

living planet symposium

BONN
23–27 May
2022

TAKING THE PULSE
OF OUR PLANET FROM SPACE



AI4EO permanent challenge for continuous super-resolution methodology improvements

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24th May 2022

AI4EO consortium



Prizes & support to challenges

Platform & data contributors

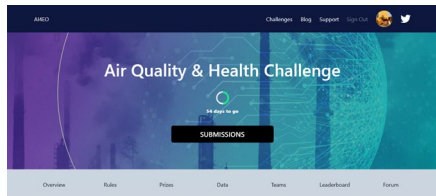


Bring the AI & EO communities together to tackle grand societal challenges.



ai4eo.eu

Crowd Platform



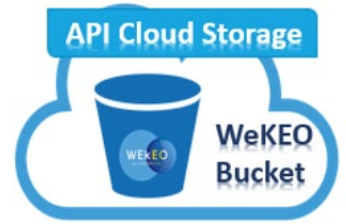
Leaderboard

TEAM	METRIC	POSITION
IT-1	ITALY	1
IT-2	ITALY	2
IT-3	ITALY	3
IT-4	ITALY	4
IT-5	ITALY	5
IT-6	ITALY	6
IT-7	ITALY	7
IT-8	ITALY	8
IT-9	ITALY	9
IT-10	ITALY	10
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IT-99	ITALY	99
IT-100	ITALY	100

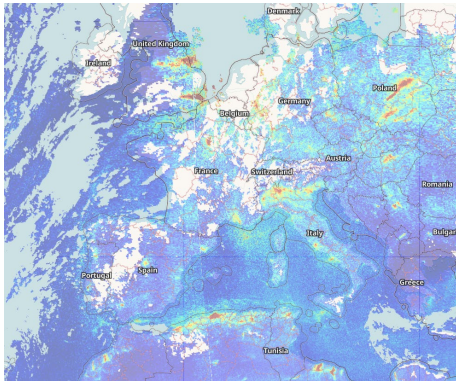
Live Scoring Tool



Cloud Object Storage



Air Quality & Health



2021-02 to 2021-05

CAMS + Sentinel-5P
Downscale PM2.5 & NO2

CLOSED

AI for Food Security



2021-10 to 2022-01

PlanetFusion, Sentinel-1, Sentinel-2
Crop mapping (2 tracks)

