

Summer schools engaging mixed audiences – case-based training for the EO*GI sector



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EO4GEO Skills Alliance

**Relevance of acquiring new geospatial skills for
the job market**

Future skills in the EO*GI sector



Co-funded by the Erasmus+ Programme of the European Union

SPACE RESEARCH

AREAS AND MAIN CONCEPTS (draft by PLUS)

Space exploration

- Space habitation
- Planetary missions
- Space debris
- Space weather

Space law

- Treaties
- Ethics

Space infrastructure

- Satellites
- Ground segment
- Swarm constellations
- Tiny sats

Space access

- Space vehicles
- Propulsion
- Launcher systems
- Payload
- Ground control

Space assets & applications

Communication Copernicus Galileo

- Satellite communications (SatCom)
- Space-based earth observation (EO)
- Positioning, navigation and timing (PNT)
- Space situational awareness (SSA)
- + in-situ obs. / EGNOS

Space economy

- New Space

Geospatial thinking!



Knowledge transfer (education)

Knowledge generation (fundamental research)



Knowledge value (application)

Upstream

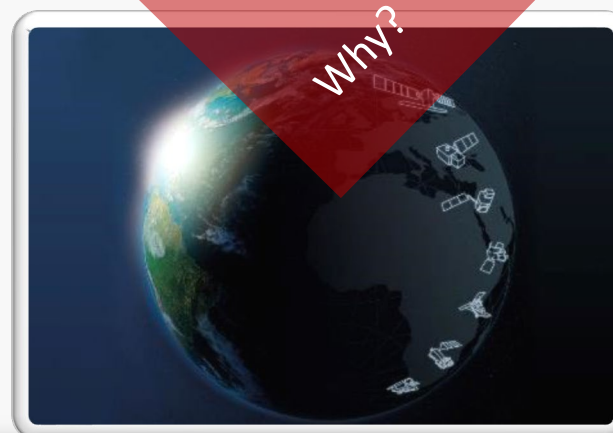
Downstream



Bridging “Space” and “Geoinformation”



...



...

Blueprint for sectoral cooperation on skills



SPACE
(GEO INFORMATION)



1

Supply-Demand studies
Gap analysis
TechTrends Watch

Set up a skills intelligence mechanism to identify the skills and competences required and provide feedback on the evolving sector needs

Education and training offer lag behind new technological developments and societal trends, and is not entirely in line with EU policy priorities

2

Body of Knowledge
Tools Ecosystem
Network of Experts

Reinforce cooperation among stakeholders from the academic, private and public sectors on skills development and requirements

Different views exist on skills needs between private/public sector and academia. Better cooperation is needed.

3

1-stop portal
Certification
Guidance mechanism

Develop a system to help and guide candidate learners in their skilling, upskilling and reskilling efforts


There is a fragmented and non-harmonized education and training offer that is difficult to access and does not cover enough the downstream sector

4

Road shows, job fairs ...
Learning sandbox
MOOC's

Encourage citizens' engagement, citizens' science practices and hands on activities enhancing the inclusion/recognition of EO/GI applications value in everyday aspects of life

Individual user needs and the search for new talent should better be taken into account ensuring a strong knowledge base in the sector



Search

Search ...

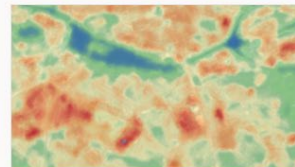
Filters

EQF level
All EQF levels

Language
All Languages


All Teaching material

BRIDGE THE GAP



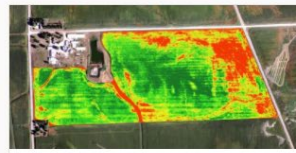
Identification of heat islands to support city planning

A slideset for city planners about Urban Heat Islands and the



Earth Observation for Decision Makers

The course material consists of 5 videos about Earth Observation technologies and capabilities made




Observando desde el espacio: Agricultura y medio ambiente

The training material introduces students from agriculture-related

OUR OPEN RESOURCES


EO4GEO will offer a series of tangible results that are usable for the broader space/geospatial education/training community.



Body of Knowledge

EO4GEO and a **network of experts** develops a commonly agreed **Body of Knowledge** (BoK) describing an updated **ontology for the EO/GI domain**.


[Learn more >](#)



Tools

EO4GEO supports **teachers, students and professionals** of the EO sector with a complete **opensource tools ecosystem** based on the Body of Knowledge.


[Learn more >](#)



Training Material

EO4GEO offers to **educators/instructors and students** and extensive catalogue of specialised training resources on how to use EO/GI data.

[Learn more >](#)



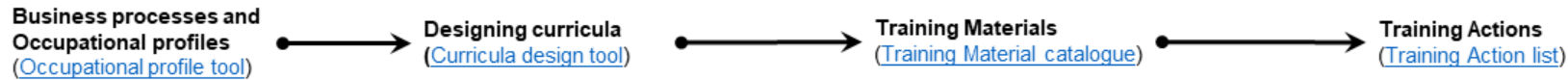
Training Actions

Join our training actions (**webinars, workshops**, etc.) for different case-based learning scenarios in the sub-sectors 'integrated applications', 'smart cities' and 'climate change'.

