



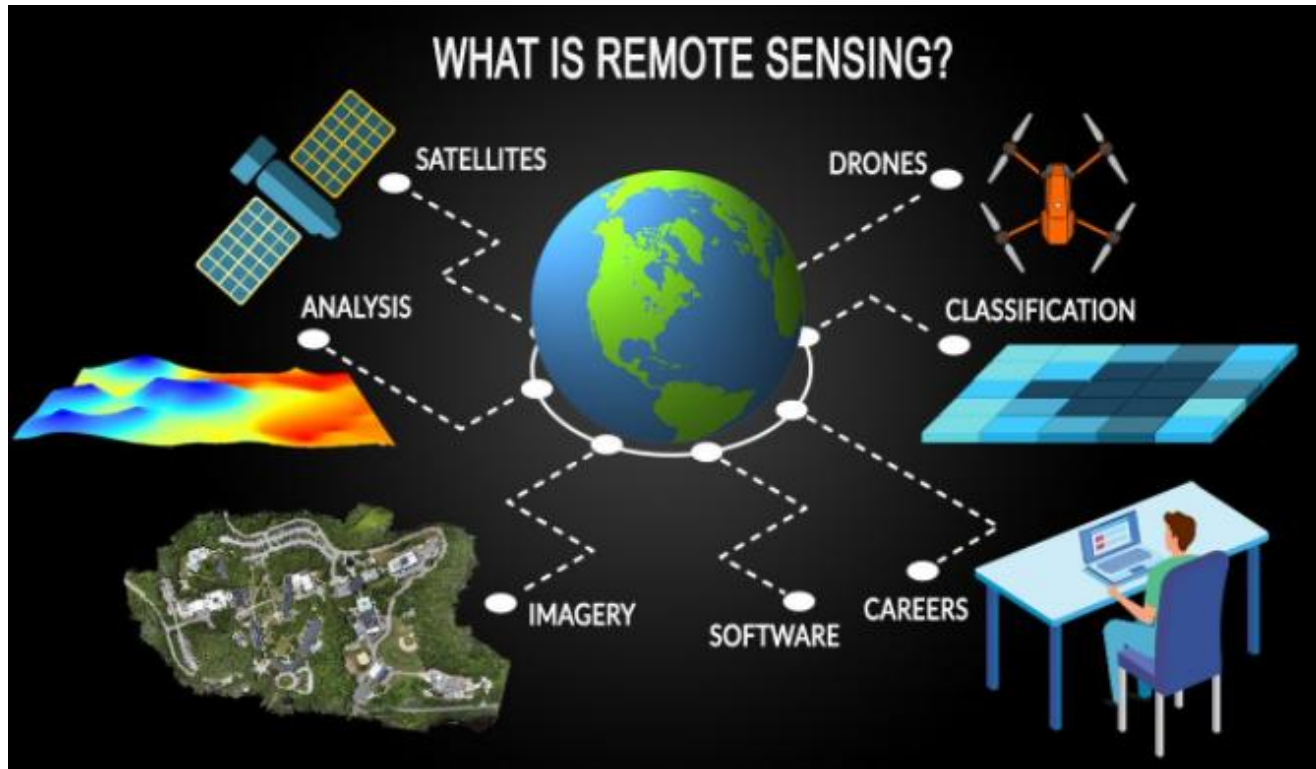
Using Google Earth Engine cloud geospatial platform for Remote Sensing applications