CLOSED

Enhanced Sentinel-2



2021-06 to 2021-10

Sentinel-2
Enhanced mapping

CLOSED PERMANENT

HyperView



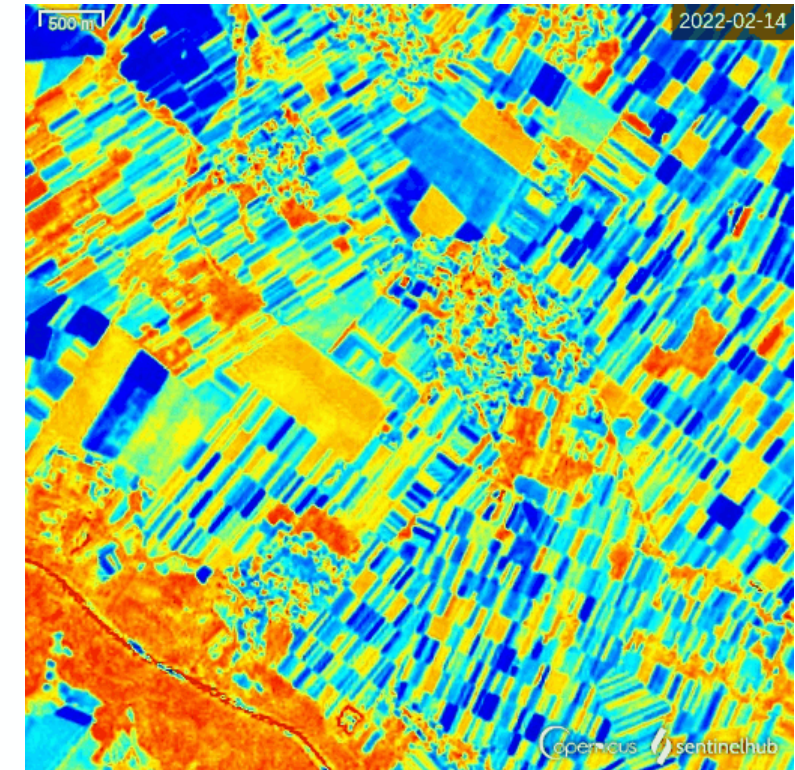
2022-02 to 2022-07

Hyperspectral
Soil parameters

ACTIVE

Enhanced Sentinel 2 for Agriculture

Multi-spectral - High revisit frequency - 10/20/60m Ground Sampling Distance



% of fields in Slovenia with less than 1 full S2 pixel: 22%

Enhanced Sentinel 2 for Agriculture



Enhanced Sentinel 2 for Agriculture



Single-Frame Super-Resolution

Very High Resolution information

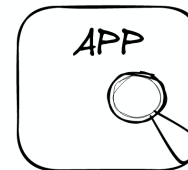
Ill-posed problem
Unrepresentative metrics
Effective spatial resolution*
Hallucinations
Spectral preservation
...

Multi-temporal information

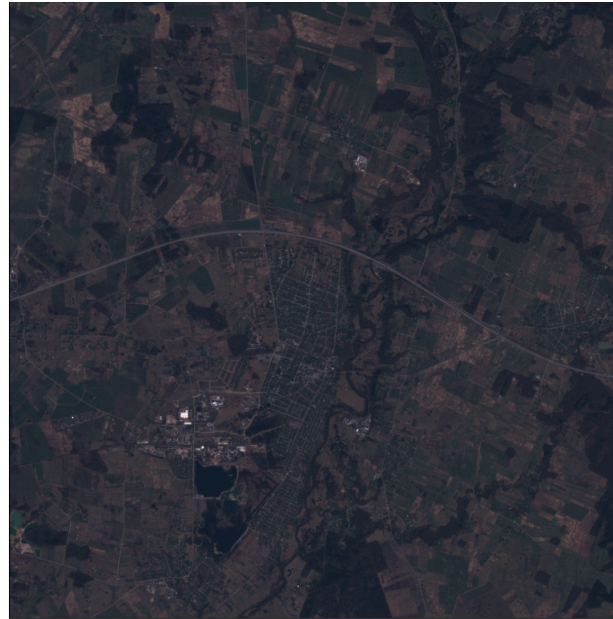


Multi-Frame Super-Resolution

Land cover classification
Crop classification
Object detection
Yield estimation
Field delineation



*SPATIAL RESOLUTION \neq PIXEL SIZE



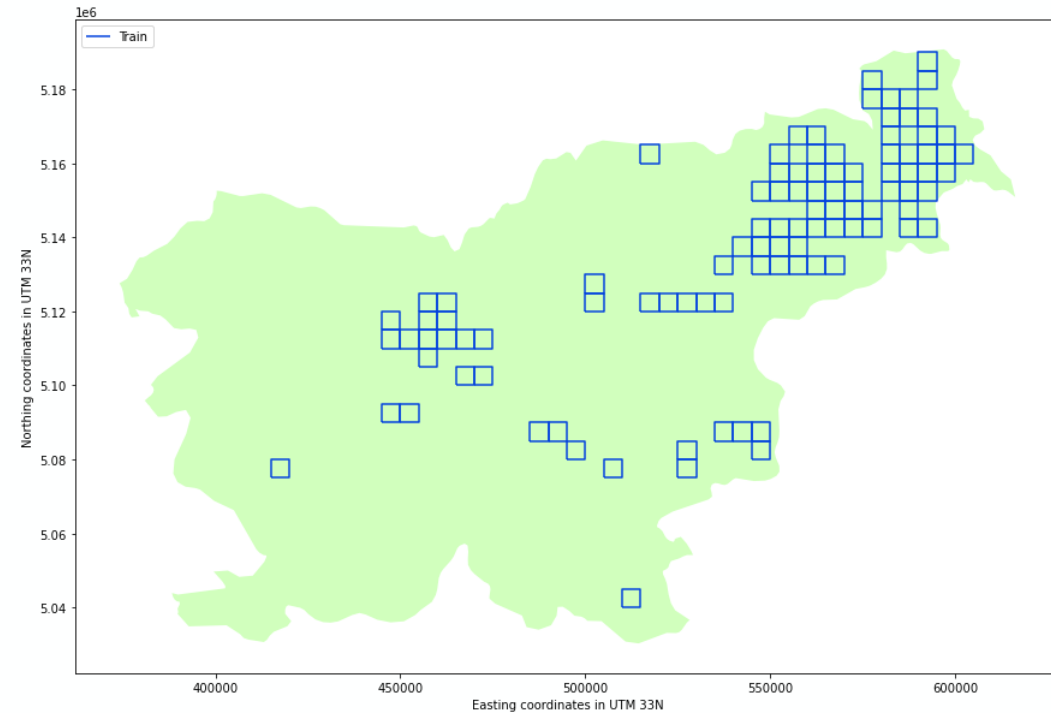
Sentinel-2 L2A time-series

Binary classification map

- * 2019-03-01 to 2019-09-01
- * 12 bands (resampled to 10 m)
- * Scene classification mask
- * s2cloudless masks

