

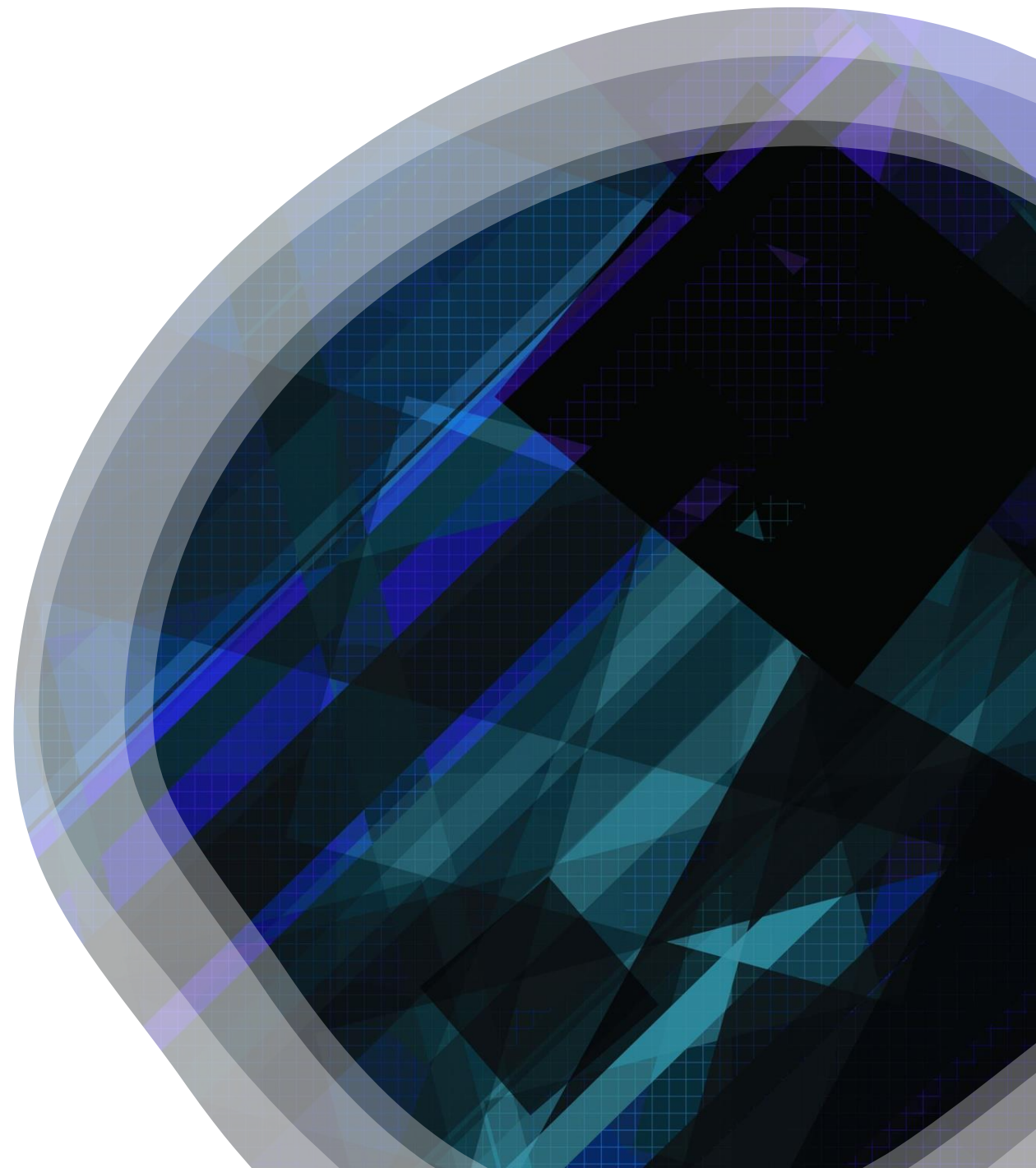


# Digital Earth: Big Earth Data Concepts

+  
Sample assignments

Creating Graphs

E08\_assignment\_GEE





Temperature time series

Task

Scripts Docs Assets

Filter scripts... NEW ↻

Owner (2)

