Ag-*Analytics*
Harmonized Landsat Sentinel Service
Documentation

2019

Overview

The Ag-Analytics® Harmonized Landsat-Sentinel Service (HLS) API provides the service in which a user can provide an area-of-interest (AOI) with additional customized options to retrieve the dynamics of their land at various times from the Landsat-8 and Sentinel-2 satellites. This service provides information on cloud cover, statistics, and Normalized Difference Vegetation Index in addition to MSI bands information.

The Harmonized Landsat-Sentinel (HLS) Project is a NASA initiative to produce a Virtual Constellation (VC) of surface reflectance (SR) data from the Operational Land Imager (OLI) and MultiSpectral Instrument (MSI) onboard the Landsat-8 and Sentinel-2 remote sensing satellites, respectively. The data from these satellites creates unprecedented opportunities for timely and accurate observation of Earth status and dynamics at moderate (<30 m) spatial resolution every 2-3 days.

API Specifications

API URL:

https://ag-analytics.portal.azure-api.net/docs/services/harmonized-landsat-sentinel-service/operations/hls-service

Header Parameters

Execute Type: POST

content-type: "application/x-www-form-urlencoded"

Request Parameters

aoi (geometry, file/text, required**):** The structure of the geometry can be one of the following.

    i.   JSON geometry objects returned by the arcgis rest api, (*file*/text)

    ii.   GEOJSON (*file*/text)

    iii.   Shapefile (*file*)

    iv.   Raster of tiff extension (*file*)

JSON Example:

{"geometryType":"esriGeometryPolygon","features":[{"geometry":{"rings":[[[-92.678953,41.741707],[-92.678966,41.740563],[-92.678972,41.739963],[-92.67896,41.738874],[-92.686062,41.738873],[-92.688546,41.738868],[-92.688544,41.739223],[-92.688555,41.743961],[-92.688124,41.743969],[-92.686658,41.744045],[-92.685481,41.74411],[-92.68513,41.744086],[-92.684627,41.743993],[-92.684352,41.743833],[-92.683972,41.743603],[-92.683789,41.743476],[-92.683333,41.742983],[-92.682923,41.742627],[-92.682497,41.742283],[-92.68213,41.742294],[-92.681444,41.742131],[-92.680101,41.741842],[-92.679444,41.741817],[-92.679094,41.741713],[-92.678953,41.741707]]],"spatialReference":{"wkid":4326}}}]}

GEOJSON Example:

{"type":"Feature","geometry":{"type":"Polygon","coordinates":[[[-93.998809,41.993243],[-93.99873,41.988358],[-94.001444,41.98838],[-94.00144,41.989089],[-94.003556,41.989116],[-94.003571,41.991767],[-94.002054,41.991735],[-94.002086,41.993278],[-93.998809,41.993243]]]},"properties":{"OBJECTID":2038888,"CALCACRES":44.63000107,"CALCACRES2":null},"id":2038888}

Shapefile Example:

A Zip folder with following files [example.shp, example.prj, example.dbf, example.shx]

Raster Example:

A GeoTiff file of '.tif' extension

Band (Spectral band name, list, required**):** Provide the list of HLS Spectral band names to retrieve for given aoi

Currently Supporting: `Red, Green, Blue, Coastal Aerosol, NIR, SWIR1, SWIR2,QA,NDVI,RGB, NDWI, NDBI, NDTI, UI, CIR, UE, LW, AP, AGR, FFBS, BE, VW`

Band Example:

['Red', 'Green', 'NDVI']

Startdate (Date, mm/dd/yyyy, optional): Enter the starting date to capture the details from Landsat/Sentinel-2

- Year in Startdate for Landsat should start from 2013

- Year in Startdate for Sentinel should start from 2015

- *Note Startdate and Enddate both should be given, In the absence of other the service retrieves the latest information available on the land.*

Enddate (Date, mm/dd/yyyy, optional): Enter the end date to capture the details from Landsat/Sentinel-2