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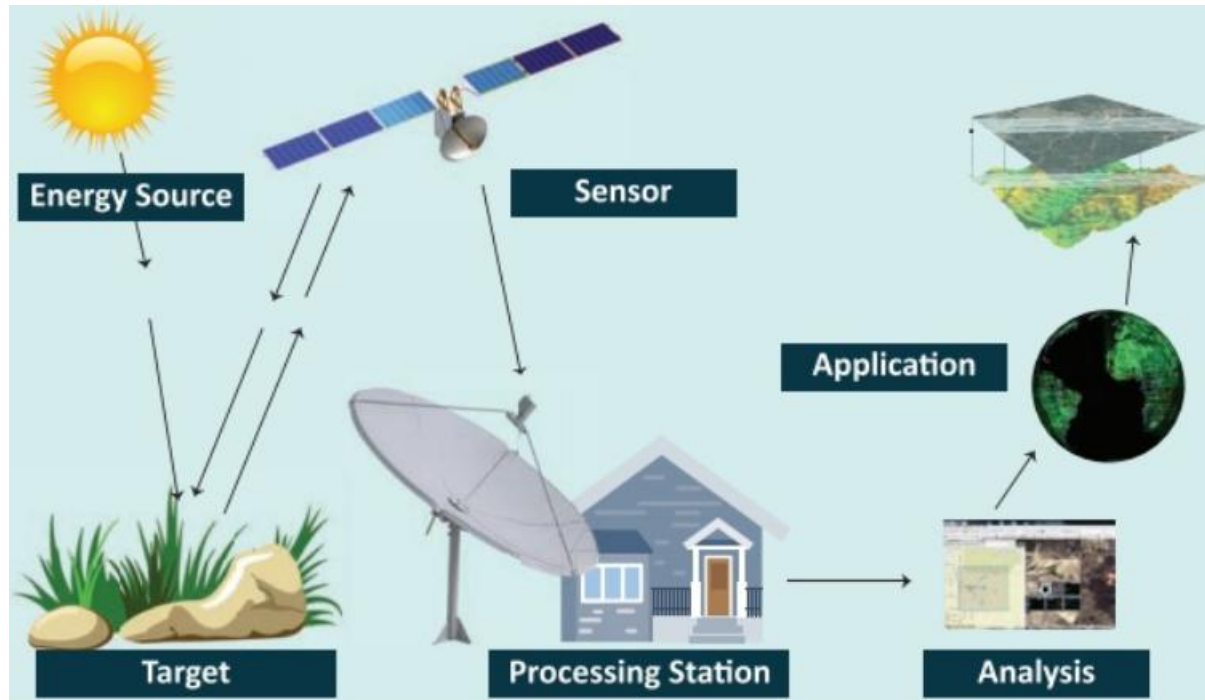


