

GE107 – Tinkering Lab

Assignment 3

Name: Riya Jain

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Task:

Use Google Earth Engine (GEE) to compute spectral indices such as NDVI, NDWI, NDSI, NDSII, NDGI, NDBI, etc. of any area, study their time series analysis of at least one year by plotting graphs and prepare a brief report.

NDVI:

It is the ratio that describes the difference between visible and near infrared reflectance of vegetation cover and can be used to estimate the density of green on an area of land.

$$NDVI = \frac{NIR - Red}{NIR + Red}$$

- NDVI values range between 0 and 1 (due to normalization procedure).
- Very low values of NDVI (< 0.1) correspond to barren areas of rock, sand or snow.

CODE:

```
Imports (3 entries)   
▶ var gaul: Table FAO/GAUL/2015/level1  
▶ var gfsad: Image "GFSAD1000: Cropland Extent 1km Multi-Study Crop Mask, Global Food-Su..."  
▶ var modis: (Deprecated) ImageCollection "MOD09A1.005 Surface Reflectance 8-Day Global ..."
```

```
Map.setCenter = (76.77,30.73, 11);
```

```
// Select 'landcover' band with pixel values 1 which represent//Rice and Wheat Rainfed crops
```

```
var wheatrice = gfsad.select('landcover').eq(1)
```

```
// Gujarat
```

```
// We use the Global Administrative Unit Layers (GAUL) dataset to get the state boundary
```

```
var Gujarat= gaul.filter(ee.Filter.eq('ADM1_NAME', 'Gujarat'))
```

```

// wheatrice image contains 1 and 0 pixels. We want to generate points
// only in the pixels that are 1 (representing crop areas)
// selfMask() masks the pixels with 0 value.
var points = wheatrice.selfMask().stratifiedSample({numPoints:5, region:Gujarat, geometries: true}
)
var points = points.map(function(feature) {
return ee.Feature(feature.geometry(), {'id': feature.id()})
})
// Show the state polygon with a blue outline
var outline = ee.Image().byte().paint({
featureCollection: Gujarat,
color: 1,
width: 3
});
Map.addLayer(outline, {palette: ['blue']}, '39;AOI')
// Show the farm locations in green
Map.addLayer(points, {color: 'green'}, 'Farm Locations')

//define the time period
var startDate = '2016-01-01'
var endDate = '2016-12-31'

// bands
var modisBands =
['sur_refl_b03','sur_refl_b04','sur_refl_b01','sur_refl_b02','sur_refl_b06','sur_refl_b07'];
var lsBands = ['blue','green','red','nir','swir1','swir2'];

// helper function to extract the QA bits
function getQABits(image, start, end, newName) {
// Compute the bits we need to extract.
var pattern = 0;

```

```

for (var i = start; i <= end; i++) {
  pattern += Math.pow(2, i);
}

// Return a single band image of the extracted QA bits, giving the band a new name.
return image.select([0], [newName])
  .bitwiseAnd(pattern)
  .rightShift(start);
}

// A function to mask out cloudy pixels.
function maskQuality(image) {
  // Select the QA band.

  var QA = image.select('StateQA');
  // Get the internal_cloud_algorithm_flag bit.
  var internalQuality = getQABits(QA, 8, 13, 'internal_quality_flag');
  // Return an image masking out cloudy areas.
  return image.updateMask(internalQuality.eq(0));
}

// create cloud free composite
var noCloud = modis.filterDate(startDate, endDate)
  .map(maskQuality)
  .select(modisBands, lsBands)
  .filter(ee.Filter.bounds(points))

// vis parameters
var visParams = {bands: ['nir', 'red', 'green'], min: 0, max: 3000, gamma: 1.3};

// add the cloud free composite
Map.addLayer(noCloud.median(), visParams, 'MODIS Composite');