- * cultivated vs non-cultivated
- * 2.5 m pixel size (4x upscale)
- * based on LPIS/farmers' declarations

Enhanced Sentinel 2 for Agriculture



Crop-types for label 2:
['maize for grain', 'maize for silage', 'sorghum', 'sweet corn', 'sorghum for fodder', 'sudan grass']

Crop-types for label 3:
['winter wheat', 'winter rye', 'winter spelt', 'winter triticale', 'winter oat', 'winter cereals', 'mixture of winter wheat and winter rye', 'winter durum wheat', 'winter khorasan wheat']

Crop-types for label 4:
['winter barley']

Crop-types for label 6:
['pumpkin for seed oil']

Crop-types for label 7:
['radicchio for fodder', 'mixture of vegetables for human consumption', 'various permanent herbs', 'annual herbs', 'mixture of vegetables, herbs and other crops', 'mixture of vegetables for human consumption under 0,1 hectare', 'asparagus', 'mixture of vegetables and other crops for snail farming', 'artichoke']

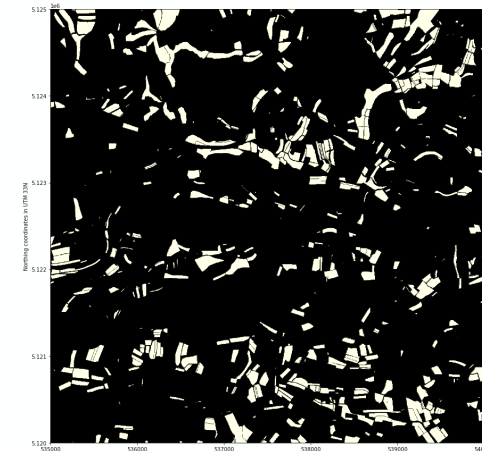
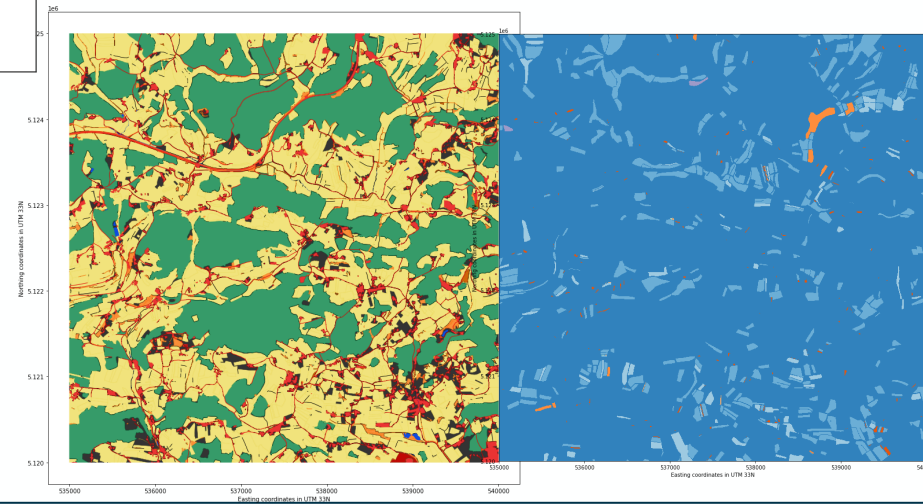
Crop-types for label 8:
['winter rapeseed for fodder', 'winter rapeseed']

Crop-types for label 9:
['summer wheat', 'summer rye', 'summer spelt', 'summer triticale', 'summer oat', 'summer barley', 'summer cereals', 'summer durum wheat', 'summer khorasan wheat']