Fundamentals of Remote Sensing



Remote Sensing → Measuring Radiance
Not physical contact

Remote Sensing Process



Remote Sensing

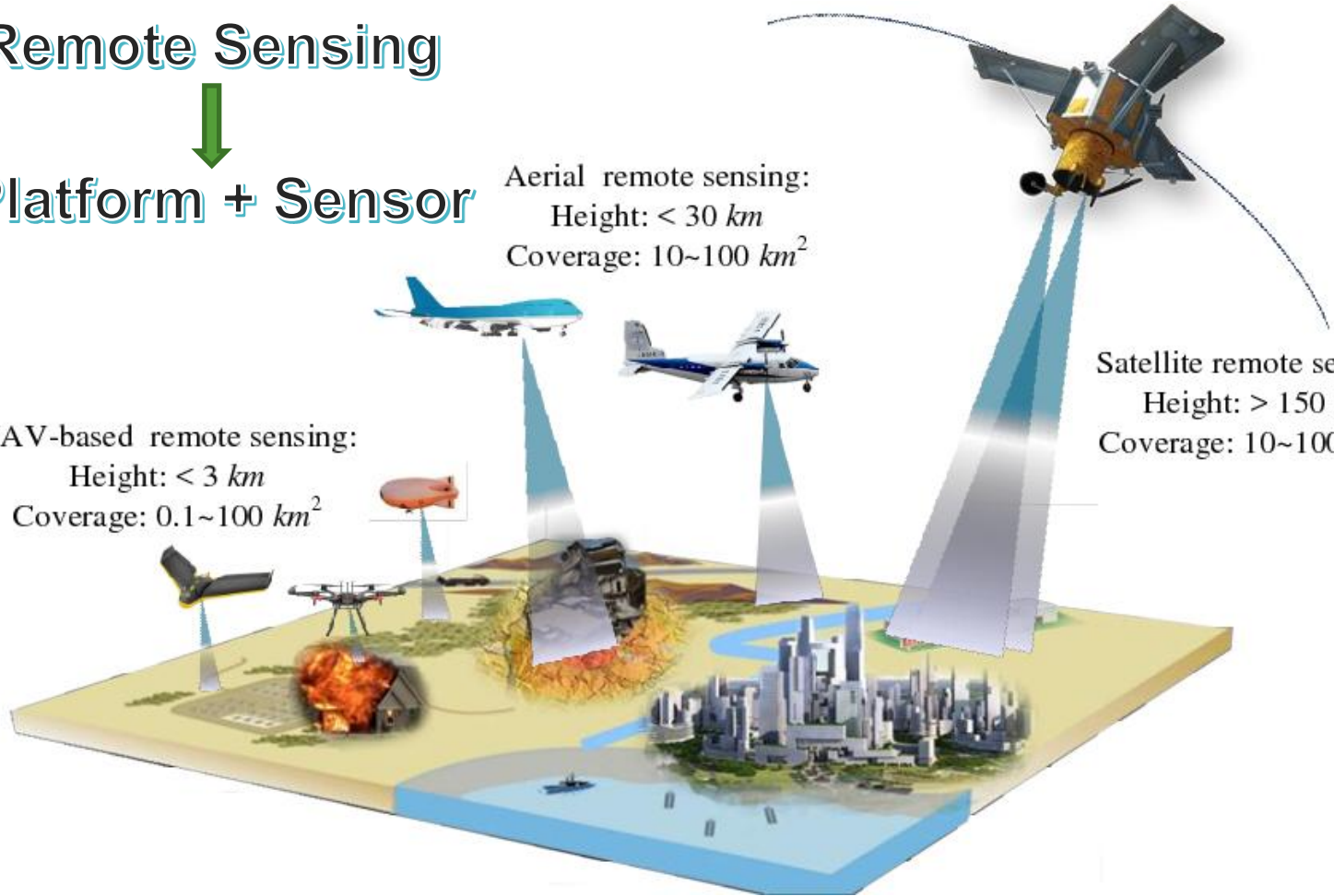


Platform + Sensor

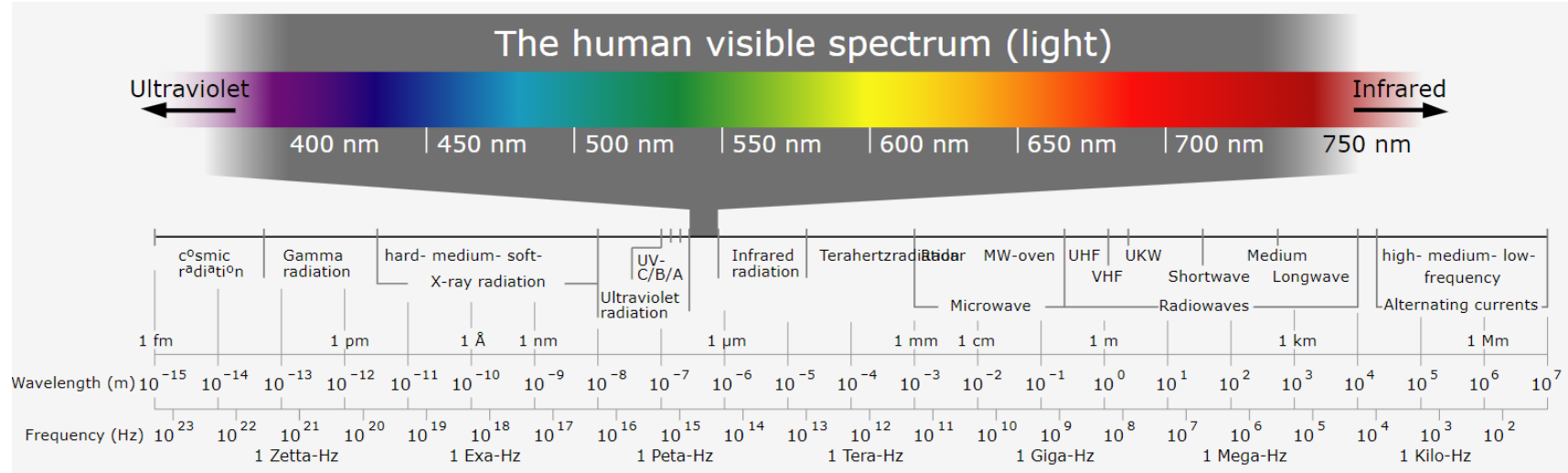
UAV-based remote sensing:
Height: $< 3\text{ km}$
Coverage: $0.1 \sim 100\text{ km}^2$