- users/turkimdhia/BEBCcourse
  - Folder
    - This folder is empty.
    - E08\_Assignment\_GEE
    - UntitledFile
- users/turkimdhia/NDVI\_Sentinel
  - NDVI\_sentinel\_
  - NDVI\_sentinel\_grd\_sfx
  - ndvi\_graph
  - supclass\_accuracy
  - supclass\_grdtn
  - supervisedclass

Writer

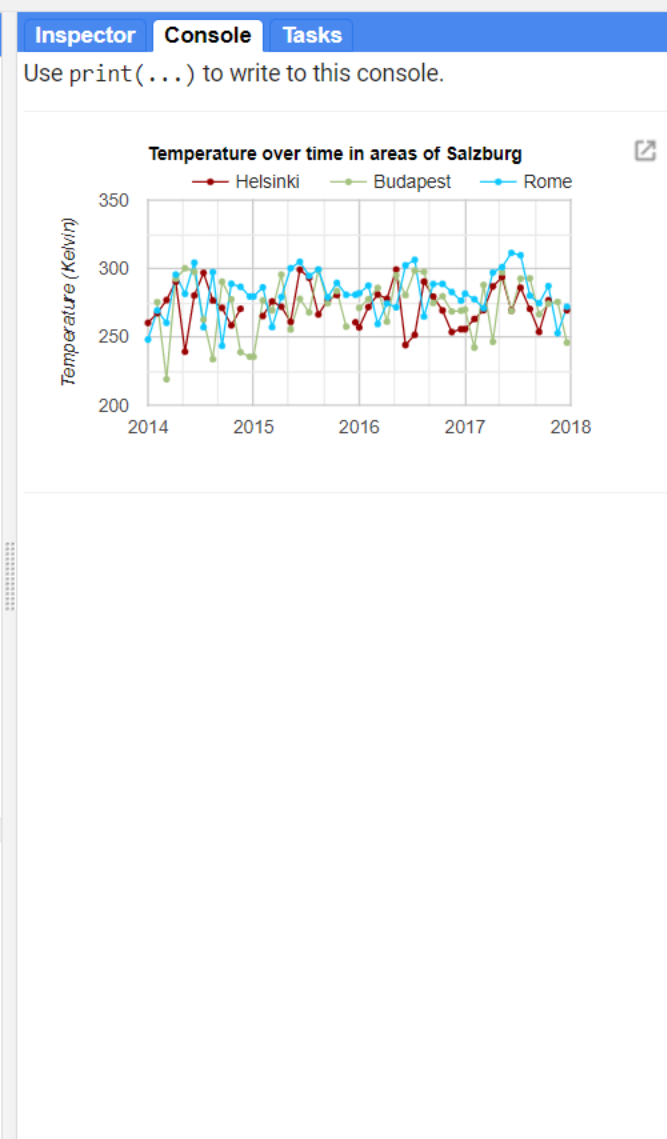
No accessible repositories. Click Refresh to check again.

Reader (5)

