

WEATHER PREDICTION USING CLOUD IMAGES

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ABSTRACT

- Weather Forecasting is used to predict the conditions of the atmosphere in a given location.
- It predicts how the future weather is going to be and we can plan accordingly.
- Farmers will most benefit from using this technology.
- Can predict the weather by analyzing the status of the cloud using Digital Image processing techniques.

INTRODUCTION

. Many factors like temperature, rainfall, pressure, humidity, sunshine, wind, and cloudiness are considered for predicting the weather. It is also possible to identify the different types of clouds associated with different patterns of weather. These patterns of weather help in predicting the weather forecast.

OBJECTIVE

- **Weather forecasting improves transportation safety**
- **Weather Forecasting benefits tourism**
- **Weather forecasting is beneficial to farmers**
- **Irrigation method is improved with the help of weather forecasting.**

EXISTING SYSTEM

- In the past, people used barometric pressure, current weather conditions, and sky conditions to predict.
- Satellite images and remote sensing techniques.
- The accuracy gets reduced with an increase in time.
- The chaotic nature of the atmosphere as it keeps on changing





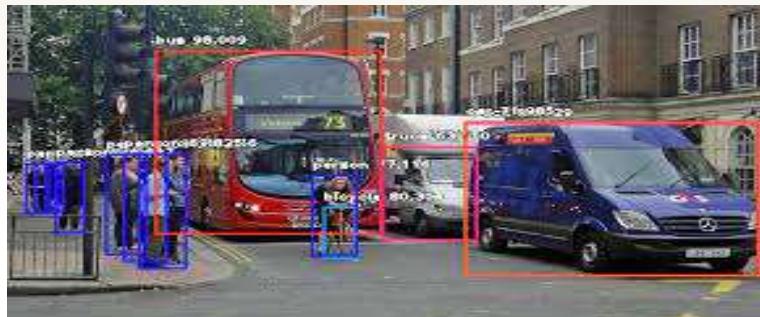
The Solution Is!

Digital Image Processing

What is DIP?

- The input of that system is a digital image and the system process that image using efficient algorithms.
- Digital Image Processing is used to manipulate the images using algorithms.
- Image processing is essential in many fields, from photography to satellite photographs.
- Digital image processing requires computers to convert images into digital form using the digital conversion method and then process them.

Techniques In DIP?



PROPOSED SYSTEM

Weather forecasting can also be done by using satellite images but acquiring the satellite images is more difficult and would even cost high. Even predicting using satellite images needs more technology. So, we are using digital image processing techniques which process the images of the sky like normalization, cloud masking algorithm, and k-mean algorithm.

METHODOLOGY



**Normalization
of image**



**Cloud
Masking
Algorithm**



**K-means
Clustering
Algorithm**

Normalization of image

- Image normalization is a typical process in image processing that changes the range of pixel intensity values.
- Image normalization ensures optimal comparisons across data acquisition methods and texture instances.
- To remove any non-uniformities present in the imaging system, dark field image subtraction, and bright field image normalization were performed
- Normalization implies making all the images have the same spatial relationship to what they demonstrate



Figure 1. Original image of cloud



Figure 2. Image after performing normalization

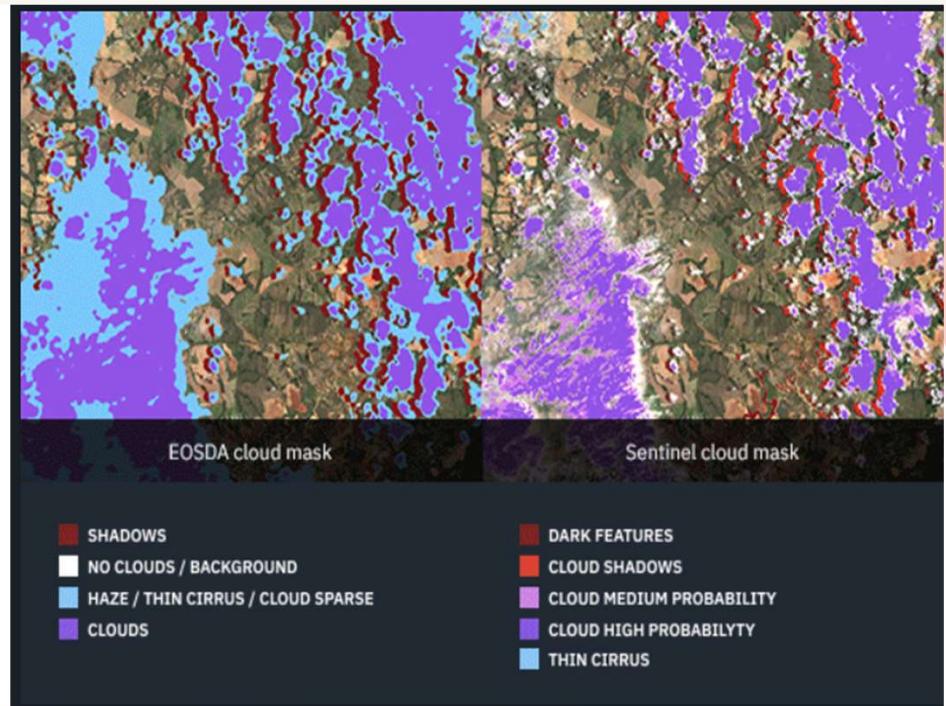
Cloud Masking Algorithm

- **Cloud masking in remote sensing prepares imagery for processing and improves product generation.**
- **Clouds (and, correspondingly, their shadows) differ in shape, size, and altitude that depend on the geographic position and climatic peculiarities of the studied region.**
- To extract the feature of the cloud part by again finding the mean value of the cloud area which will be used a feature in the next process.
- This process is done for all the images in the dataset so that we get features of all images which will be used to cluster the images into groups.

