



MASTER IN CITY & TECHNOLOGY
DIGITAL TOOLS AND BIG DATA
2019/2020

FACULTY DIEGO PAJARITO

Zonal Statistics

Making sense of indexes and land units

Raster: Continuous surfaces

Vector: Delimited areas

These differences make these two formats (sometimes) incompatible

Spatial resolution is the strongest limitation for Raster while the geometric complexity (i.e., **arc-node topology** and vertices) limits vector.

Visual disparities are examples of such issues



Spatial Aggregation plus summary statistics: Digital Values

Sum, Average, max, min, mean

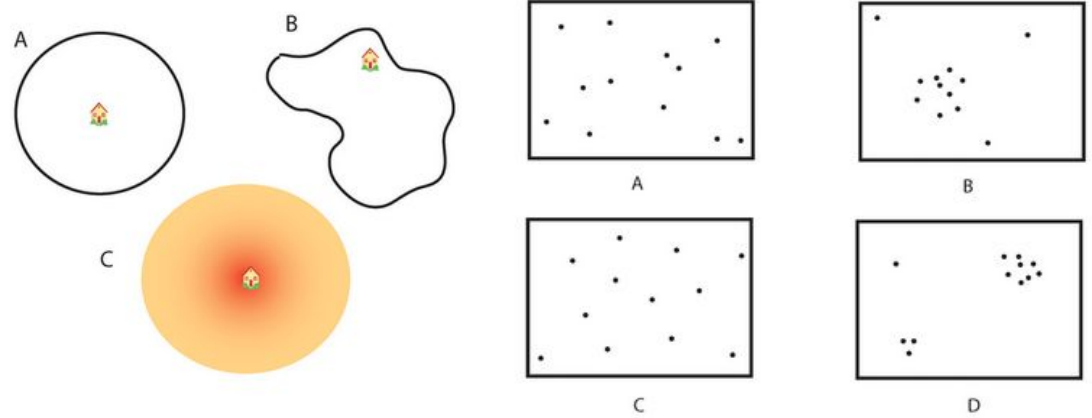
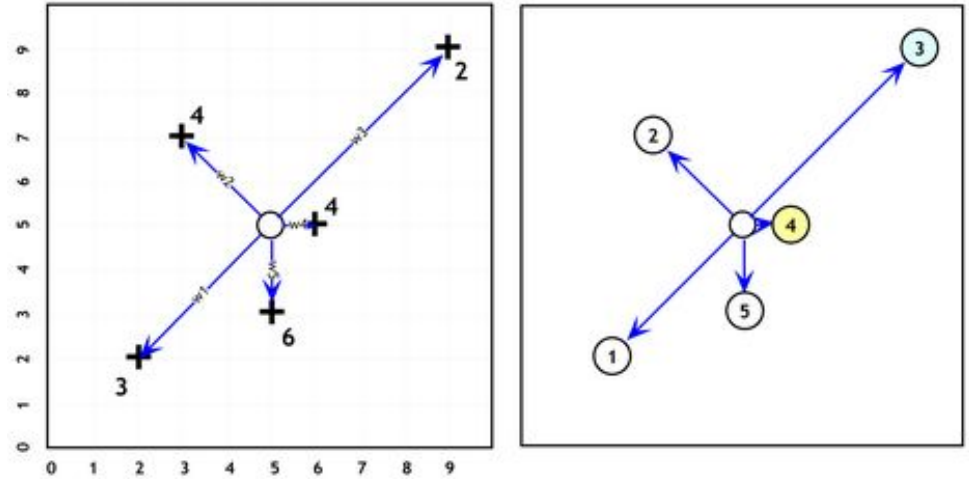
*There are limitations for calculating areas

Changes in green areas from 2015 to 2019



- Co-location
- Distance, direction and spatial weights matrices
- Multidimensional scaling
- Spatial context
- Neighborhood
- Spatial heterogeneity, dependence, sampling, interpolation
- Smoothing and sharpening