```

```
// Adding a NDWI band

function addNDWI(noCloud) {

var ndwi = noCloud.normalizedDifference(['sur_refl_b02', 'sur_refl_b03']).rename('ndwi')

return noCloud.addBands([ndwi])

}


var collection = modis.filterDate(startDate, endDate)

.map(addNDWI)


//.filter(ee.Filter.bounds(points))


// View the median composite

var vizParams = {bands: ['ndwi'], min: -1, max: 1}

Map.addLayer(collection.median(), vizParams, 'collection')


var chart = ui.Chart.image.seriesByRegion({

imageCollection: collection.select('ndwi'),

regions: points,

reducer: ee.Reducer.mean()

})

print(chart)
```

Code link:

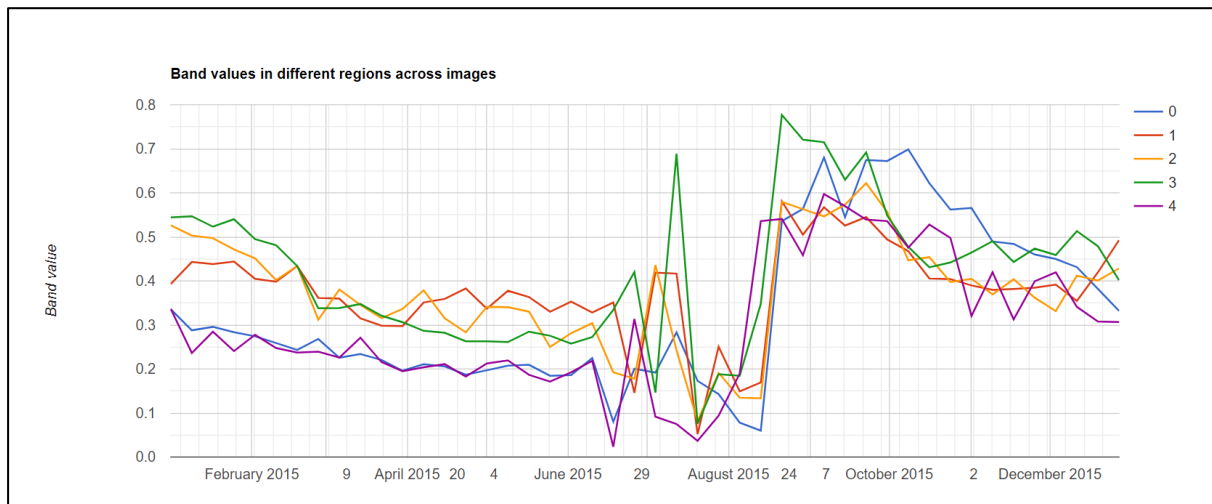
https://code.earthengine.google.com/5eb3ec42c047ed425e2477a7d776a811?accept_repo=users%2Ftylere%2Fg4g18-ee101

.CSV File:

<https://1drv.ms/u/s!AtIW4JeMzuSlgTTKDjllsG8X9wel>

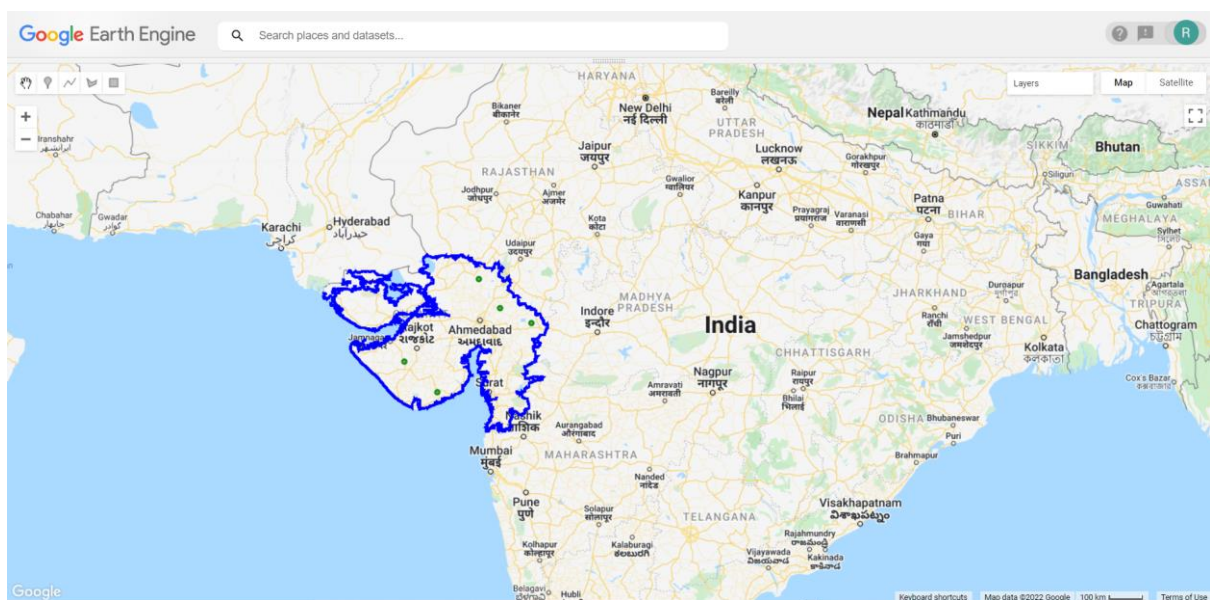
Time series analysis Chart:

The graph is plotted for NDVI vs time over a year in Gujarat

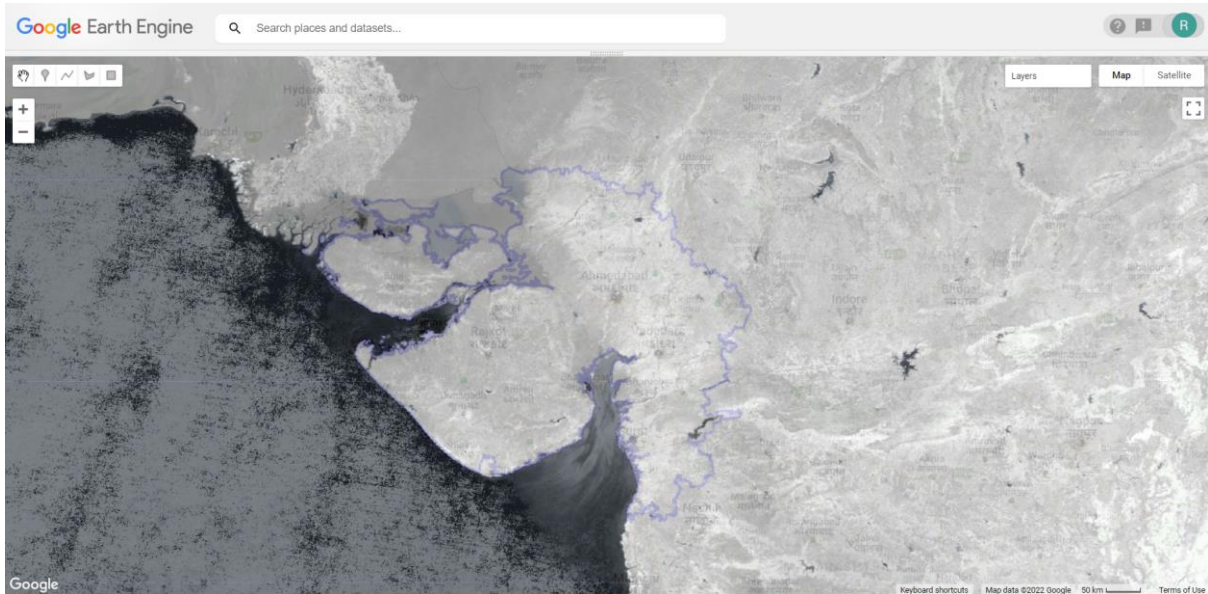


SPECTRAL INDEX MAP (NDVI):

- BOUNDARY



- **COLLECTION:**



The very light grey region in the above map marks the region for Lesser Vegetation cover while the darker grey denotes greater green cover.

The eastern part of Gujarat has a lower vegetation cover compared to the western parts.

- **MODIS COMPOSITE:**