Aerial remote sensing:
Height: $< 30\text{ km}$
Coverage: $10 \sim 100\text{ km}^2$

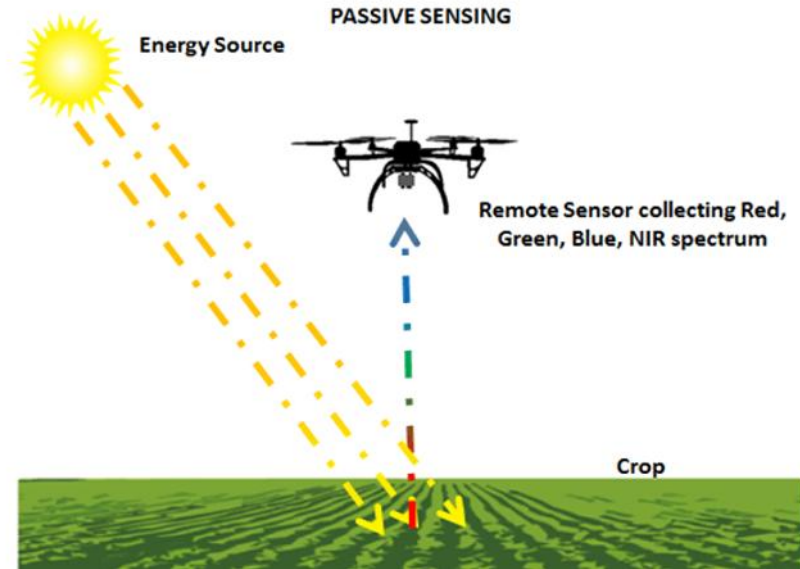
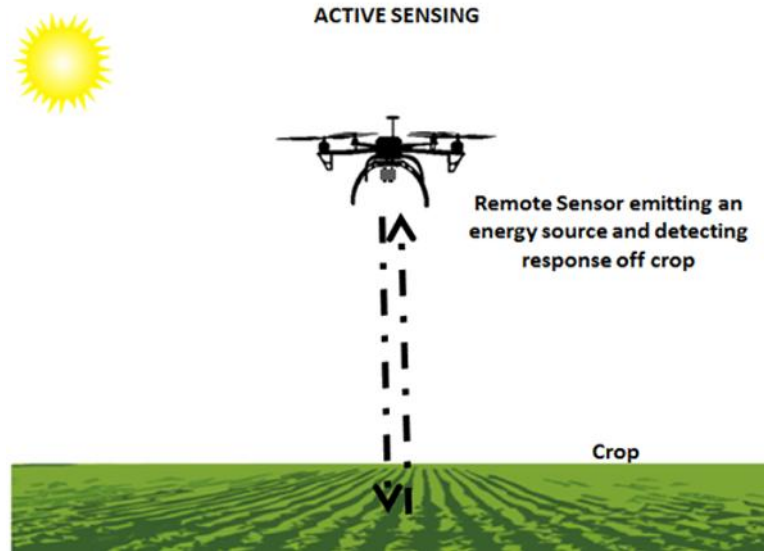
Satellite remote sensing:
Height: $> 150\text{ km}$
Coverage: $10 \sim 1000\text{ km}^2$



Electromagnetic spectrum



Sensor Types



Resolutions

Spatial resolution
(pixel size)