Cloud Masking Algorithm



Figure 3. Image obtained after performing cloud mask algorithm



K-means Clustering Algorithm

We considered clustering because for classification there would be less no of classes. But we considered ten types and hence we considered clustering rather than classification. Here we considered the clusters of the clouds as we would divide the image based on the cloud mean point.

Classification and Clustering are used for the categorization of objects into one or more classes based on their features. They appear to be a similar process as the basic difference is minute. In the case of Classification, there are predefined labels assigned to each input instance according to their properties whereas in clustering those labels are missing.

CLUSTERS OF CLOUDS



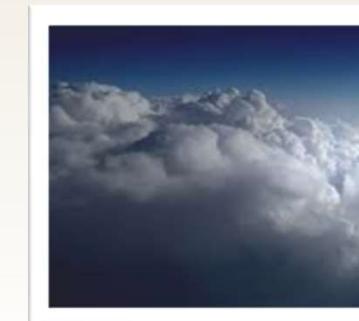
Cumulus



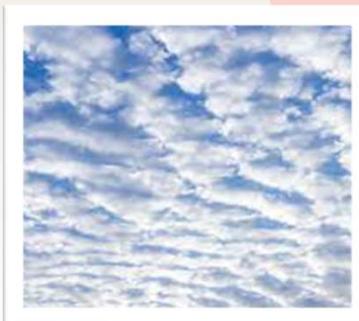
Cumulonimbus



Nimbostratus



Stratocumulus



Stratus



Altostratus



Altocumulus



Cirrocumulus



Cirrus



Cirrostratus

Algorithm System Output

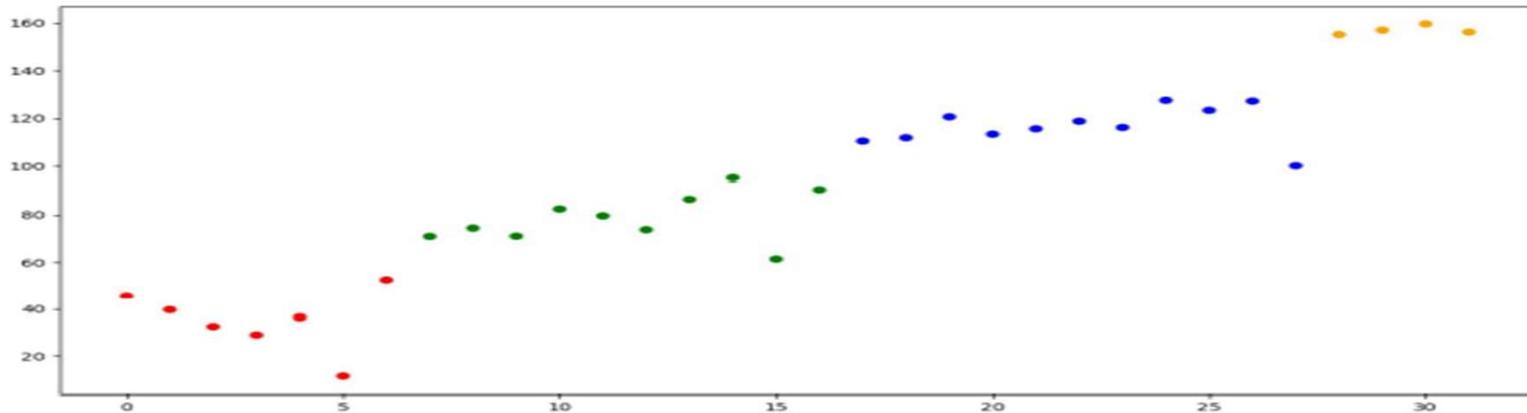


Figure 4. Scatterplot^[10] graph showing different clusters formed after training the dataset

III. EXPERIMENT AND RESULTS

```
[[35.46], [78.533], [116.721], [156.918]]  
[[49.8272664265247, 59.66750994581249, 52.90204374050354, 26.500082994626715, 50.04522095508951, 11.7055079819560715, 52.56557757526954], [70.940050588100895, 74.4005534705212, 71.05202  
156.93123571537245  
current weather condition is:  
CLOUDY WITH CHANCES OF RAIN  
  
Process finished with exit code 0
```

Figure 5. The generated output in the form of text for the given input image

CONCLUSIONS

This can give the weather condition at any point in time for any place with the help of the current cloud image at that place.

In the future, this model can be developed as to predict the weather for the next few hours based on the image with the help of cloud analysis.





YES!

THANK YOU