* *Compatible reference system for area/distance in metres*

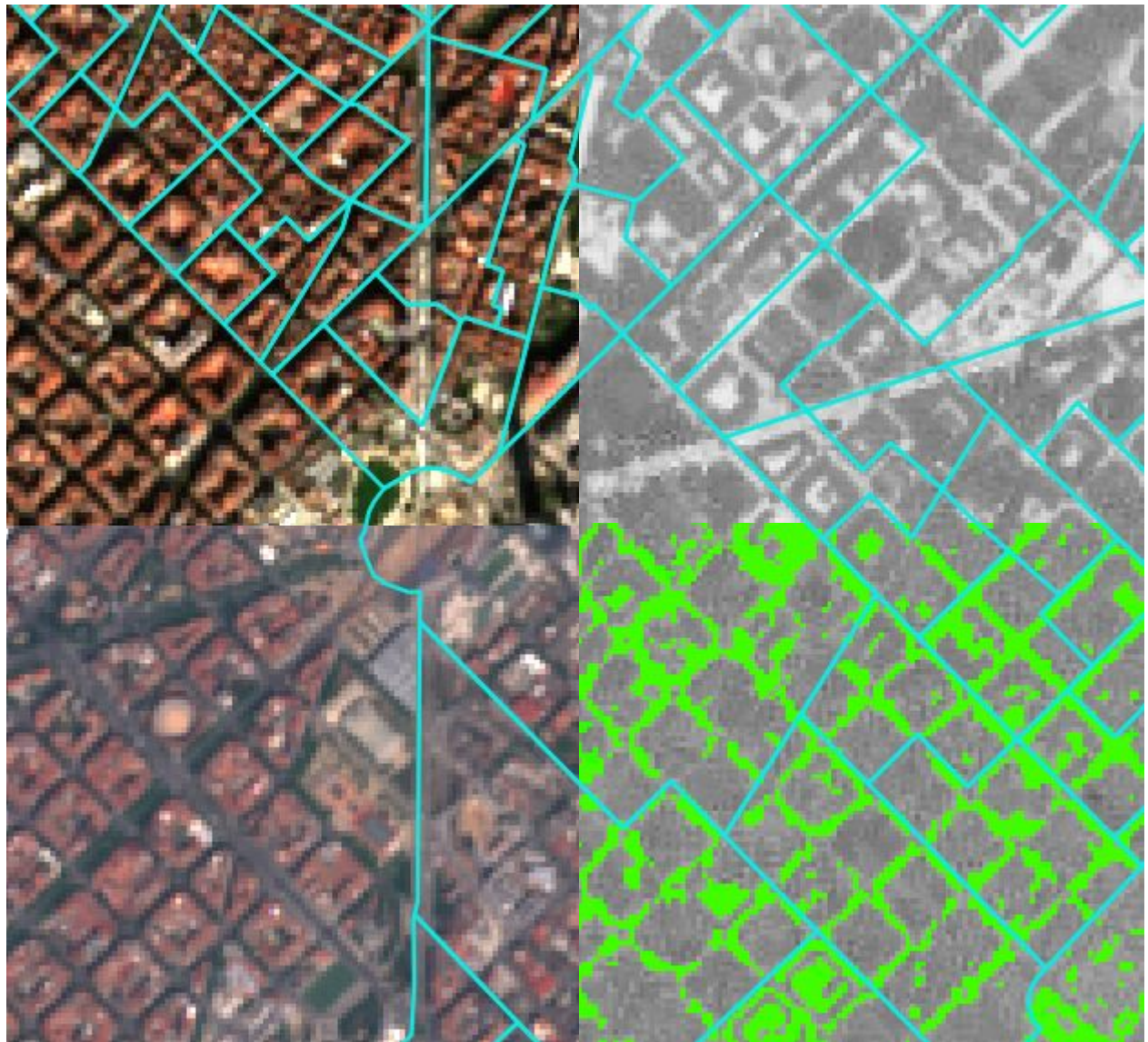


Aggregation of digital
values

Defined categories

Change detection

Raster from two or
more times

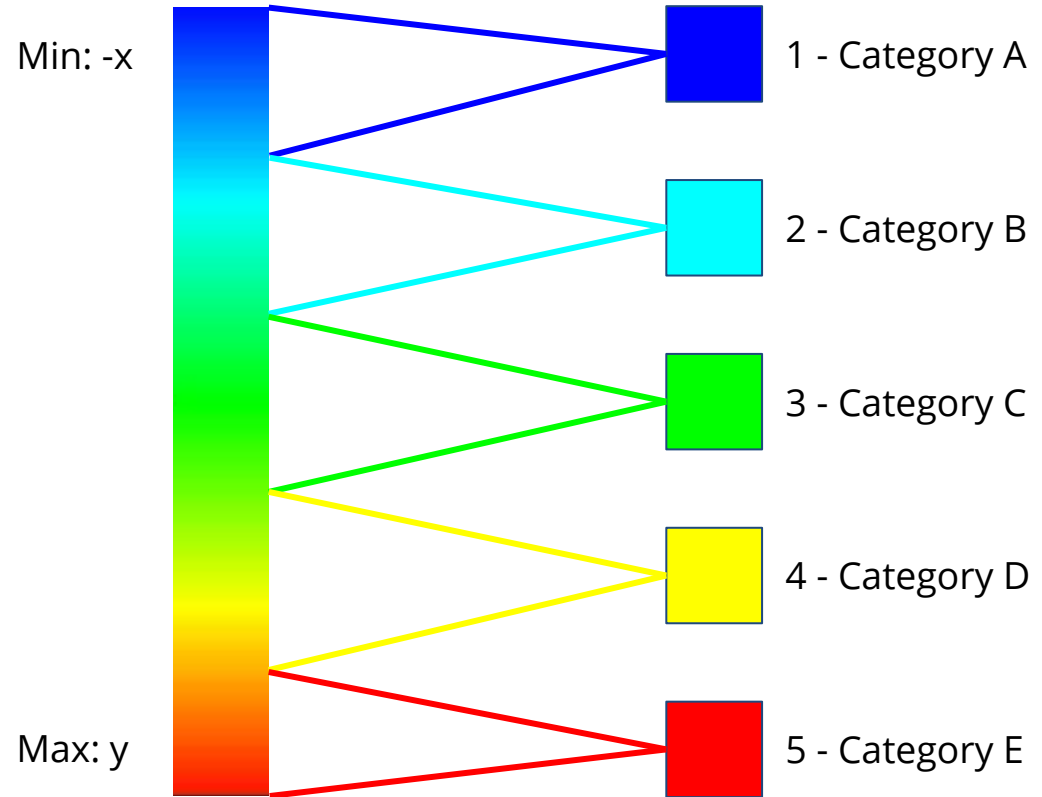


Reclassify

A change of domain

Key Elements:

- Data type (Integer / Numeric)
- Range (min - max)
- Categories and associated values



