Land Use Land Cover Using ML/GEE for Rel river, Banaskantha district (2014, 15, 16)

Arya Tripathi
20BEC130

Sahaj Soni
20BEC106

Brijesh Patel
20BEC083

Dhruvi Thakar
20BEC025

***Abstract*— Land Use Land Cover Classification (LULC) plays an important role for the researchers in defining the environmental change across the globe in the field of remote sensing and GIS (Geographic Information System). It is crucial in study of changes on the surface of the earth. The above analysis has been performed in Google Earth Engine and codes have been written in JavaScript. Annual Land Use Land Cover information on national spatial databases enables the monitoring of temporal dynamics of agricultural ecosystems, forest conversions, surface water bodies, etc. on annual basis. Land use land cover (LULC) classification is the process of categorizing the land surface into different land cover and land use classes based on its physical and human-made characteristics. This is typically done using remote sensing data, such as satellite imagery, which provides a broad view of the land surface.**

***Keywords – Land Use Land Cover* Classification, Geographic Information System, *Google Earth Engine*.**

I. Introduction

Land Use Land Cover Classification (LULC) plays an important role for the researchers in defining the environmental change across the globe in the field of remote sensing and GIS (Geographic Information System). It is crucial in study of changes on the surface of the earth. LULC mapping involves the classification of land into different categories based on these characteristics. This mapping is often done using remote sensing techniques, such as satellite imagery, which can provide a comprehensive view of the land surface.

LULC mapping is important for a variety of reasons, such as urban planning, natural resource management, and environmental monitoring. In this report, the analysis of LULC change for the years 2014, 2015 and 2016 have been performed using supervised as well as unsupervised classification. The study area taken here is Dhanera region of Banaskantha district.

The analysis has been performed using Google Earth Engine. The analysis has been performed in Google Earth Engine. Google Earth Engine is a cloud-based geospatial analysis platform that enables users to visualize and analyze satellite images of our planet. Scientists and non-profits use Earth Engine for remote sensing research, predicting disease outbreaks, natural resource management, and many such applications. Analysis can be done using Python as well as JavaScript. For this paper, the codes have been written in JavaScript.

II. Supervised Classification using CART Classifier

In supervised classification, the user or GIS Analyst manually classifies the land based on their coverage. They key characteristic is that the training dataset supervises the labeling. Classification And Regression Tree (CART), is a predictive model, which explains how an outcome variable's values can be predicted based on other values. A CART output is a decision tree where each fork is a split in a predictor variable and each end node contains a prediction for the outcome variable.