- projects/gee-edu/book
  - Part A - Applications
  - Part F - Fundamentals
- users/mrtiede/DE\_lecture\_GEE\_II
  - 0 - JavaScript intro
  - 01\_Visualize\_images (check collection...)
  - 02\_Visualize\_image(one)
  - 03\_Visualize\_images (Sentinel-2)
  - 03\_Visualize\_images (Sentinel-2)\_Andes
  - 04\_NDVI(Sentinel-2)
  - 04\_NDVI(Sentinel-2)\_reduce
  - 05\_Reduce\_Sentinel-2
  - 06\_temperature through time Salzburg...
  - 07\_widgets\_split\_panel
- users/nclinton/ICIMOD2017-training

```
E08_Assignment_GEE * Get Link Save Run Reset Apps ⚙
```

```
1 // Define a FeatureCollection: regions of Salzburg.
2
3 var regions = ee.FeatureCollection([
4   ee.Feature(// Helsinki.
5     ee.Geometry.Point(24.945831,60.192059), {label: 'Helsinki'}),
6   ee.Feature(// Budapest.
7     ee.Geometry.Point(19.040236,47.497913), {label: 'Budapest'}),
8   ee.Feature(// Rome.
9     ee.Geometry.Point(12.496366,41.902782), {label: 'Rome'})
10  ]);
11 // Load Landsat 8 collection
12 var temps2013 = ee.ImageCollection('LANDSAT/LC08/C01/T1_32DAY_TOA')
13   .filterDate('2013-12-25', '2017-12-25')
14   .select('B11');
15 // Create a time series chart.
16 var tempTimeSeries = ui.Chart.image.seriesByRegion(
17   temps2013, regions, ee.Reducer.mean(), 'B11', 200, 'system:time_start', 'label')
18   .setChartType('ScatterChart')
19   .setOptions({
20     title: 'Temperature over time in areas of Salzburg',
21     vAxis: {title: 'Temperature (Kelvin)'},
22     lineWidth: 1,
23     pointSize: 2,
24     series: {
25       0: {color: '#990000'}, // red
26       1: {color: '#a4c27f'}, // green
27       2: {color: '#0cc8ff'} // blue
28     });
29 // Display.
30 print(tempTimeSeries);
31
```



# Code (Temperature time series)

```
// Define a FeatureCollection: regions of Salzburg.
var regions = ee.FeatureCollection([
  ee.Feature( // Helsinki.
    ee.Geometry.Point(24.945831,60.192059), {label: 'Helsinki'}),
  ee.Feature( // Budapest.
    ee.Geometry.Point(19.040236,47.497913), {label: 'Budapest'}),
  ee.Feature( // Rome.
    ee.Geometry.Point(12.496366,41.902782), {label: 'Rome'})
]);
// Load Landsat 8 collection
var temps2013 = ee.ImageCollection('LANDSAT/LC08/C01/T1_32DAY_TOA')
  .filterDate('2013-12-25', '2017-12-25')
  .select('B11');
// Create a time series chart.
var tempTimeSeries = ui.Chart.image.seriesByRegion(
  temps2013, regions, ee.Reducer.mean(), 'B11', 200, 'system:time_start',
  'label')
  .setChartType('ScatterChart')
  .setOptions({
    title: 'Temperature over time in areas of Salzburg',
    vAxis: {title: 'Temperature (Kelvin)'},
    lineWidth: 1,
    pointSize: 2,
    series: {
      0: {color: '#990000'}, // red
      1: {color: '#a4c27f'}, // green
      2: {color: '#0cc8ff'} // blue
    }
  });
// Display.
print(tempTimeSeries);
```



User-defined points

Dynamic approach  
((work in progress))







Extra

NDVI graph (work in progress)



# Code (NDVI time series)

- <https://code.earthengine.google.com/ff58e77bcebcba77fcf939a27c1646b0>

# Feedback

- [s1093354@stud.sbg.ac.at](mailto:s1093354@stud.sbg.ac.at)
- Blackboard

Thank you



Using Sen2Cube to attempt  
detecting change in urban &  
**bare land** areas

Mohamed Dhia TURKI



# Purpose

- The model aims to detect change happening in the semantic categories related to urban and/or bare land areas. A thresholding will apply to the result to detect zones where change happened.