Reclass tool

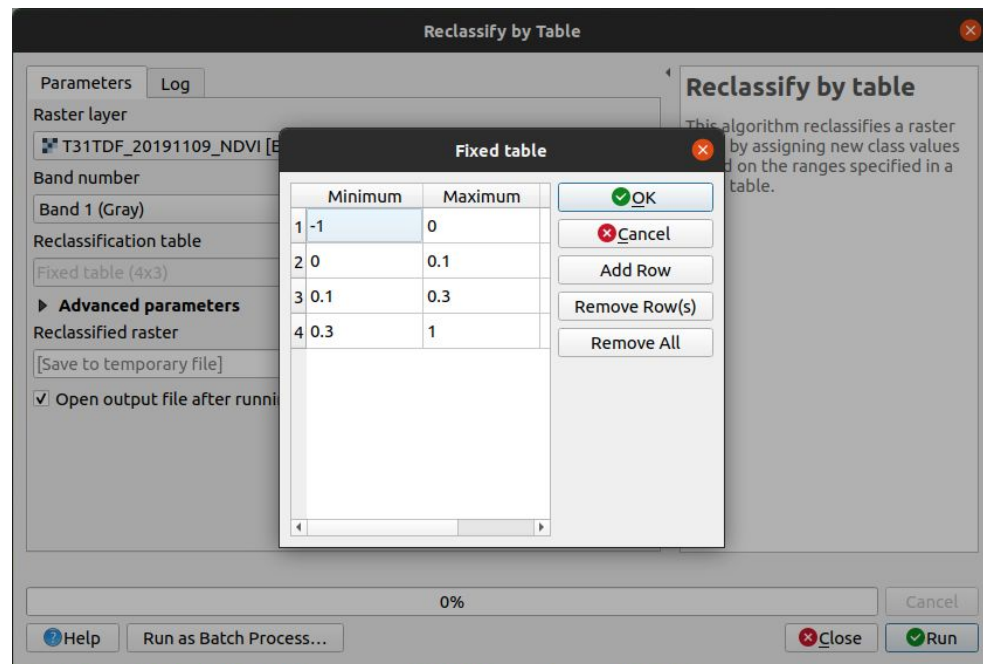
Rules.txt

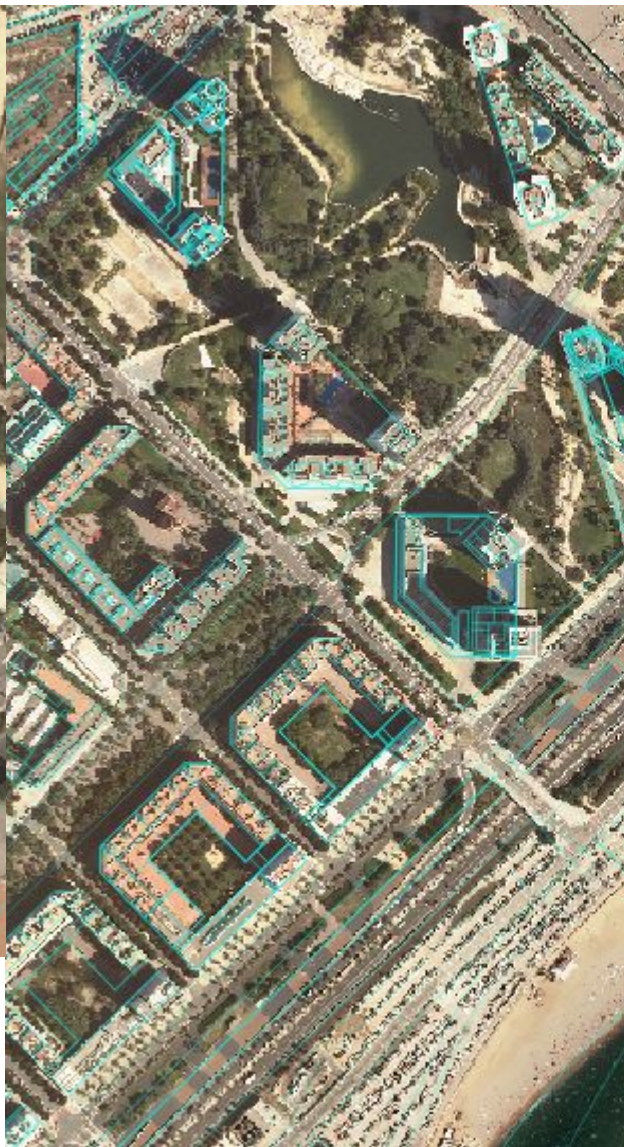
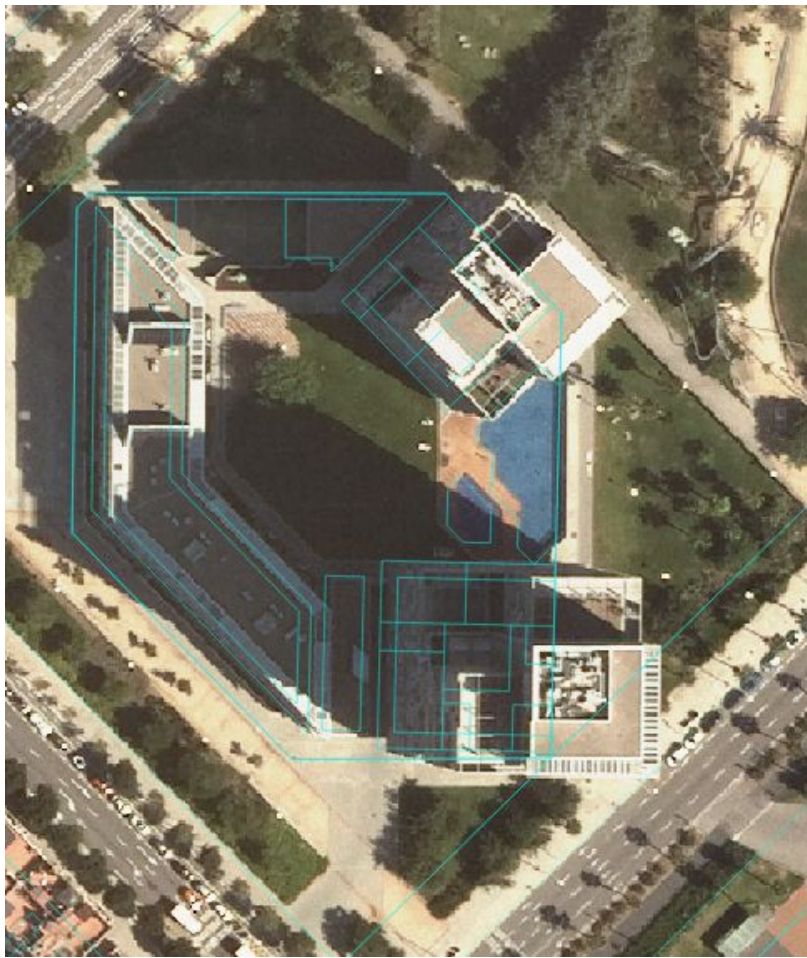
-100 thru 30 = NULL