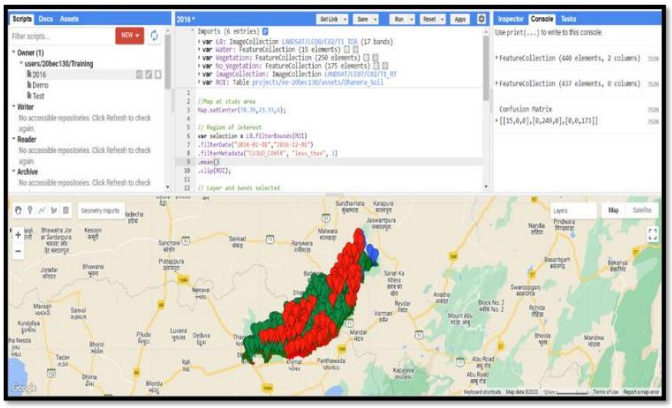


Figure 1 - Accuracy Assessment

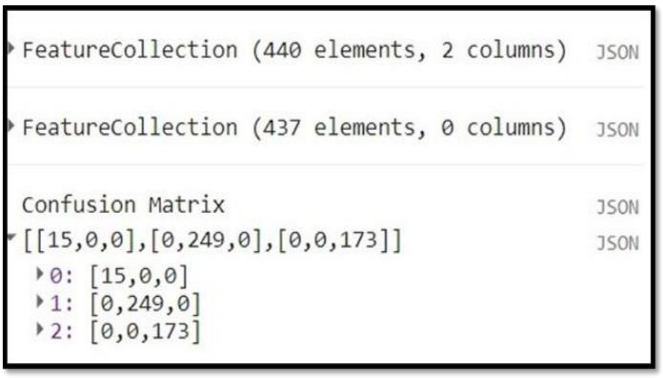
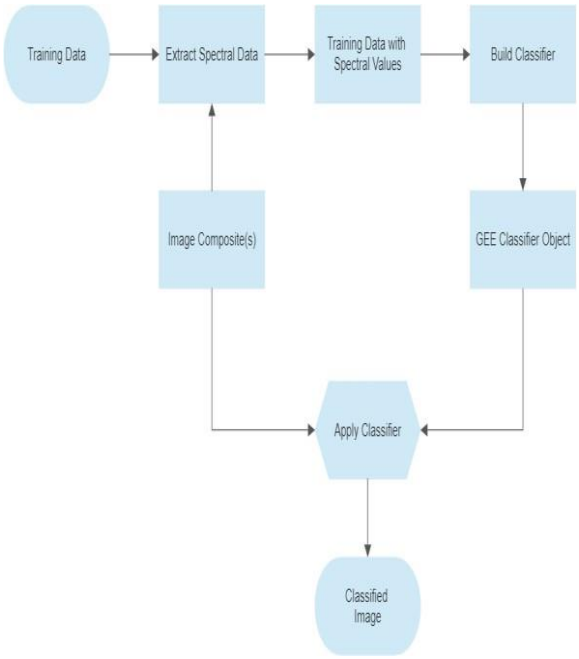


Figure 2 - Confusion Matrix

For Class A, there are 15 instances that were correctly classified as Class A (true positives), and 0 instances that were incorrectly classified as Class B or Class C (false positives). This means that the model correctly identified all

15 instances of Class A in the dataset. For Class B, there are 249 instances that were correctly classified as Class B (true positives), and 0 instances that were incorrectly classified as Class A or Class C (false positives). This means that the model correctly identified all 249 instances of Class B in the dataset. For Class C, there are 173 instances that were correctly classified as Class C (true positives), and 0 instances that were incorrectly classified as Class A or Class B (false positives). This means that the model correctly identified all 173 instances of Class C in the dataset. In summary, the model has a perfect classification accuracy for all three classes, as there are no false positives or false negatives. This indicates that the model performed very well and was able to correctly classify all instances in the dataset.



Flow Chart 1

Data augmentation is used to increase the size and diversity of a dataset by creating new, slightly modified versions of the original data. The goal of data augmentation is to improve the generalization ability of machine learning models by introducing more variability in the training data. Common techniques used for data augmentation include - Image transformations - such as rotations, flips, cropping, and scaling, Text transformations - such as adding synonyms, replacing words with their antonyms, and Audio transformations - such as changing pitch and tempo.

Map Outputs:

