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Weather Forecasting and Air Quality Analysis

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ABSTRACT: Weather vaticination, in general, is a complex process and gruelling task. It requires colourful parameters to read the rainfall. Monitoring and prognosticating rainfall help in colourful fields like husbandry, trip, pollution disbandment, communication, disaster operation, etc. hereafter, rainfall soothsaying plays a vital part in every day- to-day aspect, exercising the requirements of a common man to probe scientists Air quality has a significant impact on mortal health. declination in air quality leads to a wide range of health issues, especially in children. The capability to prognosticate air quality enables the government and other concerned associations to take necessary way to shield the most vulnerable, from being exposed to the air with dangerous quality. So “ rainfall soothsaying with air quality analysis ” helps people to get rainfall conditions and the quality of air. Keywords API, speech recognition, CNN(Convolutional Neural Networks), python, tensorflow, windows desktop operation, dataset.

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I. INTRODUCTION

Using Wisdom and technology to read the atmospheric conditions at a certain area and time is known as rainfall soothsaying. Weather soothsaying has been done sporadically for glories and formally since the 19th century. Meteorology is used to prognosticate how the atmosphere will change at a certain position while quantitative data about the state of the atmosphere, land, and ocean are gathered to give rainfall vaticinations.

Weather warnings are pivotal vaticinations because they serve to guard property and mortal life. For dealers in the commodity requests, vaticinations grounded on temperature and rush are pivotal for husbandry. mileage companies use temperature protrusions to prognosticate demand for the forthcoming days. numerous people frequently consult rainfall vaticinations to decide what to dress each day.

Heavy rain, snow, and wind bite significantly circumscribe out-of-door conditioning; thus, vaticinations can be used to record conditioning around these conditions as well as to prepare for and survive them. Due to the fast industrialization and urbanisation, air pollution has surfaced as a serious environmental concern worldwide. The mortal body is significantly harmed by airborne particulate matter(PM) with a periphery of lower than2.5 micrometres(PM2.5), which is one type of air pollution. PM2.5 is suitable to transmit dangerous chemicals into the mortal blood and lungs, which can lead to cardiovascular, respiratory, and cerebrovascular conditions as well as reduced lung function and heart attacks. PM2.5 attention has therefore been utilised as a crucial global index of air quality. The maturity of regions doesn't have access to air quality monitoring stations, which are the current standard because of their high setup costs and precious advanced detectors.

A. PROBLEM FORMULATION

Problem formulation plays an important role in order to get an idea of a project such as requirement, need and application of a project.so the problem statement of a is to develop an application which is able to give the weather forecast of any city entered and tells the air quality of an image provided to the model.



II. LITERATURE SURVEY

According to Avijoy Chakma et al. [1], the majority of regions lack access to monitoring stations, which are the foundation of air quality monitoring systems. This is because monitoring stations are expensive to set up and require sophisticated sensors. Images are used increasingly frequently to represent information now that smartphones and portable cameras are readily available. By examining photographs, it is possible to estimate air quality metrics and the air quality index (AQI), which offer an effective and economical way to monitor the quality of the air. Smartphone users are able to independently take images and determine the current local air quality.

Weather forecasting is used to anticipate the environment of a certain region, according to Yogesh Kale and Aditya Kalekar et al. [2]. Application programming interface, or API for short, is an interface that enables communication between two applications. With the use of ML technologies, the Open Weather Map API offers all the global business weather data required. With a web interface, API enables access to location-based air pollution statistics. The geographical nature of the application, which helps to provide weather in map form, uses the Google Maps API.

According to Bhagya Lakshmi Pavuluri and Ramya Sree Vejendla [3], machine learning algorithms produce the most accurate and successful outcomes when used to predict climate variables including humidity, rainfall, temperature, floods, and storms. This section is incredibly dependent on historical data and artificial awareness. The finest three algorithms for predicting the future climate are put to the test to determine which algorithm produces accurate weather predictions. They choose to use three methods to predict the day's average temperature, regardless of whether it will be hot, cold, or rainy: - 1) Random Forest algorithm; 2) Decision trees algorithm 3) K-Nearest Neighbours technique employing neural networks. The neural network was added to the algorithm for the best representation of KNN prediction, making it simple to pinpoint the process's starting point.