# Workflow

- The model starts by defining the classes related to urban/bare land areas,
- We create a first result in which the change in each pixel is assessed through a reduction over time over the selected period,
- We apply a threshold to produce a second (more comprehensible) visualization of pixels that have changed beyond that threshold.



name UrbanChange

semantic concepts

Define semantic classes related to urban / bare ...

entity

name urban

properties

property

name color

rules

with

appearance Color type

do

evaluate in

value list

category Very bright barren land or built-up

in.1 category Bright barren land or built-up

in.2 category Strong barren land or built-up

in.3 category Average barren land or built-up

in.4 category Dark barren land or built-up

in.5 category Near InfraRed-Peaked Barren land and Built-up

in.6 category Burned area

in.7

in.1

application

Visualize reduced change results

result

name urban\_reduced

instructions

with

entity urban

do

reduce over time using percentage

export yes

Threshold results

result

name urban\_change

instructions

with

result urban\_reduced

do

evaluate > scalar 20

export yes

# Examples

The screenshot displays the Sen2Cube web application interface. The browser address bar shows the URL `demo.sen2cube.at/inference/result/33821`. The page header includes the Sen2Cube logo and the text "Semantic Earth Observation Data Cube Analysis". A search bar contains the text "demo\_12".

The main content area features a large satellite image of a landscape, overlaid with a blue and yellow heatmap representing the inference results. On the left side, a sidebar panel titled "Details for inference #33821" is open, showing the following sections:

- Results**
  - urban\_reduced**: A legend with a color scale from 0 (dark blue) to 49 (yellow). Below the legend are buttons for "Download GeoTIFF (505.5 KB)" and "Copy OGC WMS Link".
  - urban\_change**: A legend with two categories: "False (0)" represented by a dark blue square and "True (1)" represented by a yellow square. Below the legend are buttons for "Download GeoTIFF (112.7 KB)" and "Copy OGC WMS Link".
  - QGIS Project**: A button for "Download as QGIS Project".

At the bottom of the page, there is a footer with the text "Welcome to Sen2Cube.at" on the left and "Provided by Department of Geoinformatics - Z\_GIS, University of Salzburg | About Sen2Cube.at | Legal information" on the right. A scale bar in the bottom right corner of the map indicates 500 m and 2000 ft.

• South-west Salzburg

• Inference #33821



# Examples

Sen2Cube.at

demo.sen2cube.at/inference/result/33821

sen2cube.at Semantic Earth Observation Data Cube Analysis

demo\_12

Base-map.at Ortoph.

Details for inference #33821

Results

urban\_reduced

Legend

0 49

Download GeoTIFF (505.5 KB) Copy OGC WMS Link

urban\_change

Legend

False (0)

True (1)

Download GeoTIFF (112.7 KB) Copy OGC WMS Link

QGIS Project

Download as QGIS Project

500 m 2000 ft

Leaflet | Datenquelle: basemap.at

Welcome to Sen2Cube.at

Provided by Department of Geoinformatics - Z\_GIS, University of Salzburg | About Sen2Cube.at | Legal information

• South-west Salzburg

• Inference #33821



# Examples

Sen2Cube.at

demo.sen2cube.at/inference/result/33825

sen2cube Semantic Earth Observation Data Cube Analysis

demo\_12

Details for inference #33825

Results

urban\_reduced

Legend

0 45

Download GeoTIFF (742.0 KB) Copy OGC WMS Link

urban\_change

Legend

False (0)

True (1)

Download GeoTIFF (127.5 KB) Copy OGC WMS Link

QGIS Project

Download as QGIS Project

Base-map.at Ortoph.

500 m 2000 ft

Leaflet | Datenquelle: basemap.at

Welcome to Sen2Cube.at

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• West Vienna

• Inference #33825



# Examples

The screenshot displays the Sen2Cube web application interface. At the top, the browser address bar shows the URL `demo.sen2cube.at/inference/result/33825`. The application header includes the Sen2Cube logo and the text "Semantic Earth Observation Data Cube Analysis". A search bar on the right contains the text "demo\_12".

The main content area features a large aerial satellite map of a city area. On the left side, a sidebar panel titled "Details for inference #33825" is open, showing the following layers and controls:

- urban\_reduced**: A layer with a legend showing a color gradient from dark blue (0) to yellow (45). Below the legend are buttons for "Download GeoTIFF (742.0 KB)" and "Copy OGC WMS Link".
- urban\_change**: A layer with a legend showing "False (0)" in dark blue and "True (1)" in yellow. A slider control is positioned above the legend. Below the legend are buttons for "Download GeoTIFF (127.5 KB)" and "Copy OGC WMS Link".
- QGIS Project**: A section with a button for "Download as QGIS Project".