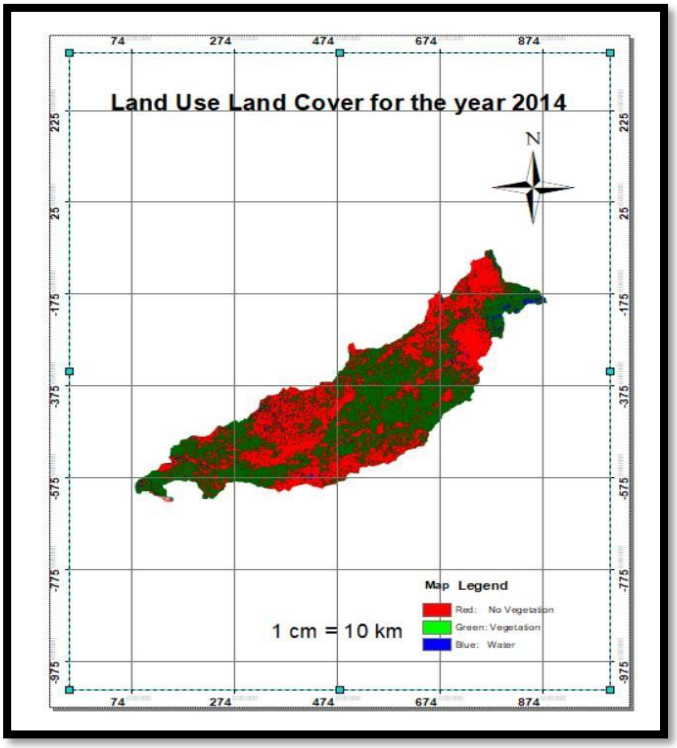


Figure 3 - Land Use land Cover for the year 2014

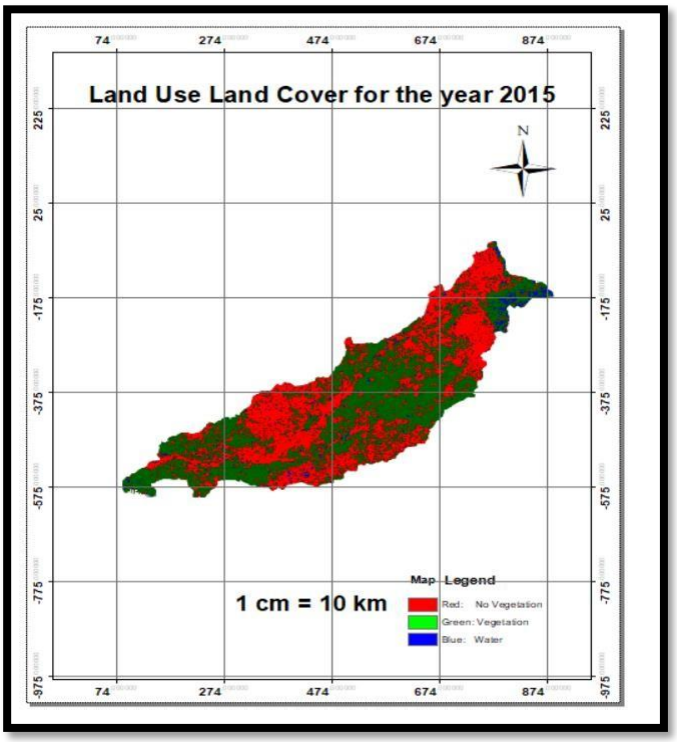


Figure 4 - Land Use Land Cover for the year 2015

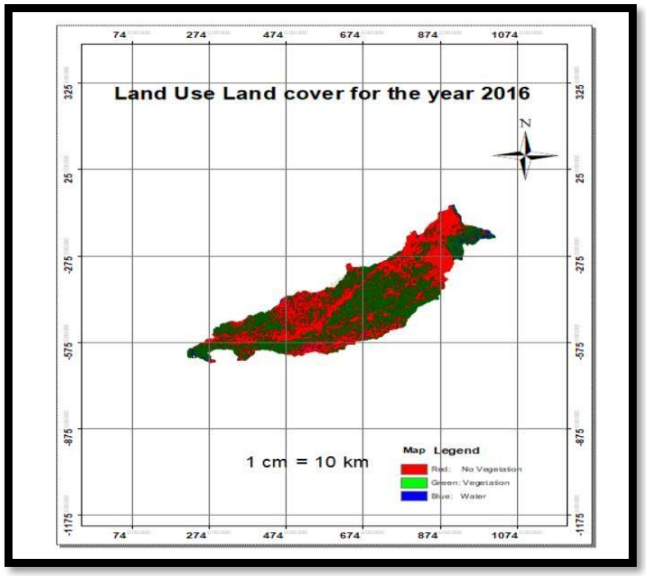


Figure 5 - Land Use Land Cover for the year 2016

Unsupervised Classification using K-means in GEE

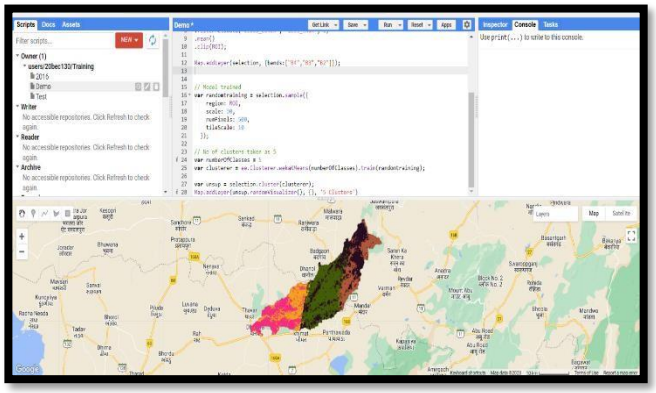
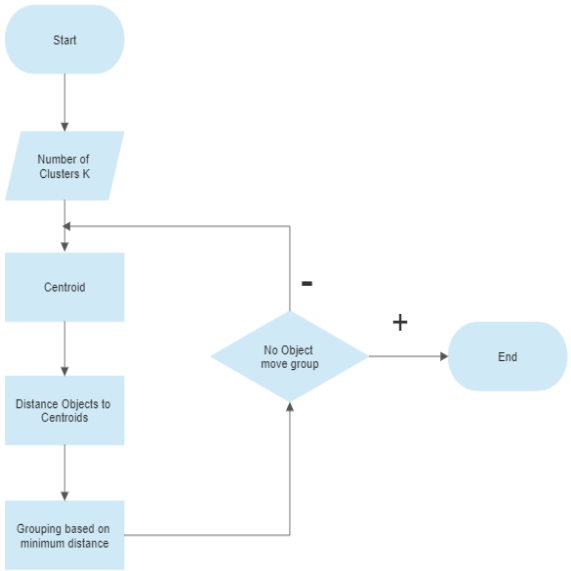


Figure 6:- Classification using K-means in GEE



Flow Chart 2

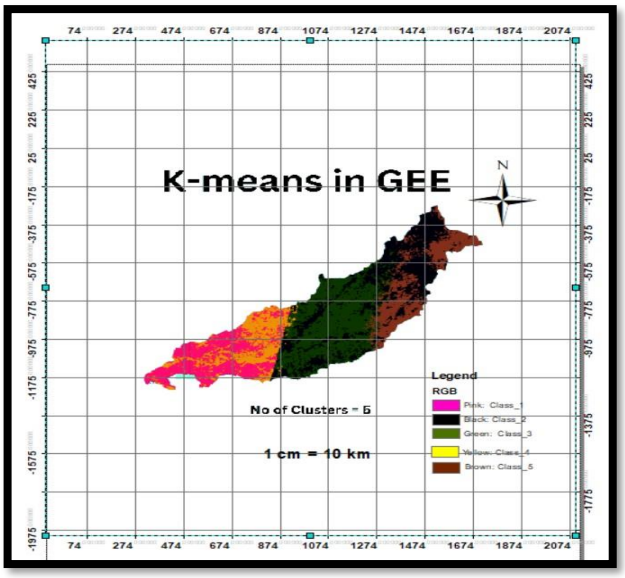


Figure 7 - Output by K-means in GEE

Unsupervised classification depends entirely on the imagery, and on separability of classes. Thus, it may better represent patterns on the landscape. But the labelling of those classes may not be useful for an end user. Moreover, the method is entirely dependent on the data space, and thus a repetition of the same basic steps on a different set of images for the same location could very well lead to a different map.

III. Result Analysis and Conclusion:

Land Use Land Cover classification maps of an area provide information to help users to understand the current landscape of the study area. Annual Land Use Land Cover information on national spatial databases enables the monitoring of temporal dynamics of agricultural ecosystems, forest conversions, surface water bodies, etc. on annual basis.

In supervised classification, regions are classified based on the class assigned whereas in unsupervised classification, The colours of the classes are not related to any meaningful quantity, a random visualizer is used. The colours of the classes do not hold any meaning, they are simply used to distinguish the classes. It is quite evident from the results that the vegetation area has been increased through the years 2014, 2015 and 2016 and consequently the non-vegetation area has been reduced which is a positive sign.

ACKNOWLEDGEMENT

We extend our sincere thanks to Dr. Nitesh Gupta and Prof. Keval Jodhani for mentoring us throughout the course of Remote Sensing.

REFERENCES

[1] Land use Land Cover Change Detection using K-means Clustering and Maximum Likelihood Classification Method in the Javadi Hills, Tamil Nadu, India.
[2] https://openmrv.org/web/guest/w/modules/mrv/modules_1/land-cover-and-land-use-classification-in-google-earth-engine