For weather forecasting, Nitin Singh, Saurabh Chaturvedi, and Shamin Akhter [4] devised a machine learning technique. The suggested system application, which was created on a Raspberry Pi 3B, uses real-time data from a humidity, temperature, and pressure sensor to forecast the likelihood of rain today. They used a Raspberry Pi 3B board, DHT11 humidity and temperature sensor, and BMP1180 pressure sensor as hardware in the project. Random Forest Classification Algorithm is a machine learning algorithm. The core idea in that study is a portable, low-cost system for weather forecasting.

According to Tanisha Mandan & Shraddha Sagar [5], it's important to precisely estimate the air quality. It can be measured using a variety of conventional techniques, but the outcomes are inaccurate and the process requires numerous mathematical calculations. A significant part in predicting air quality is played by machine learning, a subset of AI. Hence, measuring the air quality index is a crucial initial step in order to estimate the quality of the air accurately. They employed only a few methods in their papers: Neural network 2) RNN Regression with logit Algorithm for Extreme Machine Learning Random Forests 5) A model that combines a tree and a light gradient.

III. PROPOSED METHODOLOGY AND DISCUSSION

User Interface:

This is the first module developed under this project. The project is purely in python programming language. This module uses Tkinter python library which helps us to show the graphical user interface. In this module the search bar is provided in order to input the city name for which user is wishing to fetch the weather.

Weather forecasting:

After taking an input this model built in such a way that it is capable of forecasting the weather for next seven days. The libraries used in this module are geopy, timezonerfinder, datetime, requests, PIL, pytz.

geopy- Geopy is a Python package that makes it easier to determine the distance between two sites geographically.

Timezonerfinder - Timezonerfinder is a quick and lightweight Python tool for completely offline time zone lookup for specified coordinates on earth.

Datetime- When working with date and time data, the datetime library is a potent tool.

Requests-It hides the difficulties of making requests behind a lovely, straightforward API so you can concentrate on communicating with services and using data in your application.

PIL- it offers a variety of image processing libraries to give digital images image processing capabilities.

Pytz- Using Python 2.4 or above, Pytz-This package enables precise and cross-platform time zone calculations.

Weather voice Assistant:

In this module user can give command to the system as “Weather” and after that user has to specify the city name in order to get the weather update. The modules and libraries used for this module are as follows speech recognition-It allows computers to understand human language. Voice recognition is the capacity of a machine to hear spoken words and recognise them.

pyttsx3- Pyttsx3 is the name of a Python text-to-speech conversion library.Unlike rival libraries, it works offline and is compatible with Python 2 and 3.

Real time air quality:

In this module user can get real time air quality of their area by uploading images of their area. An images must contain open environment which contain at least covers 50% of sky. The technology used for image classification is CNN . We used Beijing and Shanghaiimages dataset for train and test our CNN model. The libraries used for this module are as follows:

Keras -This library used for images pre-processing ,load images in module. Keras support all the models of neural network.

Tensorflow - It is used to convert the images into multidimensional array format and handles the images.

Askopenfile – it is used to browse images from device.

CNN - The adopted CNN is VGG16 model. VGG16 is an object identification and classification method that has a 92.7% accuracy rate when classifying 1000 photos into 1000 different categories. VGG16's 16th digit denotes its 16 weighted layers.Thirteen convolutional layers, five Max Pooling layers, three Dense layers, and a total of 21 layers make up VGG16, but only sixteen of them are weight layers, also known as learnable parameters layers.