At the bottom of the map, there is a scale bar showing 500 m and 2000 ft, and a footer with the text "Welcome to Sen2Cube.at" on the left and "Provided by Department of Geoinformatics - Z\_GIS, University of Salzburg | About Sen2Cube.at | Legal information" on the right.

• West Vienna

• Inference #33825



# Examples

Sen2Cube.at

demo.sen2cube.at/inference/result/33826

sen2cube Semantic Earth Observation Data Cube Analysis

demo\_12

Base-map.at Ortoth.

Details for inference #33826

Results

urban\_reduced

Legend

0 46

Download GeoTIFF (85.2 KB) Copy OGC WMS Link

urban\_change

Legend

False (0)

True (1)

Download GeoTIFF (14.3 KB) Copy OGC WMS Link

QGIS Project

Download as QGIS Project

300 m 1000 ft

Leaflet | Datenquelle: basemap.at

Welcome to Sen2Cube.at

Provided by Department of Geoinformatics - Z\_GIS, University of Salzburg | About Sen2Cube.at | Legal information

• North-east Innsbruck

• Inference #33826



# Examples

The screenshot displays the Sen2Cube web application interface. At the top, there are three browser tabs for 'Sen2Cube.at' and a search bar containing 'demo\_12'. The main content area features an aerial map of North-east Innsbruck with a semi-transparent overlay showing urban change inference results. The results are color-coded: dark blue for 'False (0)' and yellow for 'True (1)'. A sidebar on the left contains a 'Details for inference #33826' section and a 'Results' section. The 'Results' section includes two layers: 'urban\_reduced' with a legend showing a color gradient from 0 to 46, and 'urban\_change' with a legend showing 'False (0)' in dark blue and 'True (1)' in yellow. Below the 'Results' section is a 'QGIS Project' section with a 'Download as QGIS Project' button. The footer of the application contains the text 'Welcome to Sen2Cube.at' and 'Provided by Department of Geoinformatics - Z\_GIS, University of Salzburg | About Sen2Cube.at | Legal information'. A scale bar in the bottom right corner of the map shows 300 m and 1000 ft.

• North-east Innsbruck

• Inference #33826



# Evaluation

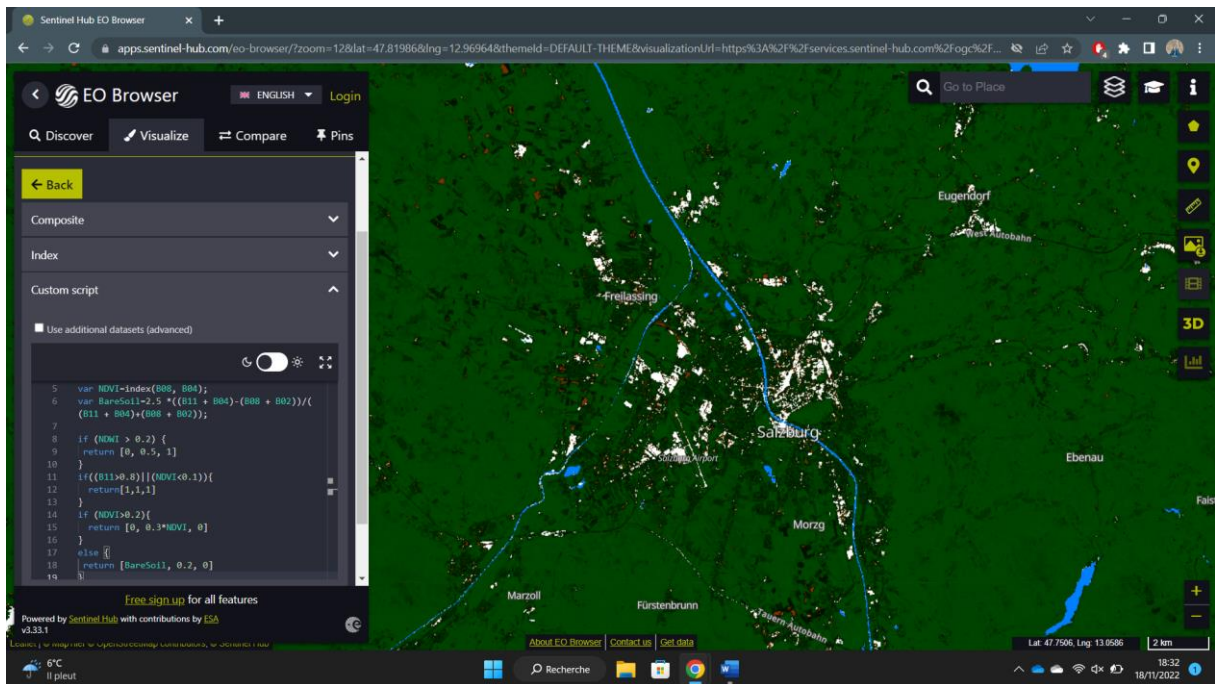
- The model produces acceptable results in the areas where it has been tested.
- The reliability of the results leaves more to be desired as the model confuses between buildings and bare soil