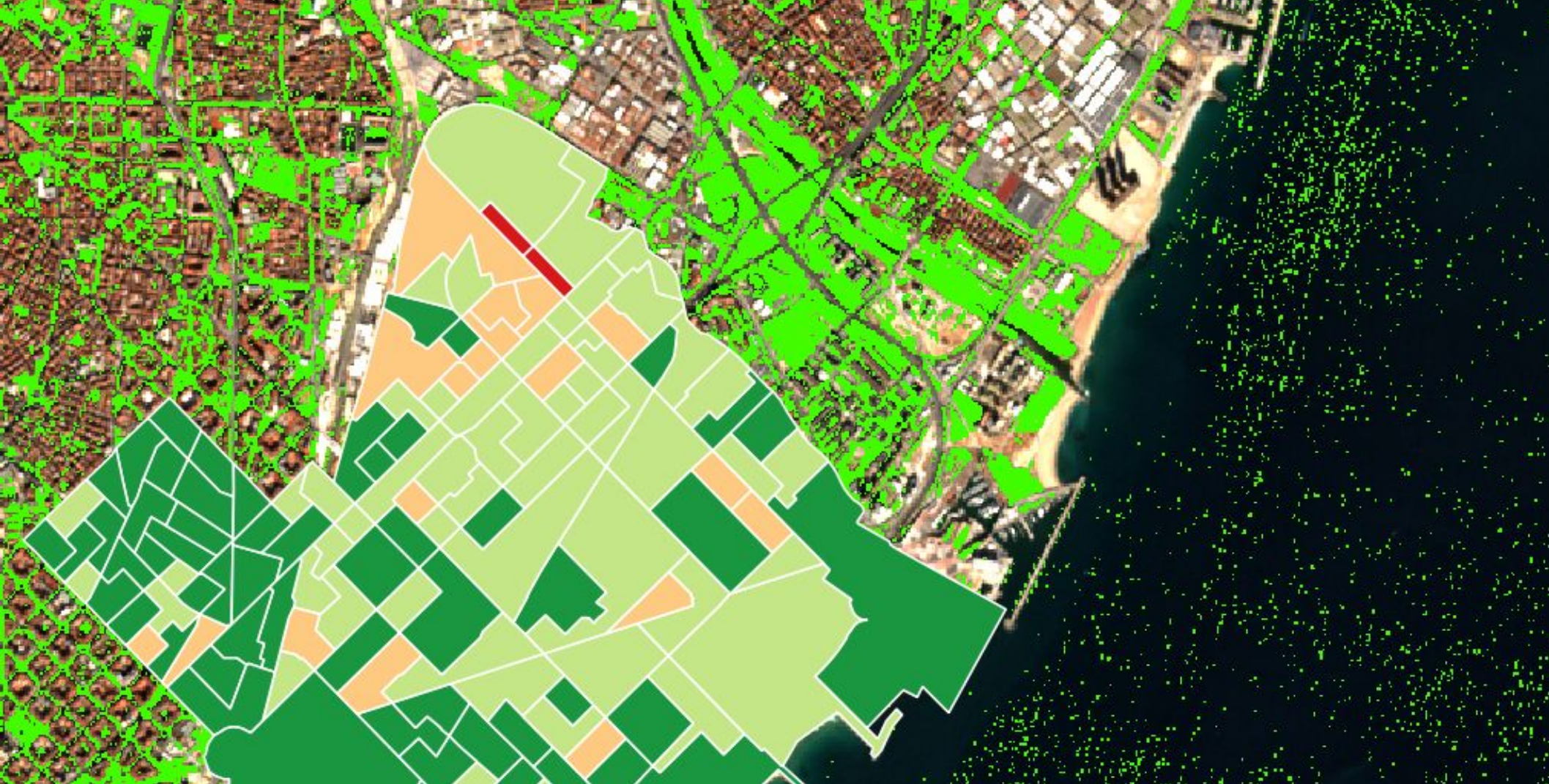
30 thru 100 = 1

Raster Calculator

$$\begin{aligned} & ("T31TDF_20150802_NDBI@1" \leq 0) * 1 + \\ & (("T31TDF_20150802_NDBI@1" > 0) \text{ AND } ("T31TDF_20150802_NDBI@1" \leq 0.1)) * 2 + \\ & (("T31TDF_20150802_NDBI@1" > 0.1) \text{ AND } ("T31TDF_20150802_NDBI@1" \leq 0.3)) * 3 + \\ & ("T31TDF_20150802_NDBI@1" > 0.3) * 4 \end{aligned}$$

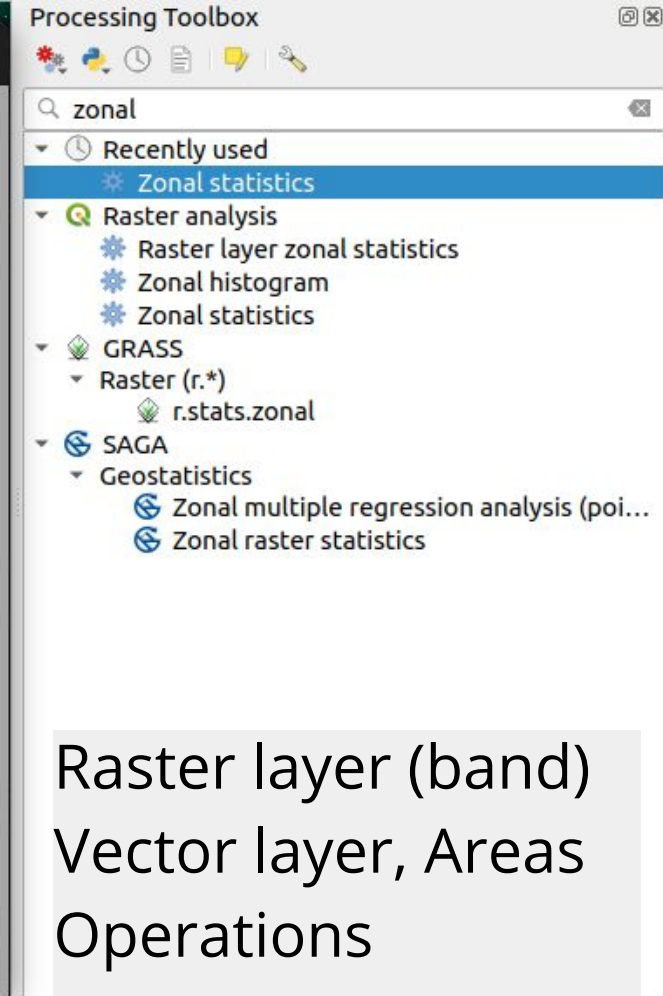
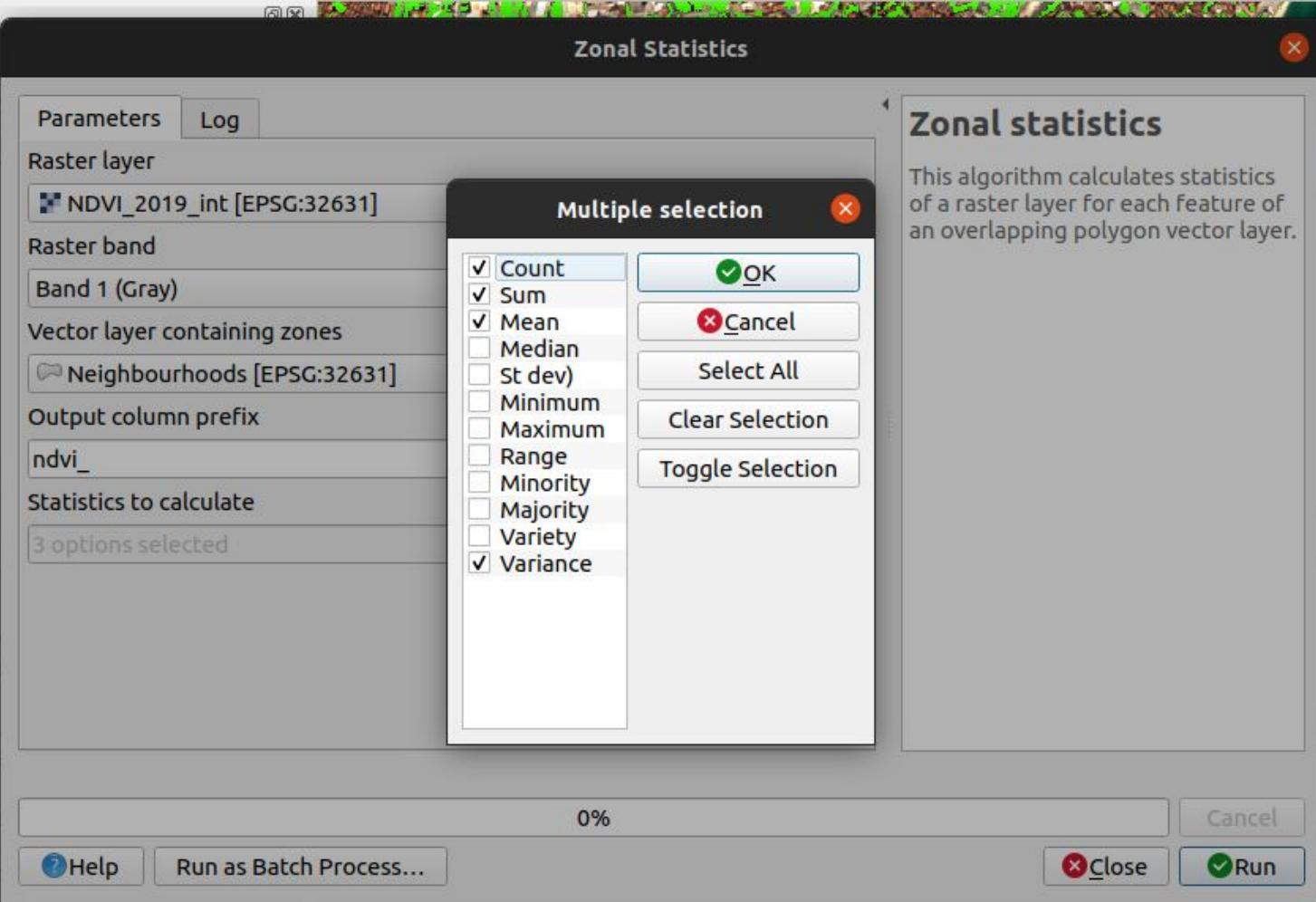






