modules are working in synchronous with one another. This testing strategy helps in guaranteeing that all modules which are running superbly when checked freely are in likewise running in connection with various modules. For this kind of testing we make experiments to detect total modules once and afterward produced testing blends of test ways all through the framework that ensures that no other way is advancing within disorder.

Integration Testing

Testing is a significant quality control measure used during programming development. Its fundamental limit is to recognize botches. Sub limits when united may not convey than it is needed. Overall data structures can address the issues. Consolidated testing is a deliberate strategy in building the program structure while coordinating the tests. To uncover mistakes that are connected with interfacing the objective is to make unit test modules and assembled a program structure that has been distinguished by plan. Here, non - gradual incorporation all of the modules are joined early and the program

is attempted all in all. Here blunders will appear in an endless circle task. In steady testing, the code is built and attempted in little fragments in which the blunders are separated and redressed. Unmistakable steady incorporation procedures known as top-down coordination, base up mix, backslide testing.

Acceptance Testing : This testing is a level of programming testing in which a system pursued agreeableness. The purpose of this test is to survey the system's consistency with the business necessities and evaluate whether it is satisfactory for transport. Formal testing with respect to customer needs, essentials, and business systems prompted choose if a structure satisfies the affirmation criteria and to engage the customer, customers or other endorsed component to choose if to recognize the structure.

IV. RESULTS And DISCUSSION

Results :

```

newfile.py - C:\Users\GANDHI\Desktop\Buy Projects\1\Heatmap\newfile.py (3.8.2)
File Edit Format Run Options Window Help
import numpy as np
import pandas as pd
import seaborn as sns
import folium
import webbrowser
from sklearn import preprocessing
from sklearn.ensemble import ExtraTreesClassifier
from folium.plugins import HeatMap # Call various libraries

df=pd.read_csv(r'another.csv') # Get data stored on your computer

num = len(df) #xx is the number of dataset

posi=df.replace(to_replace="", value=np.nan)
posi=posi.dropna()
num=len(posi)
print(num)
df['CO'] = df['CO'].apply(lambda x: x*100)
df['Status']=df['Status'].map({'very Poor':8,'Poor':6,'Moderate':4,'Satisfactory

print(df[['CO']])
X = df[['Id','Time','Pulse','Temp','sound','Pm2.5','Pm10','SO2','NO2','CO','Lat'
Y = df[['Status']]

Y.info()

from sklearn import preprocessing
X_norm = X
y = np.squeeze(np.array(Y).reshape(1,-1))

```

```

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Y.info()

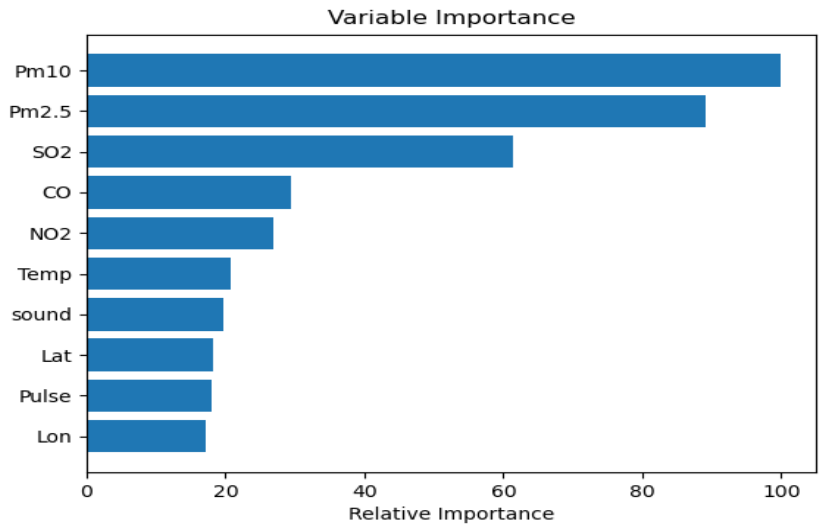
from sklearn import preprocessing
X_norm = X
y = np.squeeze(np.array(Y).reshape(1,-1))

```

```

Python 3.8.2 Shell
File Edit Shell Debug Options Window Help
Python 3.8.2 (tags/v3.8.2:7b3ab59, Feb 25 2020, 23:03:10) [MSC v.1916 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: C:\Users\GANDHI\Desktop\Buy Projects\1\Heatmap\newfile.py =====
108
0      CO
1      10.0
2      12.0
3      14.0
4      11.0
5      9.0
..     ...
103    75.0
104    103.0
105    91.0
106    13.0
107    78.0

[108 rows x 1 columns]
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 108 entries, 0 to 107
Data columns (total 1 columns):
 # Column Non-Null Count  Dtype
---  ---
0 Status 108 non-null     int64
dtypes: int64(1)
memory usage: 992.0 bytes
    
```







```
[4 4 8 6 6 4 3 8 8 3 6 4 6 6 4 4 6 4 3 4 4 6 4 4 6 4 4 6 6 4 4 8 3 4 4 6]
0.6111111111111112
[[ 2 5 0 0]
 [ 2 10 6 0]
 [ 0 1 6 0]
 [ 0 0 0 4]]
[4 4 8 4 6 4 3 8 8 3 4 4 4 4 4 4 6 4 4 4 3 4 4 4 6 4 4 6 6 4 3 8 4 4 3 4]
[[ 5 2 0 0]
 [ 0 18 0 0]
 [ 0 2 5 0]
 [ 0 0 0 4]]
0.8888888888888888
0.7777777777777778
0.8055555555555556
0.6388888888888888
>>> |
```

V. CONCLUSION

By using the IOT devices to collect the data from the military personnel in real time helps us to constantly monitor the health status of a person even if the communication devices fails, and by using this information gathered from the IOT devices the higher officials can take quick decisions on sending help to the military personnel. Even in something happens and the information is not retrieved from the IOT devices we can predict the health status of the person in combination with the previous recorded Pulse and Health status values with the live climatic conditions and when this information is fed into our Linear regression prediction model it will predict the Health condition of the specific military personnel. The accuracy of the model is around 88.8% for the Random forest classifier which can improved further by using large amounts of data for the training and improving the model efficiency by cleaning the data more precisely. We can also apply the same prediction model idea in combination with the air pollutants and can verify whether the air quality is bad naturally or some kind of poisonous gas is being used by the opposite army personnel and take appropriate measures. The military personnel who health status is poor or very poor are show on the heat map and on the graph at the same time to help the higher officials locate those personnel in less amount of time.

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