## E05 - EO Browser

[Used script](#) : Urban Classified Script

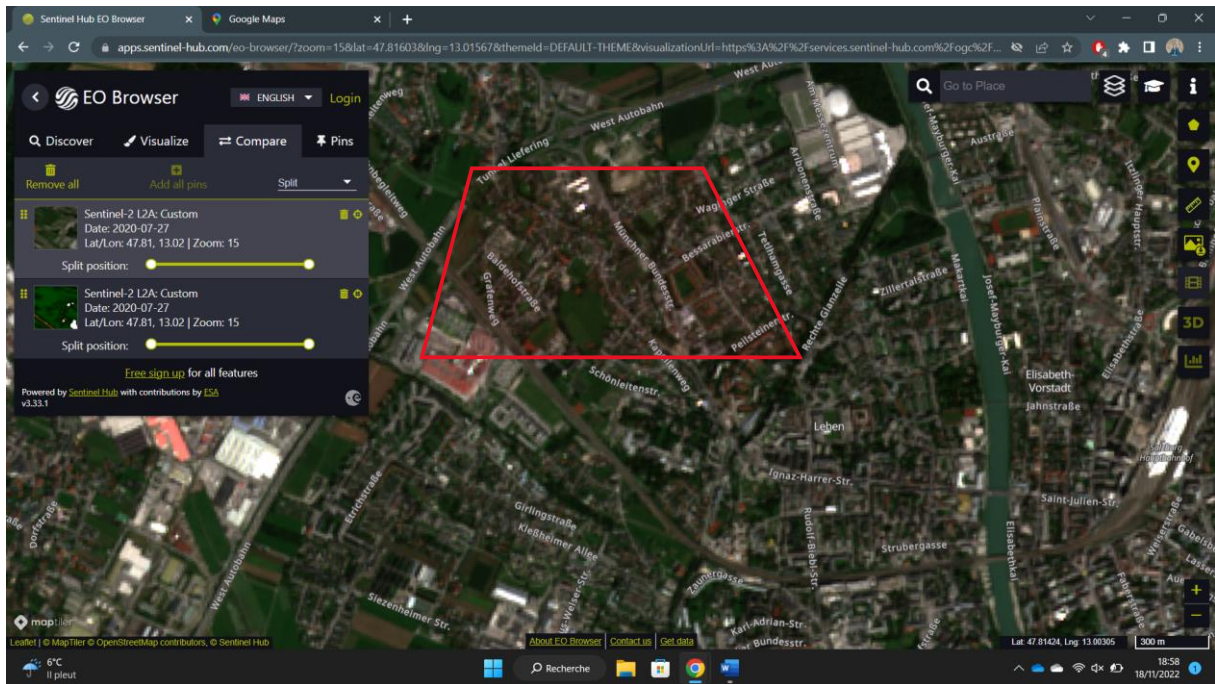
The script classifies water, built-up areas, bare regions, and vegetated areas using the NDWI, NDVI, Bare Soil, and B11 SWIR band. **Water** is depicted in the script as being **blue**, **vegetation** as being **green**, built-up regions as being white, **arid soil** as being **brown**, and all other pixels as being dark green.