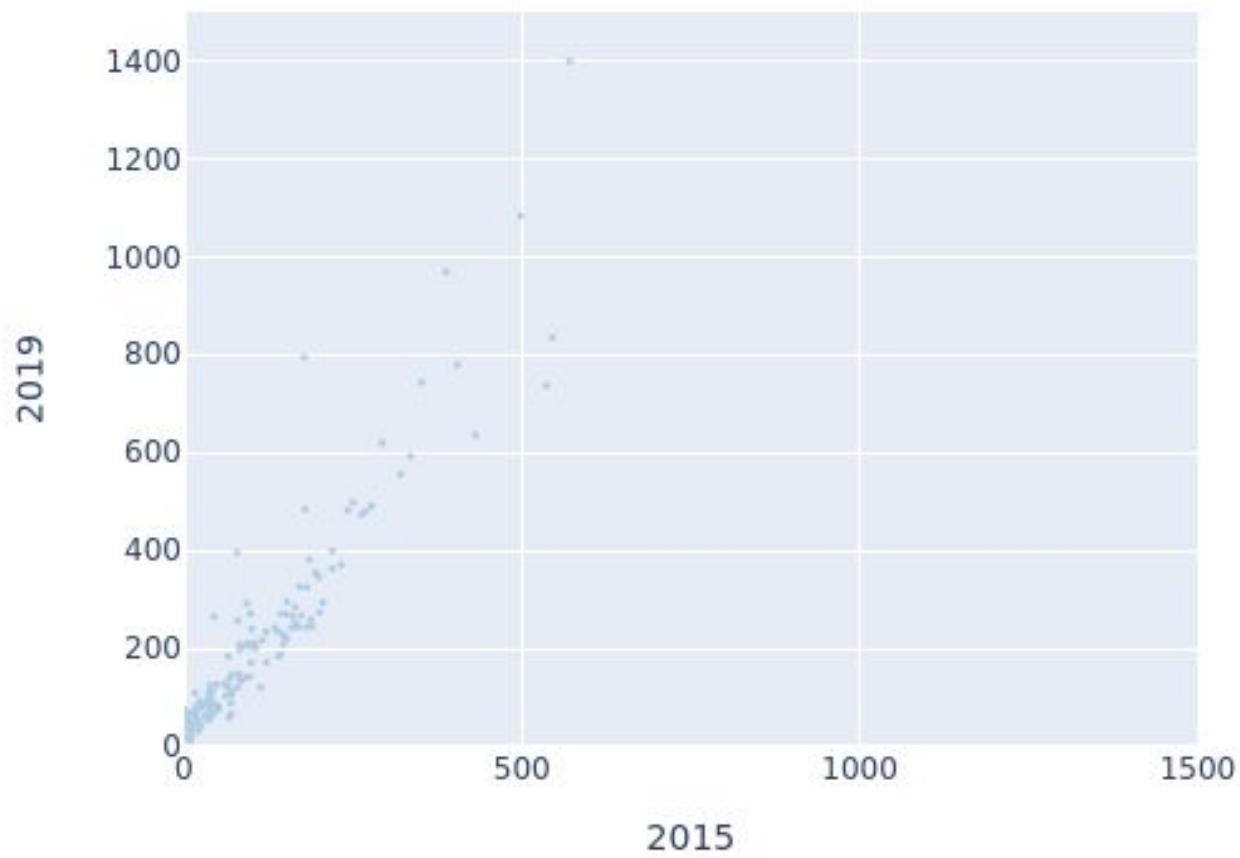
Zonal Statistics

A simple operation



Raster layer (band)
Vector layer, Areas
Operations

Vegetation Pixels



What are the most convenient units of analysis?

Which indexes coming from satellite images worth to aggregate?

What variables are missing in your studio project?

Hands-on

Creating zonal statistics for vegetation and buildings

Let's see what we are thinking

<http://etc.ch/wDKV>

<https://www.directpoll.com/>



** This survey is designed only for the live session*

COVERAGES

VEGETATION

NDVI - Integer values

Vegetation (NDVI > 0.3)

CHANGE

NDVI 2019 - NDVI 2015

Reclassified difference

INDEXES

VEGETATION

BUILT UP AREA

DIFFERENCES BETWEEN 2019 AND 2015

RAW IMAGE

TRUE COLOR

Reclass NDIV (Table)

-1 thru 0 = 1 Water

0 thru 0.1 = 2 Barren areas of rock, sand, or snow

0.1 thru 0.3 = 2 Shrub and grassland

0.3 thru 1 = 3 vegetation

Reclass NDVI Difference (Table)

-2 thru -0.2 = 0 vegetation lost

-0.1 thru 0.1 = 1 no change

0.2 thru 2 = 2 vegetation gain

Reclass NDIV (Raster calculator)

$$(\text{"RASTER"} \leq 0) * 1 +$$
$$((\text{"RASTER"} > 0) \text{ AND } (\text{"RASTER"} \leq 0.1)) * 2 +$$
$$((\text{"RASTER"} > 0.1) \text{ AND } (\text{"RASTER"} \leq 0.3)) * 3 +$$
$$(\text{"RASTER"} > 0.3) * 4$$

Reclass NDBI (Raster calculator)

$$(\text{"T31TDF_20150802_NDBI@1"} \leq 0) * 1 +$$
$$((\text{"T31TDF_20150802_NDBI@1"} > 0) \text{ AND } (\text{"T31TDF_20150802_NDBI@1"} \leq 0.1)) * 2 +$$
$$(\text{"T31TDF_20150802_NDBI@1"} > 0.1) * 3$$

Video

1. Calculate zonal statistics for vegetation using city blocks
2. Find a convenient visualisation for greener city blocks
3. Calculate zonal statistics for built-up area
4. Find a convenient visualisation for built-up areas