Landsat 30m



IKONOS 4m



Orthophoto 0.5m

Spectral resolution
(# bands)



Radiometric resolution – bit depth



Temporal resolution – orbital period
(return rate)



Spatial Resolution

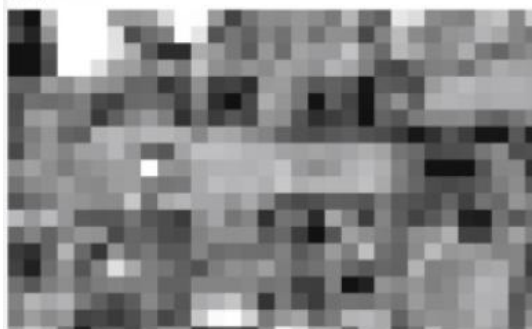
(A) 1 m



(B) 10 m



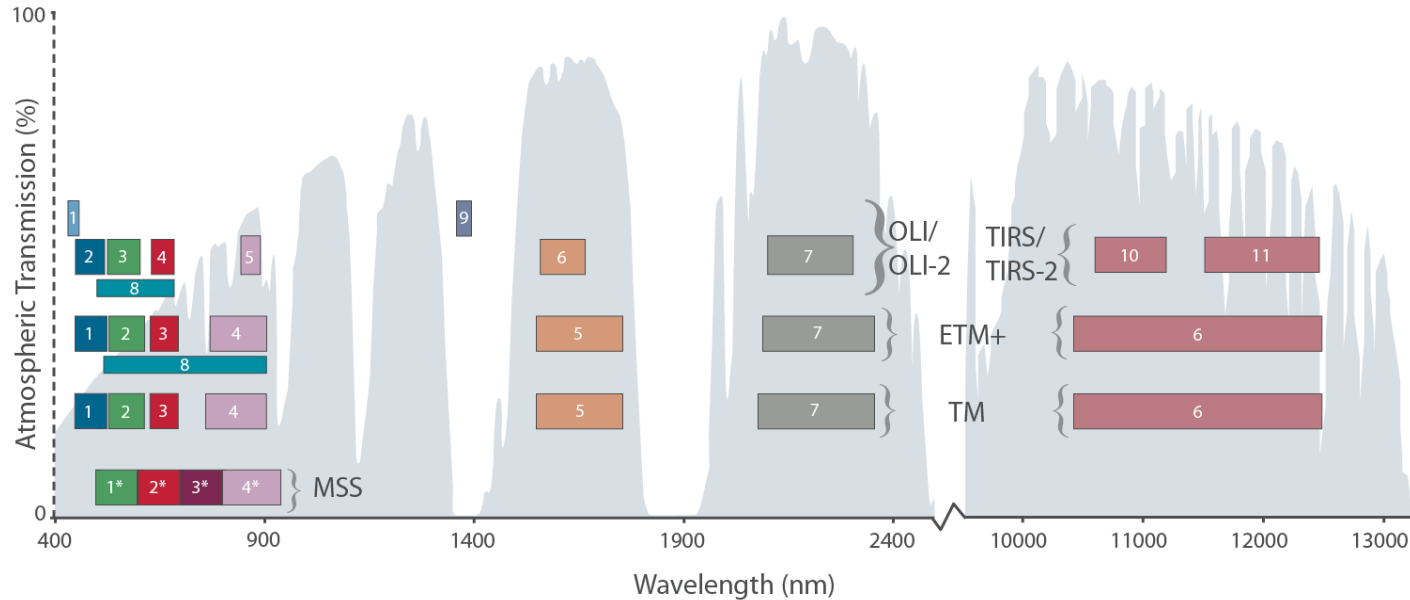
(C) 30 m



(D) 250 m

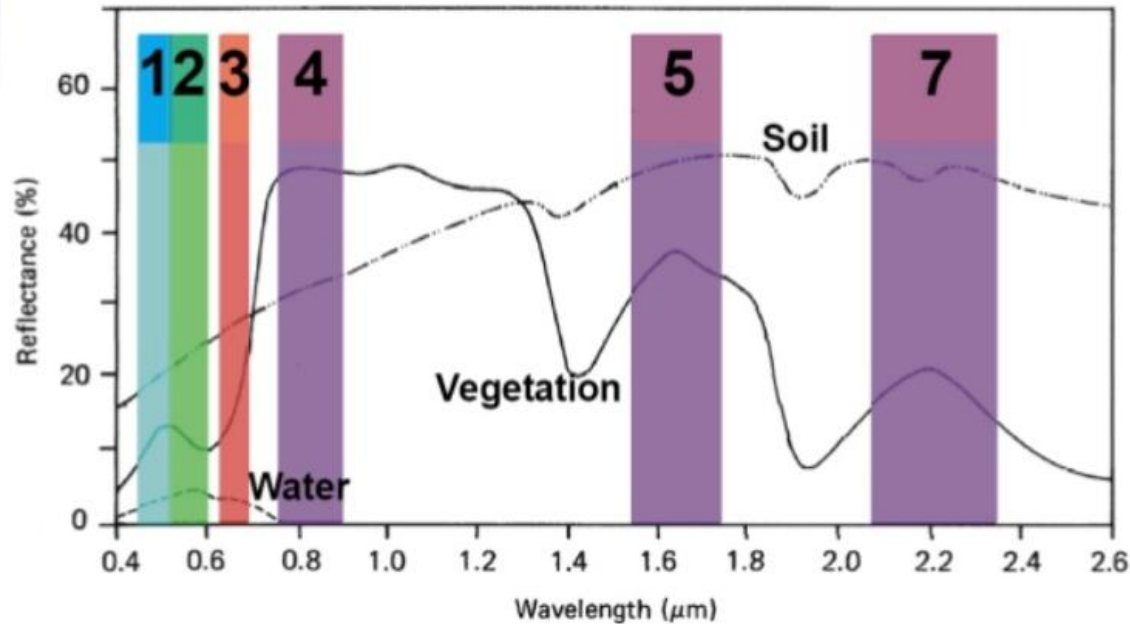


Spectral Resolution



<https://www.usgs.gov/faqs/what-are-band-designations-landsat-satellites>

Spectral Resolution - Spectral signatures



Multispectral indices

Multispectral indices are useful to improve the knowledge of plant organic functionality.

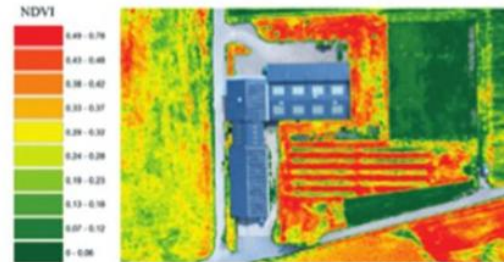
$$NDVI = \frac{NIR-RED}{NIR+RED}$$



Résultat classique pour comparaison



Cliché brut.



Carte d'activité végétale NDVI obtenue à partir du cliché brut.