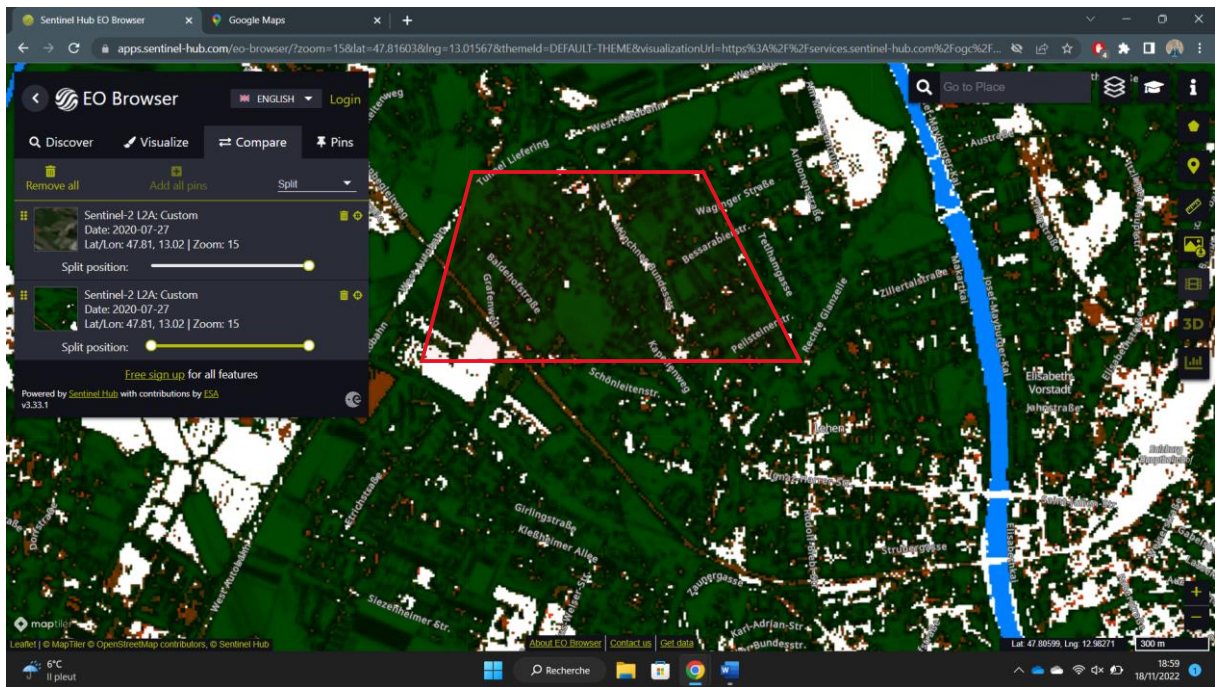
1 Urban classification script output – Salzburg Area – Sentinel image from July 27<sup>th</sup> 2020

Water pixels are defined as those with NDWI values greater than 0.2. Pixels with B11 values greater than 0.8 or NDVI values less than 0.1 will be built up areas. Pixels with NDVI values greater than 0.2 will be classified as vegetation. The remaining pixels will be classified as bare soil or as other.

The script performs rather well but fails to accurately distinguish built up areas from vegetation in places where there's an alternating variation of vegetation and buildings (North West Lehen)



2 Sentinel-2 Image in true color composite



3 Sentinel-2 image classified with Urban Classified script