- Year in Enddate for Landsat can be till current year

- Year in Enddate for Sentinel can be till current year

- *Note Startdate and Enddate both should be given, In the absence of other the service retrieves the latest information available on the land.*

byweek(int, boolean, optional) Default 1

if byweek then the result raster will be mosaic of all the tiles in a particular week for a given satellite

satellite (Type of satellite, text, optional): Landsat or Sentinel. Default (Landsat)

if satellite is Landsat, Sentinel then the result will be the mosaic of both satellites for the given dates

showlatest (int, boolean, optional): Default 1

if startdate or enddate is not given, shows the latest available tile

if the startdate and enddate are given, tries to output the response from the tiles between these dates, if none of the tiles are found then gets the response from latest available tiles

filter (int, boolean, optional) Default 0

if filter is 1, then returns the response which is cloud free after mosaic

qafilter (int, boolean, optional) Default 0

*if qafilter is 1, continues to filter tiles until the invalid pixels are less than **qacloudperc***

qacloudperc ((0-100),float, optional): Default 100

This parameter comes to action with qafilter. If qafilter parameter is 1 then considers the tiles till the invalid pixels in those are less than **qacloudperc**

displaynormalvalue (float, optional): Default 2000

This parameter is used to normalize the band values for display purpose . specially used for bands like RGB, AGR etc

legendtype (To display ranges, text, optional): *Relative/Absolute. Default (Relative)*

resolution (cellsize in meters, float, optional): Default (0.0001)

flatten_data (integer, boolean, optional): Flatten data which has list of Xcoord, Ycoord and Values for each band in the output. If 1 flattendata is returned. Default Value 0

statistics (int, boolean, optional): To return features of the output tif file. If 0 features won't be shown. Default Value 1

return_tif (int, optional): To return the downloadable link to output raster. If 0 downloadable link will not be returned. Default Value 1

projection (text, optional): Enter the projection for the result raster. Default is the projection of aoi.

Projection Syntax:

```
projection: projection of a new resampled raster. It may take the following
forms:
                1. Well Known Text definition
                2. "EPSG:n"
                3. "EPSGA:n"
                4. "AUTO:proj_id,unit_id,lon0,lat0" - WMS auto projections
                5. "urn:ogc:def:crs:EPSG::n" - ogc urns
                6. PROJ.4 definitions
                6. well known name, such as NAD27, NAD83, WGS84 or WGS72
                7. "IGNF:xxxx", "ESRI:xxxx", etc. definitions from the
PROJ database
```

Projection Example:

```
"urn:ogc:def:crs:EPSG::n"
```

Response Parameters

download_url:

- URL to download result raster (.tif) file

flattendtext:

- An array of Xcoord, Ycoord, Values from the tif files
- E.g. [[list of Xcoord], [list of Ycoord], [Band Values]]

tiledate (mm/dd/yyyy):

- The tile dates from where the band values are retrieved.

tilenames:

- list the blob names used from the azure storage container

features:

- An array of features from the database. Each feature will have "attributes" corresponding to the requested fields.

features.attributes.CellSize (resolution):

- Resolution of result Geotiff file in meters

features.attributes.CoordinateSystem:

- Coordinate System of the result raster

features.attributes.Extent:

- Extents of the result raster

features.attributes.Legend (list):

- Legend gives the following details for each range of values
    - i. Area: Area covered in percentage
    - ii. Count: number of pixels from the result raster in that range
    - iii. CountAllPixels: total number of pixels in the result raster
    - iv. Max: Maximum value in the range
    - v. Min: Minimum value in the range
    - vi. Mean: Mean value in the range
    - vii. color: Hexa color used for the range of values

features.attributes.Matrix (list [rows, columns])

features.attributes.Max (number):   Maximum value from the result raster

features.attributes.Min (number):   Minimum value from the result raster

features.attributes.Mean (number): Average value from the result raster

features.attributes.Percentile5 (number): 5th percentile value from result raster

features.attributes.Percentile95 (number): 95th percentile value from result raster

features.attributes.pngb64(link): base64png image of the result raster with legend entries

Example Request/Response

Request

```
{
Band: "['NDVI']"
Enddate: "3/8/2019"
Startdate: "3/2/2019"
aoi: "{"type":"Feature","geometry":{"type":"Polygon","coordinates":[[[-93.511545,42.071053],[-
93.511565,42.074566],[-93.50667,42.074588],[-93.501908,42.074559],[-93.501936,42.071045],[-
93.511545,42.071053]]]},"properties":{"OBJECTID":3350330,"CALCACRES":77.09999847,"CALCACRES2":n
ull},"id":3350330}"
legendtype: "Relative"
satellite: "Landsat"
}
```

```
[
                    {
                        "key": "Band",
                        "value": "['NDVI']",
                        "description": "",
                        "type": "text",
                        "enabled": true
                    },
                    {
                        "key": "Startdate",
                        "value": "01/09/2019",
                        "description": "",
                        "type": "text",
                        "enabled": true
                    },
                    {
                        "key": "Enddate",
                        "value": "02/15/2019",
                        "description": "",
                        "type": "text",
                        "enabled": true
                    },
                    {
                        "key": "satellite",
                        "value": "Sentinel",
                        "description": "",
                        "type": "text",
                        "enabled": true
                    },
                    {
                        "key": "aoi",
                        "value": "",
                        "description": "",
                        "type": "file",
                        "enabled": true
                    },
                    {
                        "key": "legendtype",
                        "value": "Relative",
                        "description": "",
                        "type": "text",
                        "enabled": true
                    }
            ]
```