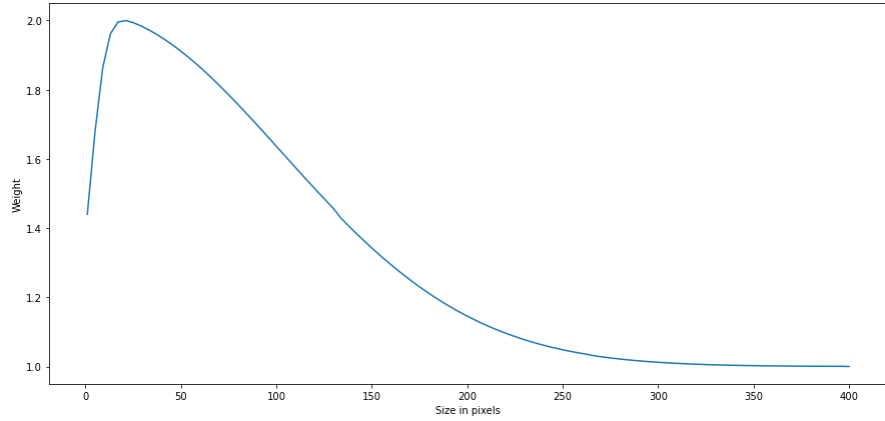
Crop-types for label 10:

AOI:

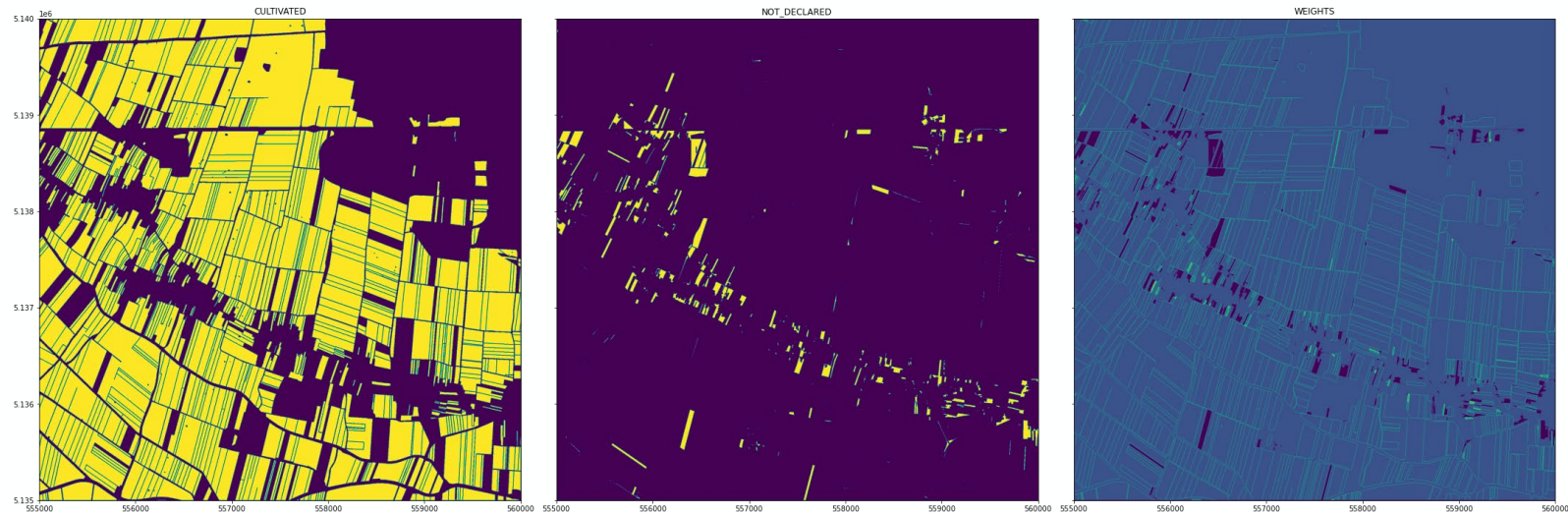
- * Slovenia
- * 100 training areas
- * 25 test areas (public/private)



Enhanced Sentinel 2 for Agriculture

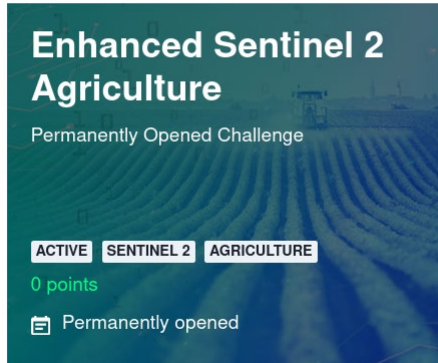


$$MCC = \frac{TP \times TN - FP \times FN}{\sqrt{(TP + FP)(TP + FN)(TN + FP)(TN + FN)}}$$



Our Challenges

CLOSED SENTINEL 2 AGRICULTURE ACTIVE AIR QUALITY



AI4EO - Feature enhancement for land management

Get started with the challenge

This notebook will get you started with downloading, exploring and analysing the input and output data of the challenge.