Aerial Photography

A high-resolution data source

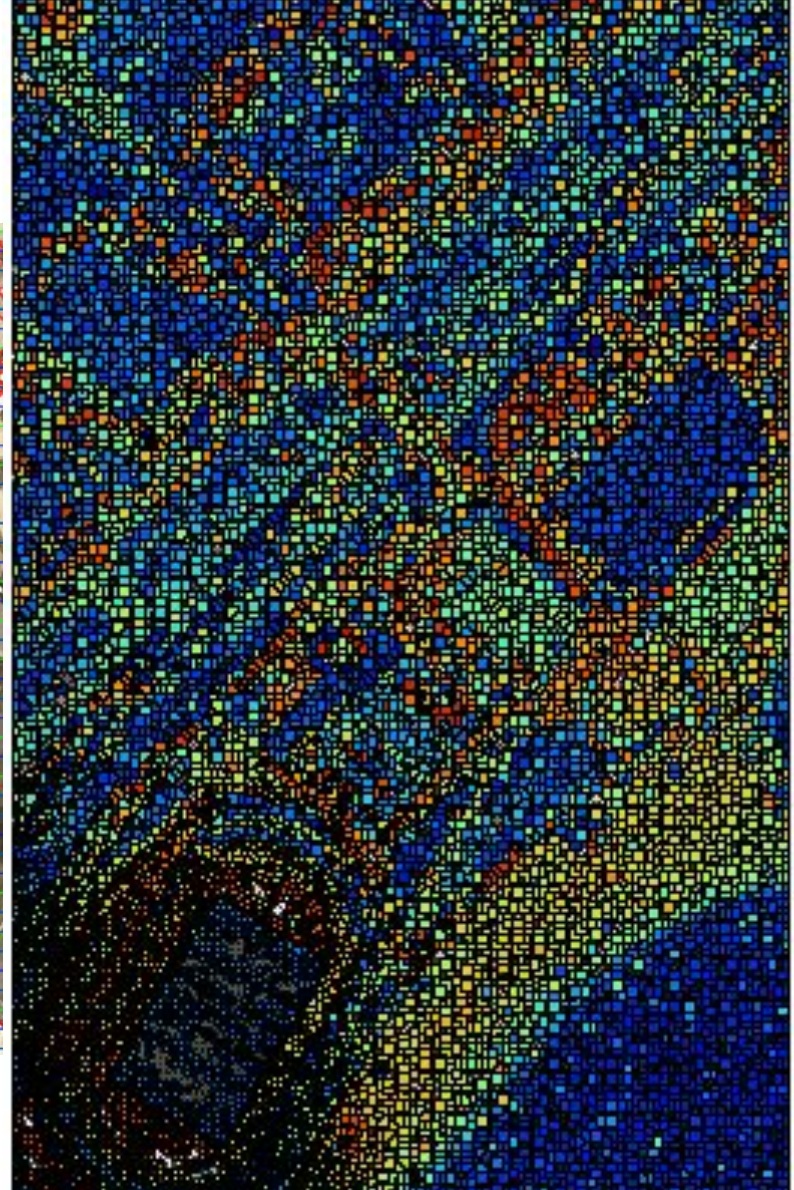
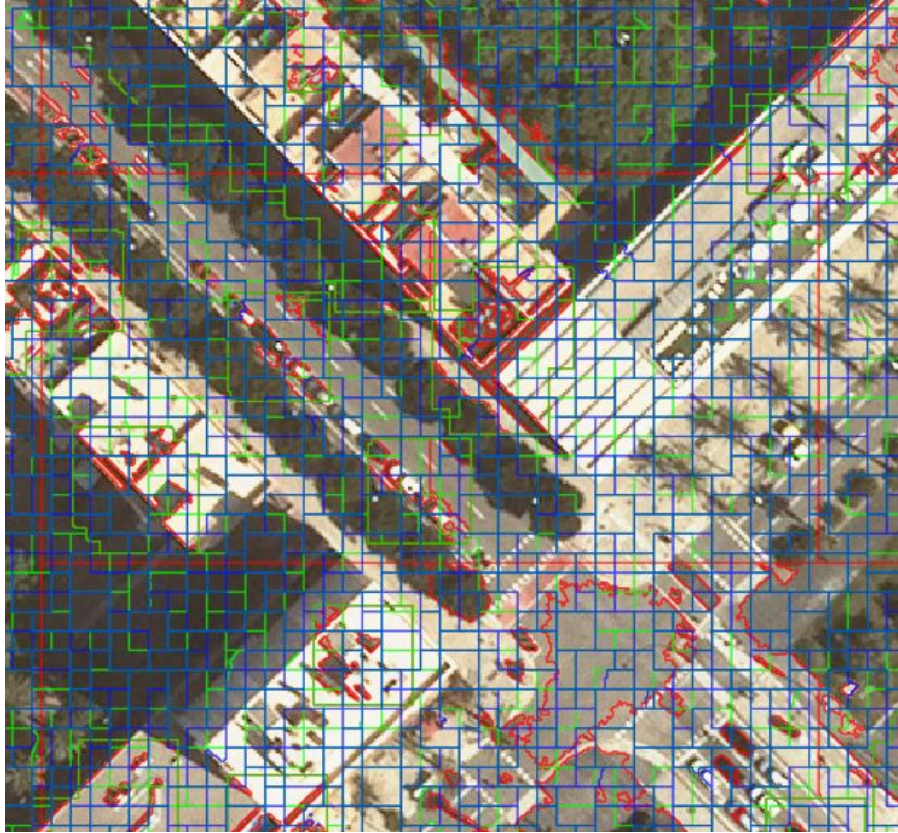
<p>Fotos aéreas</p> <p>Fotografías aéreas actuales y antiguas</p> 	<p>NDVI</p> <p>Normalized Difference Vegetation Index</p> 	<p>Ortofoto convencional</p> <p>Mosaico continuo de fotografías aéreas, de elevada calidad y precisión</p> 
<p>Ortofoto Infrarroja</p> <p>Mosaico continuo de fotografías aéreas infrarrojas</p> 	<p>Ortoimágenes Sentinel-2</p> <p>Mosaico continuo de imágenes captadas por el satélite Sentinel-2</p> 	<p>ortoXpres</p> <p>Mosaico rápido de fotografías aéreas, de máxima inmediatez</p> 

Source: ICGC <https://www.icgc.cat/es/Administracion-y-empresa/Descargas/Fotografias-aereas-y-ortofotos>