Response

[{"band":"Red","download_url":"downloads/result_raster_20190711_205353_6769.tif","downloadable_flattendfile":"<text file with x,y,pixel value>","features":[{"attributes":{"CellSize":[1e-05,-1e-05],"CoordinateSystem":"GEOGCS[\"WGS 84\",DATUM[\"WGS_1984\",SPHEROID[\"WGS 84\",6378137,298.257223563,AUTHORITY[\"EPSG\",\"7030\"]],AUTHORITY[\"EPSG\",\"6326\"]],PRIMEM[\"Greenwich\",0,AUTHORITY[\"EPSG\",\"8901\"]],UNIT[\"degree\",0.0174532925199433,AUTHORITY[\"EPSG\",\"9122\"]],AUTHORITY[\"EPSG\",\"4326\"]]","Extent":"-93.51123513090414, 42.07129071607388, -93.50220513090414, 42.074410716073885","Legend":[{"Area":"13.89 %","Count":39138,"CountAllPixels":281736,"Max":8255.852213541666,"Mean":8243.963216145832,"Min":8232.07421875,"color":"#ffcccc"},{"Area":"34.18 %","Count":96309,"CountAllPixels":281736,"Max":8279.630208333334,"Mean":8267.7412109375,"Min":8255.852213541666,"color":"#ff9999"},{"Area":"18.34 %","Count":51668,"CountAllPixels":281736,"Max":8303.408203125,"Mean":8291.519205729168,"Min":8279.630208333334,"color":"#ff6666"},{"Area":"17.51 %","Count":49343,"CountAllPixels":281736,"Max":8327.186197916666,"Mean":8315.297200520832,"Min":8303.408203125,"color":"#ff3333"},{"Area":"8.34 %","Count":23501,"CountAllPixels":281736,"Max":8350.964192708334,"Mean":8339.0751953125,"Min":8327.186197916666,"color":"#ff6666"},{"Area":"7.73 %","Count":21779,"CountAllPixels":281736,"Max":8374.7421875,"Mean":8362.853190104168,"Min":8350.964192708334,"color":"#ff0000"}],"Matrix":[312,903],"Max":8374.7421875,"Mean":8290.544558163216,"Min":8232.07421875,"OID":0,"Percentile5":8245.0927734375,"Percentile95":8360.68408203125,"Variety":"NoVariety","pngb64":"data:image/png;base64,mutYUgofBm/skhRBFoYQIALGuFnixYKLz5X8lPQmKYssN6AAAAAElFTkSuQmCC"}],"tiledate":"03/02/2019","tilenames":["L309/HLS.L30.T15TVG.2019061.v1.4_04.tif"]},{"band":"NIR","download_url":"downloads/result_raster_20190711_205353_4520.tif","downloadable_flattendfile":"<text file with x,y,pixel value>","features":[{"attributes":{"CellSize":[1e-05,-1e-05],"CoordinateSystem":"GEOGCS[\"WGS 84\",DATUM[\"WGS_1984\",SPHEROID[\"WGS 84\",6378137,298.257223563,AUTHORITY[\"EPSG\",\"7030\"]],AUTHORITY[\"EPSG\",\"6326\"]],PRIMEM[\"Greenwich\",0,AUTHORITY[\"EPSG\",\"8901\"]],UNIT[\"degree\",0.0174532925199433,AUTHORITY[\"EPSG\",\"9122\"]],AUTHORITY[\"EPSG\",\"4326\"]]","Extent":"-93.51123513090414, 42.07129071607388, -93.50220513090414, 42.074410716073885","Legend":[{"Area":"16.28 %","Count":45855,"CountAllPixels":281736,"Max":7401.626383463542,"Mean":7388.108601888021,"Min":7374.5908203125,"color":"#ff66ff"},{"Area":"28.53 %","Count":80378,"CountAllPixels":281736,"Max":7428.661946614583,"Mean":7415.1441650390625,"Min":7401.626383463542,"color":"#ff00ff"},{"Area":"21.6 %","Count":60868,"CountAllPixels":281736,"Max":7455.697509765625,"Mean":7442.179728190104,"Min":7428.661946614583,"color":"#6666ff"},{"Area":"17.97 %","Count":50614,"CountAllPixels":281736,"Max":7482.733072916667,"Mean":7469.215291341146,"Min":7455.697509765625,"color":"#0000ff"},{"Area":"10.75 %","Count":30277,"CountAllPixels":281736,"Max":7509.768636067708,"Mean":7496.2508544921875,"Min":7482.733072916667,"color":"#ff6666"},{"Area":"4.88 %","Count":13744,"CountAllPixels":281736,"Max":7536.80419921875,"Mean":7523.286417643229,"Min":7509.768636067708,"color":"#ff0000"}],"Matrix":[312,903],"Max":7536.80419921875,"Mean":7440.100378213115,"Min":7374.5908203125,"OID":0,"Percentile5":7388.278076171875,"Percentile95":7509.30029296875,"Variety":"NoVariety","pngb64":"data:image/png;base64,/o4l4QvP7f9QEACnv/5NCnqABU8s4JoT0QgML8zCFvaXtqCNS0JOx53RR6MgPRwHvh0GbISsIlEMbaPc2eCEAxTg4B6EewA4Bv/g8iX7pvClqa1QAAAABJRU5ErkJggg=="}],"tiledate":"03/02/2019","tilenames":["L309/HLS.L30.T15TVG.2019061.v1.4_05.tif"]},{"band":"NDVI","download_url":"downloads/result_raster_20190711_205353_4168.tif","downloadable_flattendfile":"<text file with x,y,pixel value>","features":[{"attributes":{"CellSize":[1e-05,-1e-05],"CoordinateSystem":"GEOGCS[\"WGS 84\",DATUM[\"WGS_1984\",SPHEROID[\"WGS 84\",6378137,298.257223563,AUTHORITY[\"EPSG\",\"7030\"]],AUTHORITY[\"EPSG\",\"6326\"]],PRIMEM[\"Greenwich\",0],UNIT[\"degree\",0.0174532925199433]],AUTHORITY[\"EPSG\",\"4326\"]]","Extent":"-93.51123513090414, 42.07129071607388, -93.50220513090414, 42.074410716073885","Legend":[{"Area":"0.59 %","Count":1672,"CountAllPixels":281736,"Max":-0.055610956383331835,"Mean":-0.055951172883823064,"Min":-0.056291389384314286,"color":"#ff0000"},{"Area":"9.78 %","Count":27544,"CountAllPixels":281736,"Max":-0.05493052338234938,"Mean":-0.055270739882840605,"Min":-0.055610956383331835,"color":"#ff6666"},{"Area":"30.13 %","Count":84880,"CountAllPixels":281736,"Max":-0.054250090381366925,"Mean":-0.054590306881858154,"Min":-0.05493052338234938,"color":"#ffff66"},{"Area":"35.33 %","Count":99532,"CountAllPixels":281736,"Max":-0.053569657380384474,"Mean":-0.0539098738808757,"Min":-0.054250090381366925,"color":"#ffff00"},{"Area":"19.71 %","Count":55544,"CountAllPixels":281736,"Max":-0.05288922437940202,"Mean":-0.053229440879893244,"Min":-0.053569657380384474,"color":"#66ff66"},{"Area":"4.46 %","Count":12564,"CountAllPixels":281736,"Max":-0.05220879137841957,"Mean":-0.0525490078789108,"Min":-0.05288922437940202,"color":"#00ff00"}],"Matrix":[312,903],"Max":-0.05220879137841957,"Mean":-0.05406482052045416,"Min":-0.056291389384314286,"OID":0,"Percentile5":-0.05510109689270422,"Percentile95":-0.05293787942371861,"Variety":"NoVariety","pngb64":"data:image/png;base64,+zw0BuCyjcBgzYG5DIQERANAeIfQYTg3BGEBT/wd2t5niTKUsLAAAAABJRU5ErkJggg=="}],"tiledate":"03/02/2019","tilenames":[["/home/aganalyticshls/AgAnalyticsMain/HLSserviceapp/server/downloads/result_raster_20190711_205353_6769.tif",4],["/home/aganalyticshls/AgAnalyticsMain/HLSserviceapp/server/downloads/result_raster_20190711_205353_4520.tif",5]]}]

Citation

Format:
vector polygon - Arc shapefiles

Spatial Reference Information:
Universal Transverse Mercator (UTM) Dominant Zone, North American Datum 1983

Please contact Joshua Woodard, josh@ag-analytics.org or woodardjoshua@gmail.com, with any comments or question