The aim of this challenge is to create AI systems that can exploit the temporal information of Sentinel-2 images into an enhanced spatial resolution.

Your task will be to estimate a *cultivated land* map at **2.5m** spatial resolution given as input a *Sentinel-2 time-series* at **10m** spatial resolution, therefore resulting in a **4x** spatial resolution improvement.

This notebook showcases how to download and process the data using [eo-learn](#), a Python library specifically designed to deal with Earth Observation data. The data will be stored into `EOPatches` as `numpy` arrays and `geopandas` dataframes to facilitate processing operations. However, you can use any other Python tool of preference to process the provided data.

The notebook also showcases how to generate a valid submission file.

As per challenge rules, the following applies:

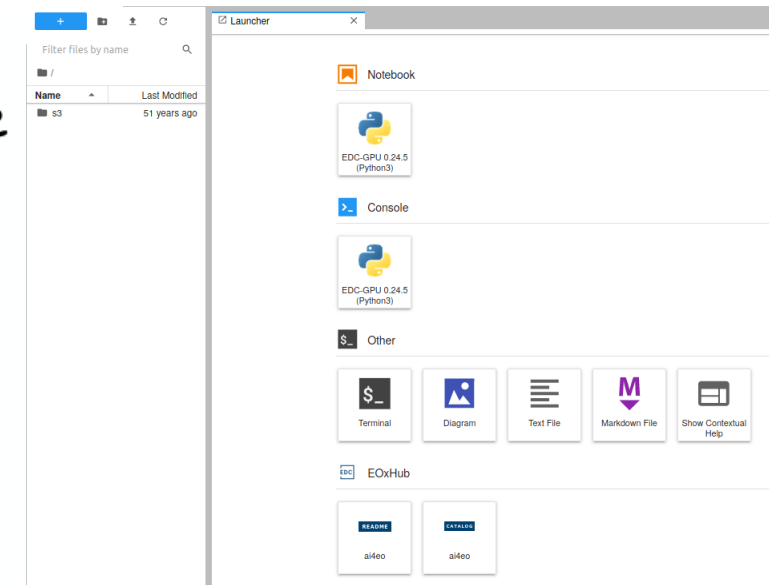
- no data source other than the ones provided can be used to produce your outputs;
- pre-trained models are not allowed.



github.com/AI4EO/enhanced-sentinel2-agriculture-challenge

Download

- [Link](#) to testing dataset `test-eopatches.tar.gz` (approx 2.7GB). This dataset is required to submit your solution and is available through this link only.
- [Link](#) to training dataset `train-eopatches.tar.gz` (approx 10.7GB). This dataset can be downloaded through APIs (recommended, consult the starter-pack notebook) or through this direct link.
- [Link](#) to the GitHub repo containing the starter-pack material.
- [Link](#) to request a GPU-based hosted workspace on the Euro Data Cube platform..



Enhanced Sentinel 2 for Agriculture



Leaderboard

Your best submission will appear on the leaderboard.

Entries: 17

Public Private

TEAM	SCORE
IPL Total submissions: 45 Last submission: 235 days ago	0.862
TCSA-AI Total submissions: 112 Last submission: 235 days ago	0.846
EagleEyes Total submissions: 20 Last submission: 234 days ago	0.832

1st place
TEAM IPL
»» DIEGO VALSESIA,
POLITECNICO DI
TORINO

2nd place
TEAM TCSA-AI
»» CHRISTIAN AYALA
JAVIER LASHERAS
CHRISTIAN GUTIERREZ,
TRACASA

3rd place
TEAM EAGLEEYES
»» DR. FRAUKE ALBRECHT
DR. CAROLINE ARNOLD,
GERMAN CLIMATE
COMPUTING CENTRE



ai4eo:

- * engage AI and EO together for compelling challenges
- * permanent challenges == active benchmarks
- * push boundaries of research & win prizes (!)
- * engage communities by organizing a challenge