# User Guide to use the application

SENTINEL-2 is a European wide-swath, high-resolution, multi-spectral imaging mission. Its high-resolution optical images many applications, including land monitoring, emergency response and security services assistance. The satellite's multi spectral image provides a versatile set of 13 spectral bands spanning from the visible and near infrared to the shortwave infrared. The Copernicus Sentinel-2 mission comprises a constellation of two polar-orbiting satellites placed in the same sun-synchronous orbit, phased at 180° to each other. It aims at monitoring variability in land surface conditions, and its wide swath width (290 km) and high revisit time (10 days at the equator with one satellite, and 5 days with 2 satellites under cloud-free conditions which results in 2-3 days at mid-latitudes) will support monitoring of Earth's surface changes. For more information: https://sentinel.esa.int/web/sentinel/missions/sentinel-2

Layout of the application:
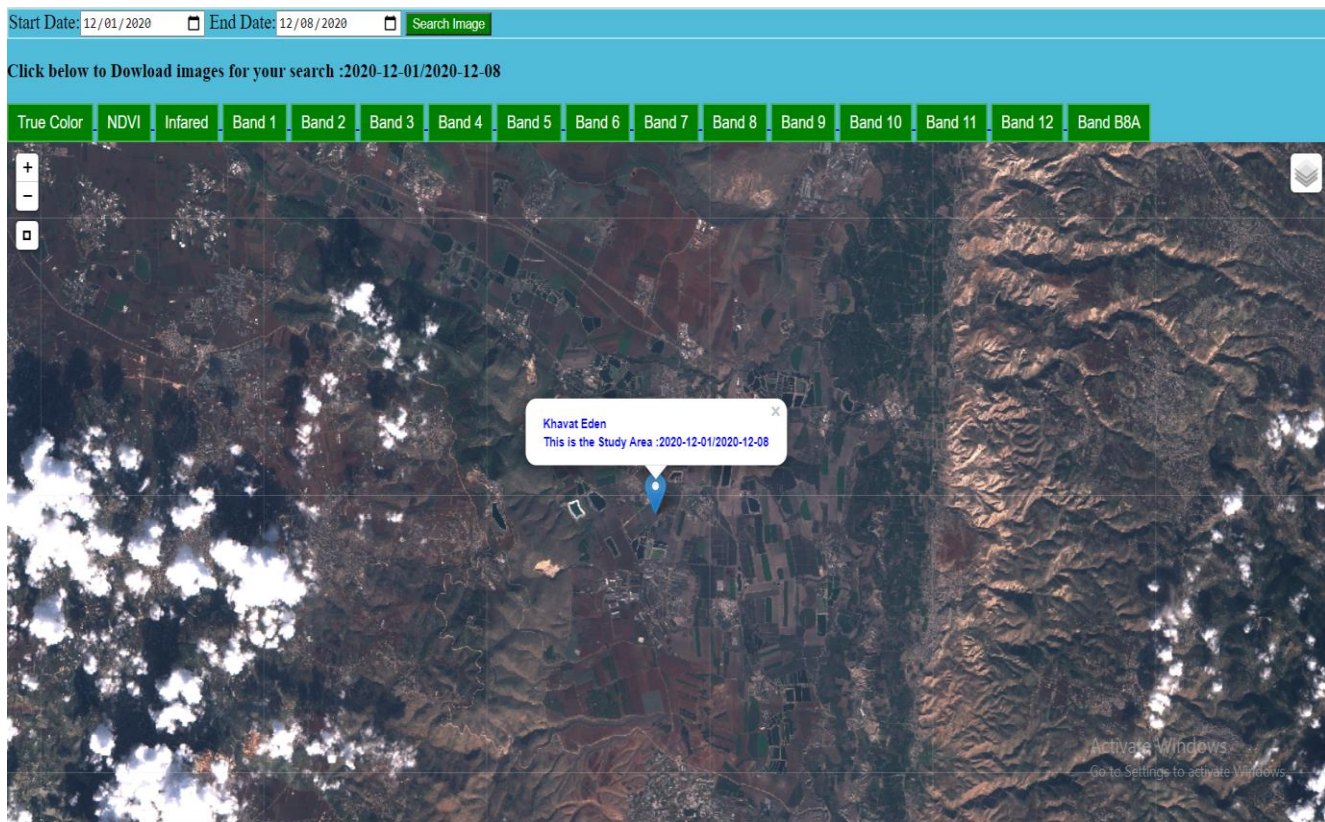
When you first visit the application or send a get request to homepage you will see the satellite image which have been acquired in recent 5 days interval. For example if the current date is 2020-12-21 then it will get the most recent available image from 2020-12-16 to 2020-12-21. If you are still not so familiar with satellite image or bands I will discuss them below.