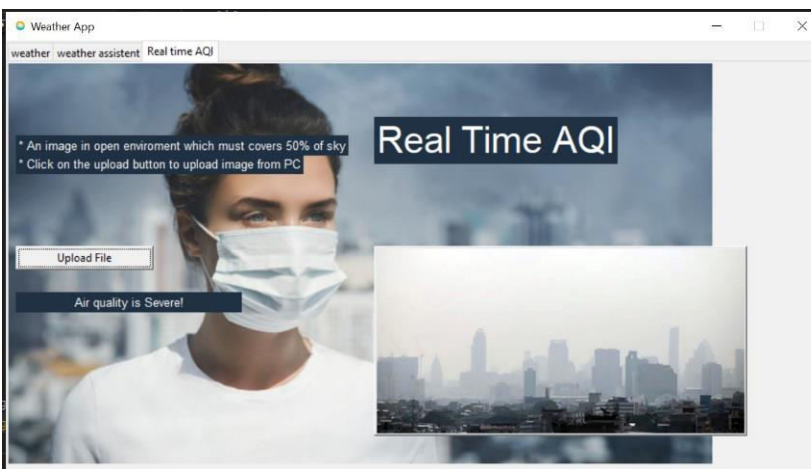
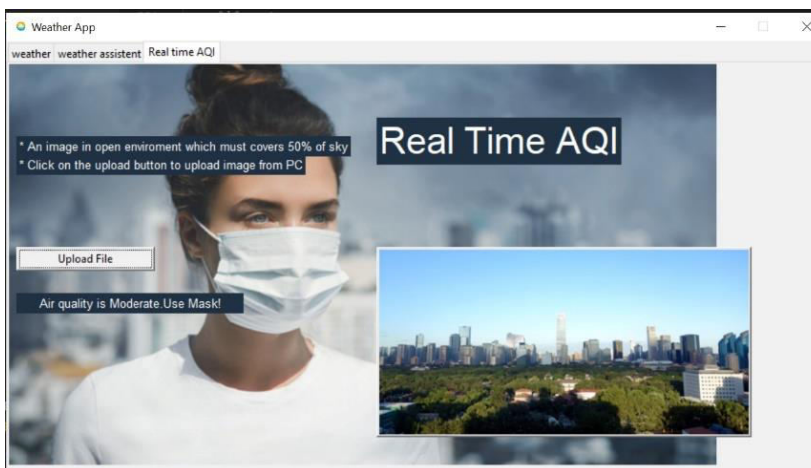
Weather forecast : when entered city name it will show the forecast of that city next 7 days with the parameters such as temperature, humidity, pressure, wind speed and description about weather.



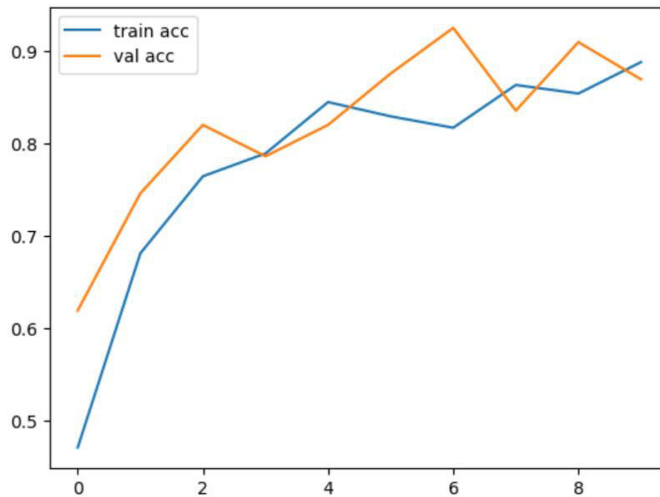
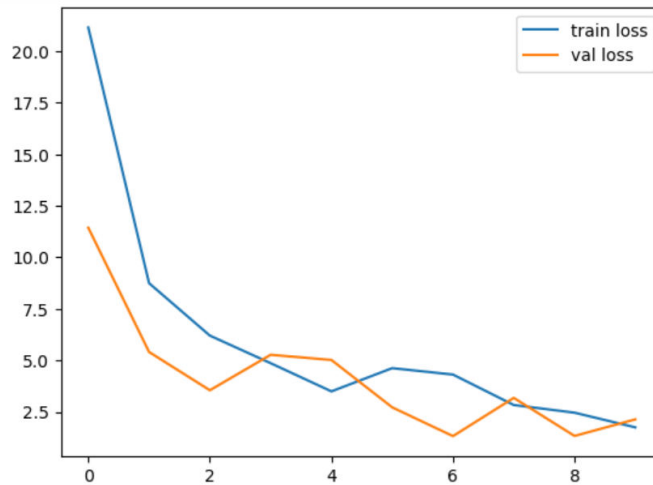
Voice assistant: here user can give voice command to the model with the city of which he is interested to get weather forecast then the assistant will give the weather updates by voice to the user.