HEALTHY

VEGETATION REFLECTANCE

50% NIR 8% RED



NDVI = 0.72

STRESSED

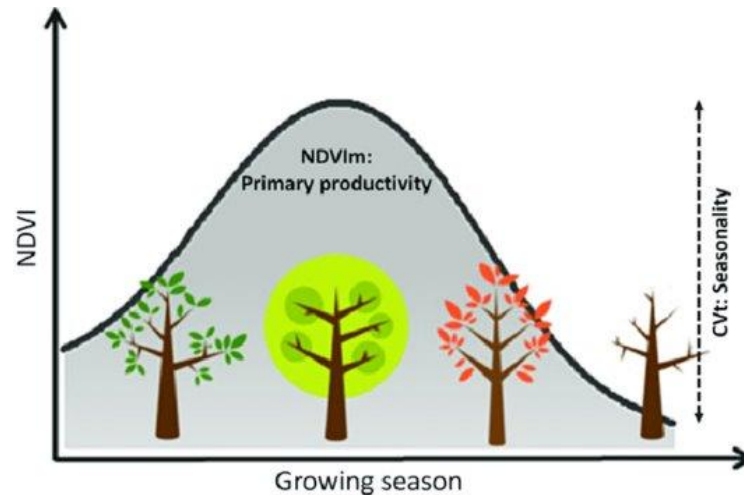
VEGETATION REFLECTANCE

40% NIR 30% RED



NDVI = 0.14

$$\text{NDVI} = \frac{\text{NIR} - \text{RED}}{\text{NIR} + \text{RED}}$$



Where we can use Google Earth Engine GEE

GEE Javascript

Earth Engine (EE) Python
API

rgee package R

Google Earth Engine QGIS
complement

GEE a cloud geoprocessing service

What do you need?

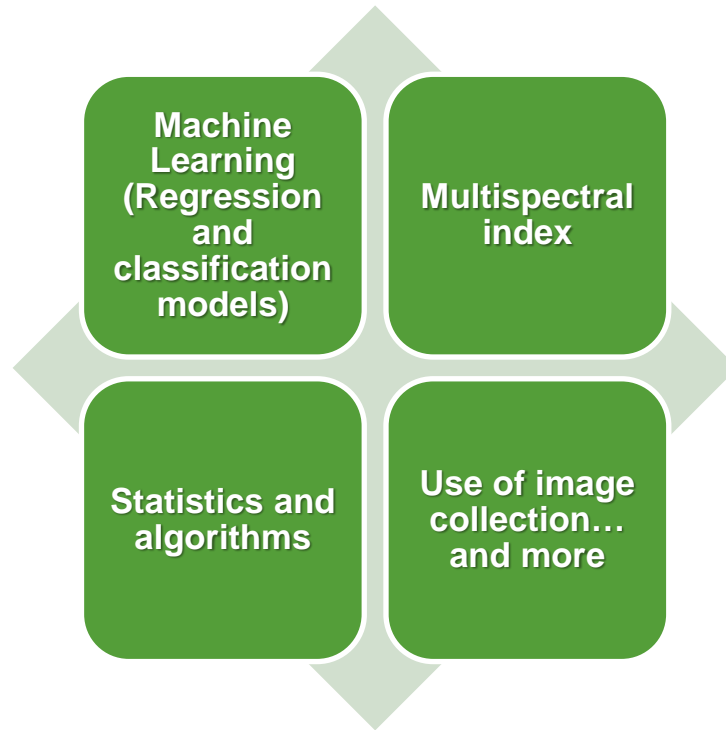
- Gmail account
- Access to GEE
- Javascript or Python fundamentals
- Remote Sensing knowledge

<https://github.com/osoivan/GEEWorkshop>

The screenshot shows the Google Earth Engine web interface. Labels with arrows point to the following components:

- Script manager**: Points to the 'Scripts' tab in the left sidebar.
- API documentation**: Points to the 'Docs' tab in the left sidebar.
- Asset manager**: Points to the 'Assets' tab in the left sidebar.
- Search for datasets or places**: Points to the search bar at the top.
- Get a link (URL) to the script**: Points to the 'Get Link' button above the script editor.
- Save the script**: Points to the 'Save' button above the script editor.
- Run the script**: Points to the 'Run' button above the script editor.
- Help button**: Points to the help icon in the top right.
- Feedback button**: Points to the feedback icon in the top right.
- Code Editor**: Points to the central area containing the JavaScript code for a Sentinel-2 QA mask.
- Task manager**: Points to the 'Inspector' tab in the right sidebar.
- Console output**: Points to the 'Console' tab in the right sidebar.
- Inspect locations, pixel values, objects on the map**: Points to the 'Tasks' tab in the right sidebar.
- Geometry Tools**: Points to the toolbar on the left side of the map.
- Zoom**: Points to the zoom controls on the left side of the map.
- Map**: Points to the main map area showing a satellite image of a coastal region.
- Layer manager**: Points to the 'Layers' panel in the top right of the map.

What things can we make with GEE?





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Thanks for your
attention!