What do I mean by image or bands?

Before talking about the bands or image, lets talk about how the satellite captures the image of a location. For example lets also assume that we want the image of the location same as shown in the application which is Khavat Eden. The sentinel satellite provide image of this location in interval of 5 days. This means it takes 5 days for the satellite to arrive in this particular area again and it provide the image every 5 days for the particular date. And when the satellite capture image for particular date lets says 2020-12-16 it records in different bands like Band 1, Band 2,Band 3 and Band 4 etc. Here I am referencing each band as an image. If you are well know to a scientific definition of image then an image is always a composite (combination) of three bands which is Red, Blue and Green (RBG). Likewise the same with satellite image to see the actual image or true color image of the location. We have to composite three bands Band2 (Blue), Band3 (Green)and Band4(Red) to see the actual or true view of the location. But no worries you don't need to composite on your own there is True color image already provided for you. The satellite do provides other bands also you can see information about each band in the table below.

Name	Description	Resolution
B01	Coastal aerosol, 442.7 nm (S2A), 442.3 nm (S2B)	60m
B02	Blue, 492.4 nm (S2A), 492.1 nm (S2B)	10m
B03	Green, 559.8 nm (S2A), 559.0 nm (S2B)	10m
B04	Red, 664.6 nm (S2A), 665.0 nm (S2B)	10m
B05	Vegetation red edge, 704.1 nm (S2A), 703.8 nm (S2B)	20m
B06	Vegetation red edge, 740.5 nm (S2A), 739.1 nm (S2B)	20m
B07	Vegetation red edge, 782.8 nm (S2A), 779.7 nm (S2B)	20m
B08	NIR, 832.8 nm (S2A), 833.0 nm (S2B)	10m
B8A	Narrow NIR, 864.7 nm (S2A), 864.0 nm (S2B)	20m
B09	Water vapour, 945.1 nm (S2A), 943.2 nm (S2B)	60m
B10	SWIR – Cirrus, 1373.5 nm (S2A), 1376.9 nm (S2B)	60m
B11	SWIR, 1613.7 nm (S2A), 1610.4 nm (S2B)	20m
B12	SWIR, 2202.4 nm (S2A), 2185.7 nm (S2B)	20m

And the best part of this application is you can see each bands separately along with True color and NDVI. Normalized difference vegetation index (NDVI) is a simple graphical indicator that can be used to analyze remote sensing measurements, often from a space platform, assessing whether or not the target being observed contains live green vegetation. Band 4(Red) and Band 8 (Near Infrared) are used to calculate the NDVI of the location. All the bands provided by the sentinel are used for different purposes but I will not cover them all here.

Now how to see the bands for particular date?

As mentioned earlier by default it provide recent image every time you visit the application. So now to see the bands follow these steps:

Just click on the widget to the upper right of your screen and select the band you want to see. The date for the particular image is also provided to you as shown in the two red box below.

The interval of 5 days is set because you now know that sentinel doesn't provide daily images. In order to provide the satellite image to the user I have to set the minimum of 5 days interval.

How to use date filter buttons to see the past images?

So if you have visit the application you have noticed two date input fields. One is Start Date and the other is the End date, these two fields are there so that the user can set their own interval to see the images between their desired interval. There are certain validation the user have to make sure before they filter for their interval as the application throws some validation error if your input is not valid. And they are as follows:

1) If you set the Start date and End date which are dates in future then this will throw an error that Start date and End date should not be the dates in future. This obviously makes sense as the satellite cannot provide you the future images.

2) If you set End date greater than Start date then also it will throw an error because End date should not be ahead in time than Start date.

3)Lastly, the Start date and End date should not be the same date.

Hence make sure to input the valid arguments to the date input fields and filter according to your purpose. The application will display the interval same as above in the screen so no need to remember the interval you have submitted.

A demo for filtering date for image.