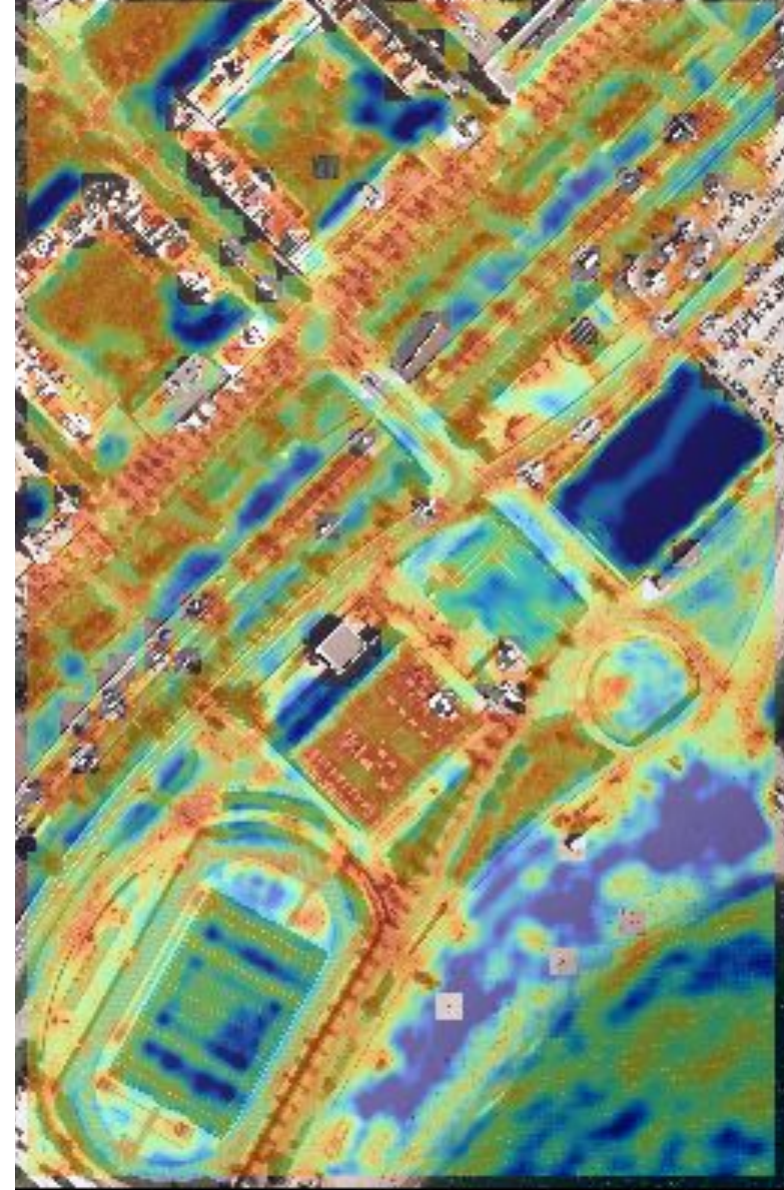
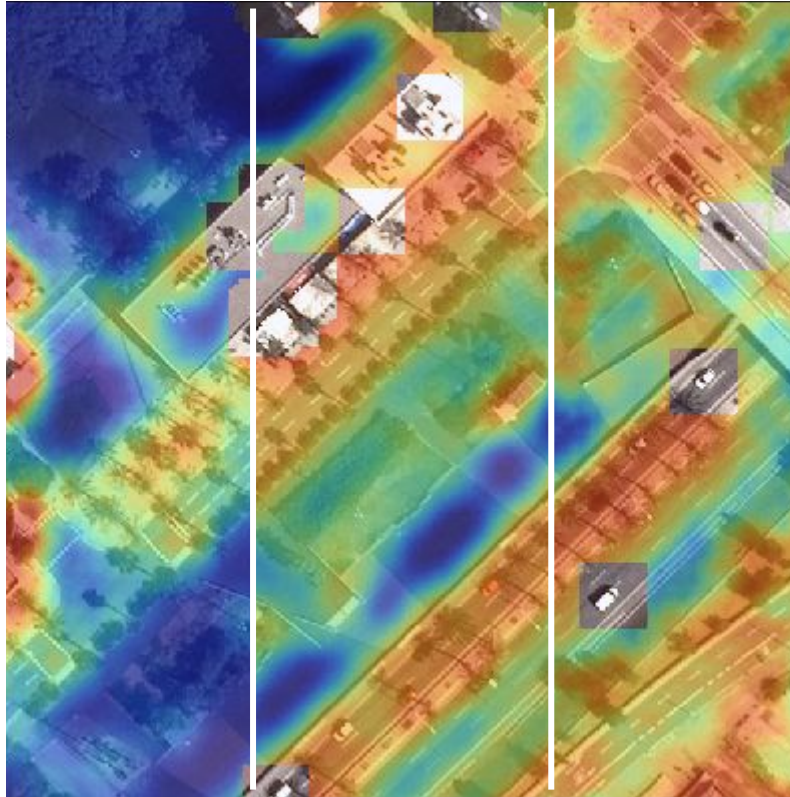
Grid Skeletonization