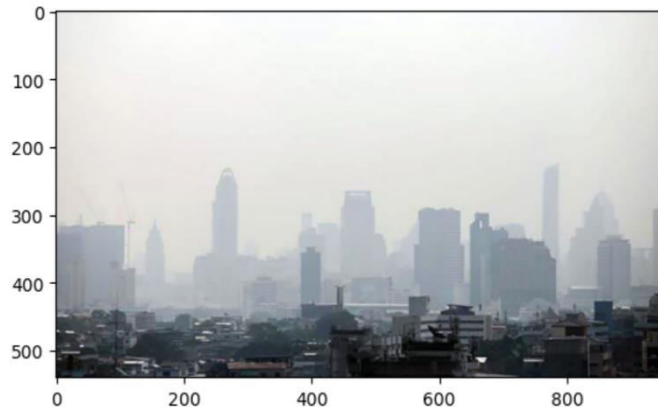
Air quality detection: here user has to provide an image (.jpeg, .png) then the model tells us about the air quality for that particular image.



The following graphs shows loss in training, validation and accuracy of model on test data set. The validation loss shows how well the model fits new data, while the training loss shows how well it matches training data.



1/1 [=====] - 1s 502ms/step
Severe



V. CONCLUSION

To conclude our paper has performed weather forecast using open weather API to forecast the weather for next 7 days. We introduce the first work in the literature that uses CNN based method to estimate PM2.5 concentration for natural images in this paper. Besides the proposed method, we also created a PM2.5 concentration image dataset, which



currently contains 700 images with corresponding PM2.5 values. This dataset is publicly downloadable and other researchers working in this area can use this dataset to test and compare their methods.

Now we are collecting more images to increase the dataset size. Our future work includes collecting more PM2.5 images from different environments (e.g., cities, rural areas, national parks) and testing different CNN models to improve the classification accuracy.

REFERENCES

- [1] Avijoy chakma, Ben Vizena, Tingting Cao, Jerry Lin, Jing Zhang, "Image based Air quality analysis using deep convolutional neural network.", 1Computer Science Department, Lamar University, TX, 77710, USA 2Center for Advances in Water and Air Quality, Lamar University, TX, 77710, USA Dec 24, 2020
- [2] Prof. Anil Hulsure, Yogesh Kale, Aditya Kalekar, Vijay Ganesh, "Weather Forecasting & crop recommendation.", Published by: International Journal of Engineering Research Technology (IJERT) <http://www.ijert.org> Vol. 10 Issue 05, May-2021
- [3] Bhagya Lakshmi Pavuluri, Ramya Sree Vejedla, Pavuluri Jitendra, Tinnavalli Deepika, Shahana Bano, "Forecasting Meteorological Analysis using Machine learning algorithms.", proceedings of the International conference on smart electronics & communication (ICOSEC 2020) Nov 5, 2020
- [4] N. Singh, S. Chaturvedi and S. Akhter, "Weather Forecasting Using Machine Learning Algorithm," 2019 International Conference on Signal Processing and Communication (ICSC), 2019, pp. 171-174, doi: 10.1109/ICSC45622.2019.8938211.
- [5] Tanisha Mandan, Shraddha Sagar and Deepali Virmani, "Air Quality Prediction using Machine Learning Algorithms." 2020 2nd International Conference on Advances in Computing, Communication Control and Networking (ICACCCN) | 978-1-7281- 8337-©2020 IEEE | DOI: 10.1109/ICACCCN51052.2020.9362912



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