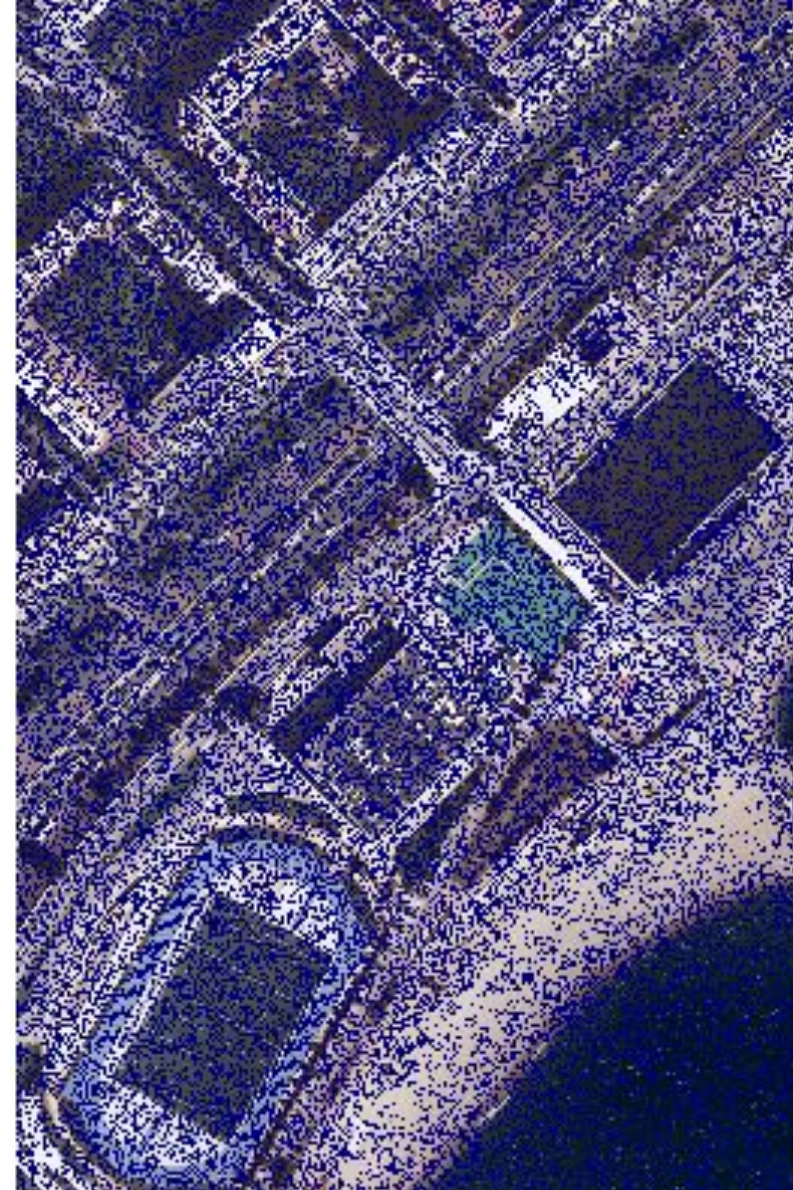
Supapixel segmentation



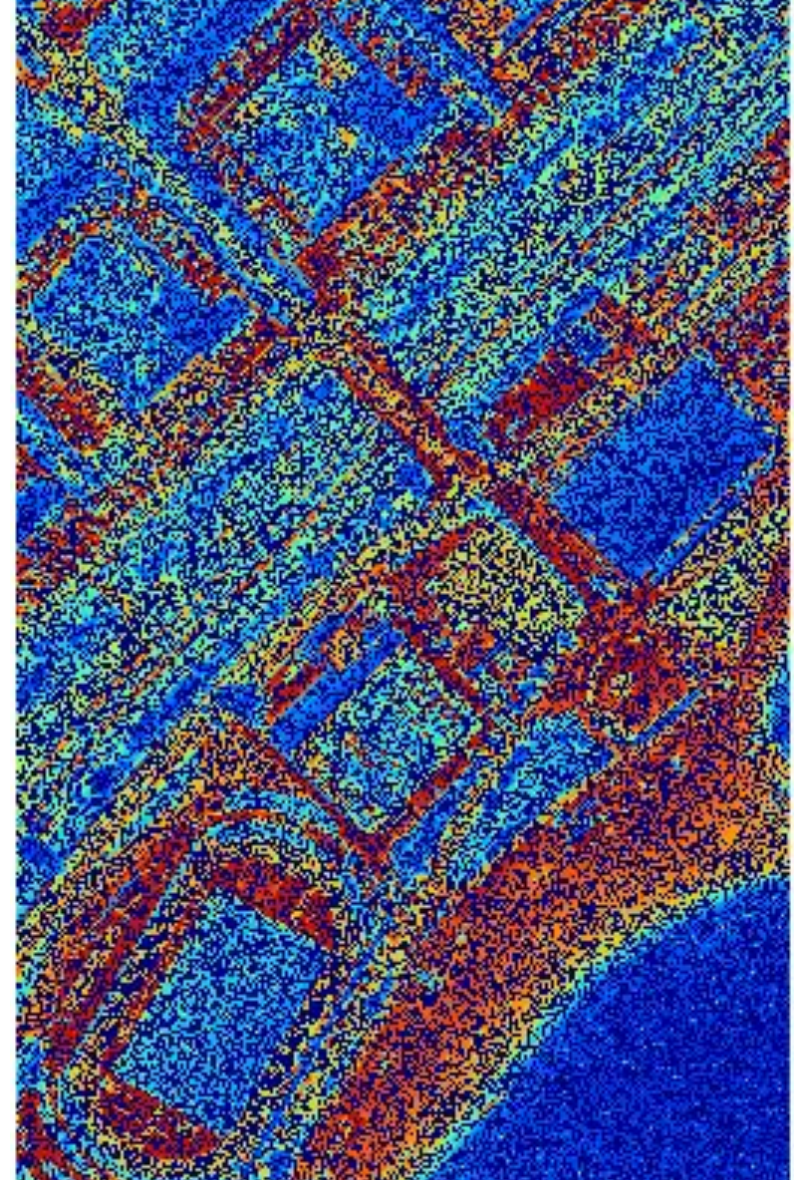
Textural features (contrast, Measure of Correlation, Entropy)



Edge Detection



Watershed Segmentation

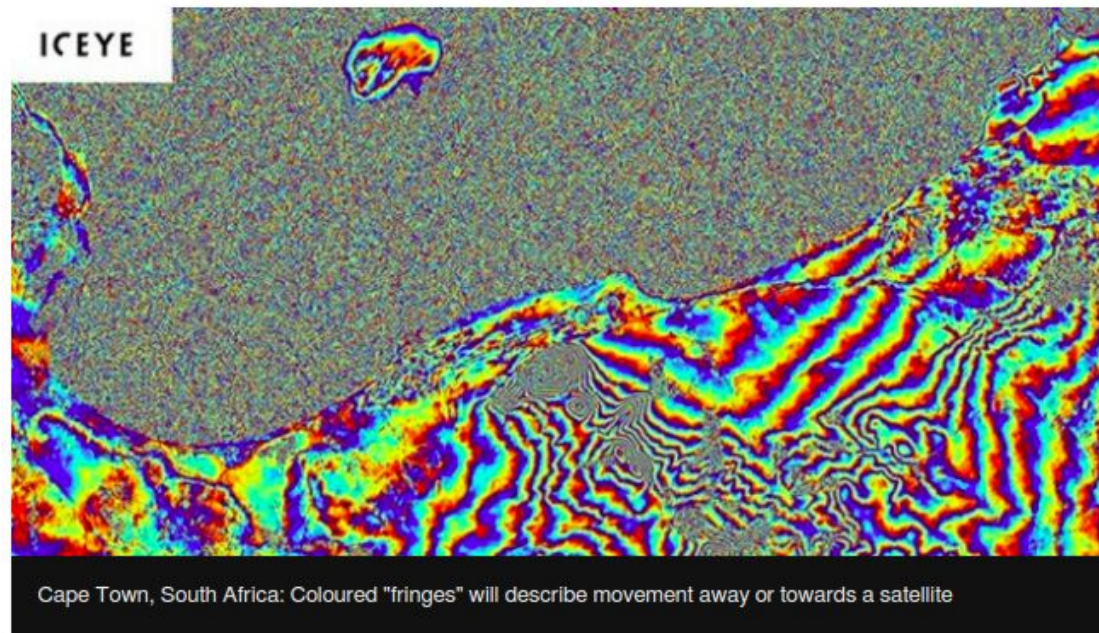


Iceye's small radar satellites achieve big capability

By Jonathan Amos
BBC Science Correspondent

🕒 6 hours ago

f 🗨️ 🐦 ✉️ Share



Hands-on

Creating zonal statistics for vegetation and buildings

File Geoprocessing Map Window ?

Properties: Grid Skeletonization

1. General View 2. Grid Skeletonization 3. Superpixel 4. Textural features

Settings **Description**

Data Objects

- Grids**
 - Grid system <not set>
 - >> Grid <not set>
 - << Skeleton <create>
- Shapes**
 - < Skeleton <not set>
- Options**
 - Method Standard
 - Initialisation Greater than
 - Threshold (Init.) 0
 - Convergence 3

Apply Restore Execute Load Save

Messages

General **Execution** **Errors**

[2020-05-07/22:19:03] Loading library: /usr/lib/x86_64-linux-gnu/saga/libgnss_tools.so...okay

[2020-05-07/22:19:03] Loading library: /usr/lib/x86_64-linux-gnu/saga/libclimate_tools.so...okay

[2020-05-07/22:19:03] Loading library: /usr/lib/x86_64-linux-gnu/saga/libtable_calculus.so...okay

[2020-05-07/22:19:03] Loading library: /usr/lib/x86_64-linux-gnu/saga/libtable_tools.so...okay

ready

1. Get infrared aerial photography for Barcelona
2. Apply one of the presented methods for both true color and infrared photographs. Change the Area of Interest.
3. Optional (Perform a supervised classification for either sentinel-2 or aerial photography)

Tutorial: <https://sagatutorials.wordpress.com/supervised-segmentation-classification/>

Let's see what we are thinking

<http://etc.ch/h3EP>



<https://www.directpoll.com/>

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Video



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