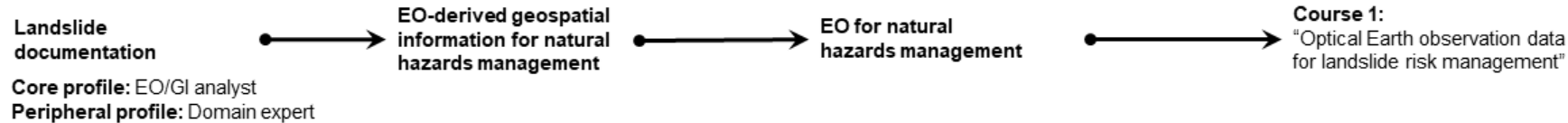
[Learn more >](#)



General design

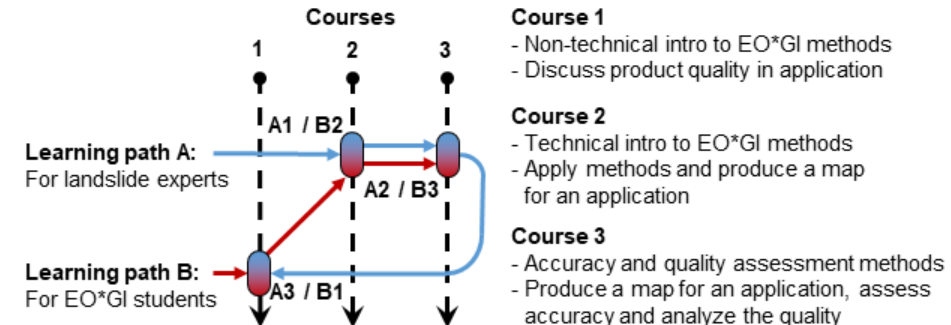


Individual scenario

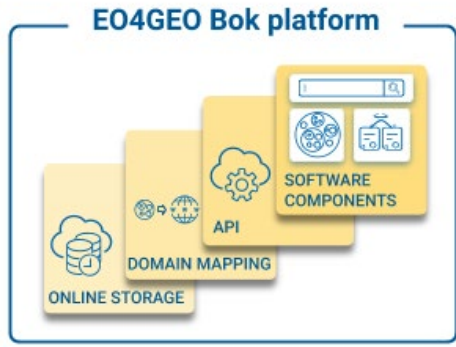


Case-based training elements

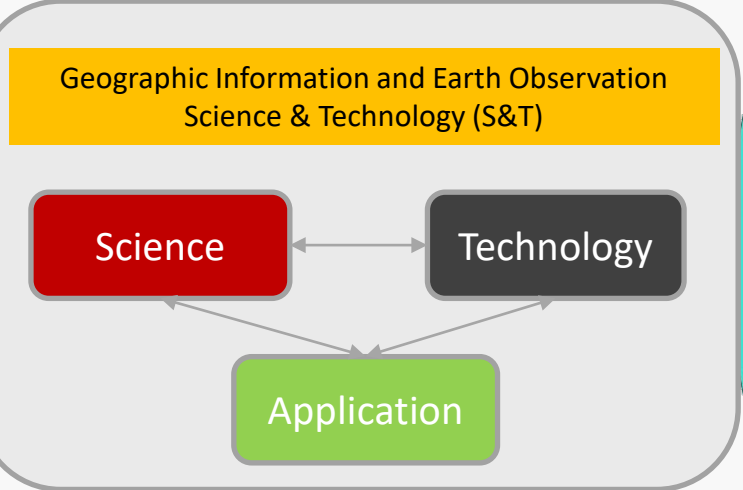
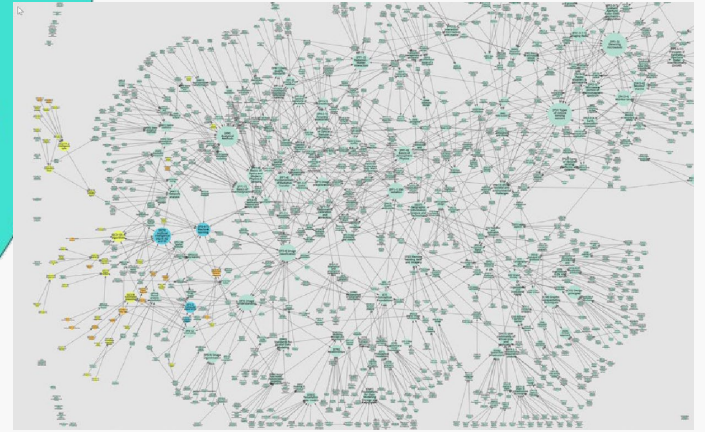
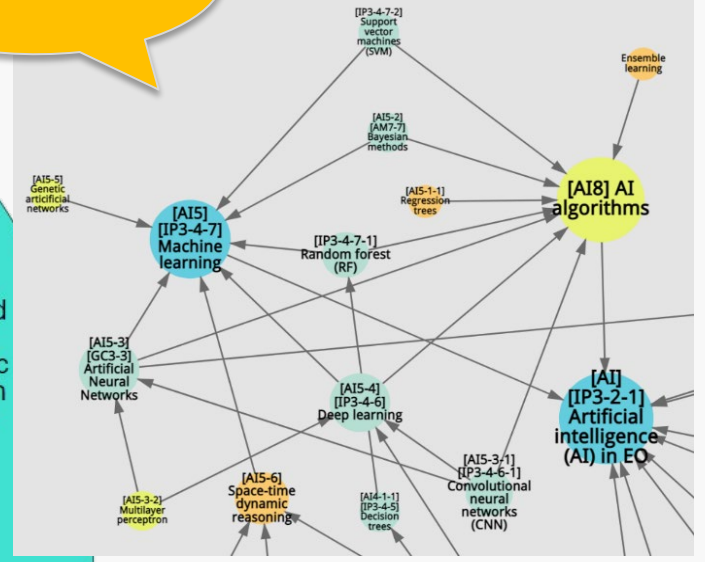
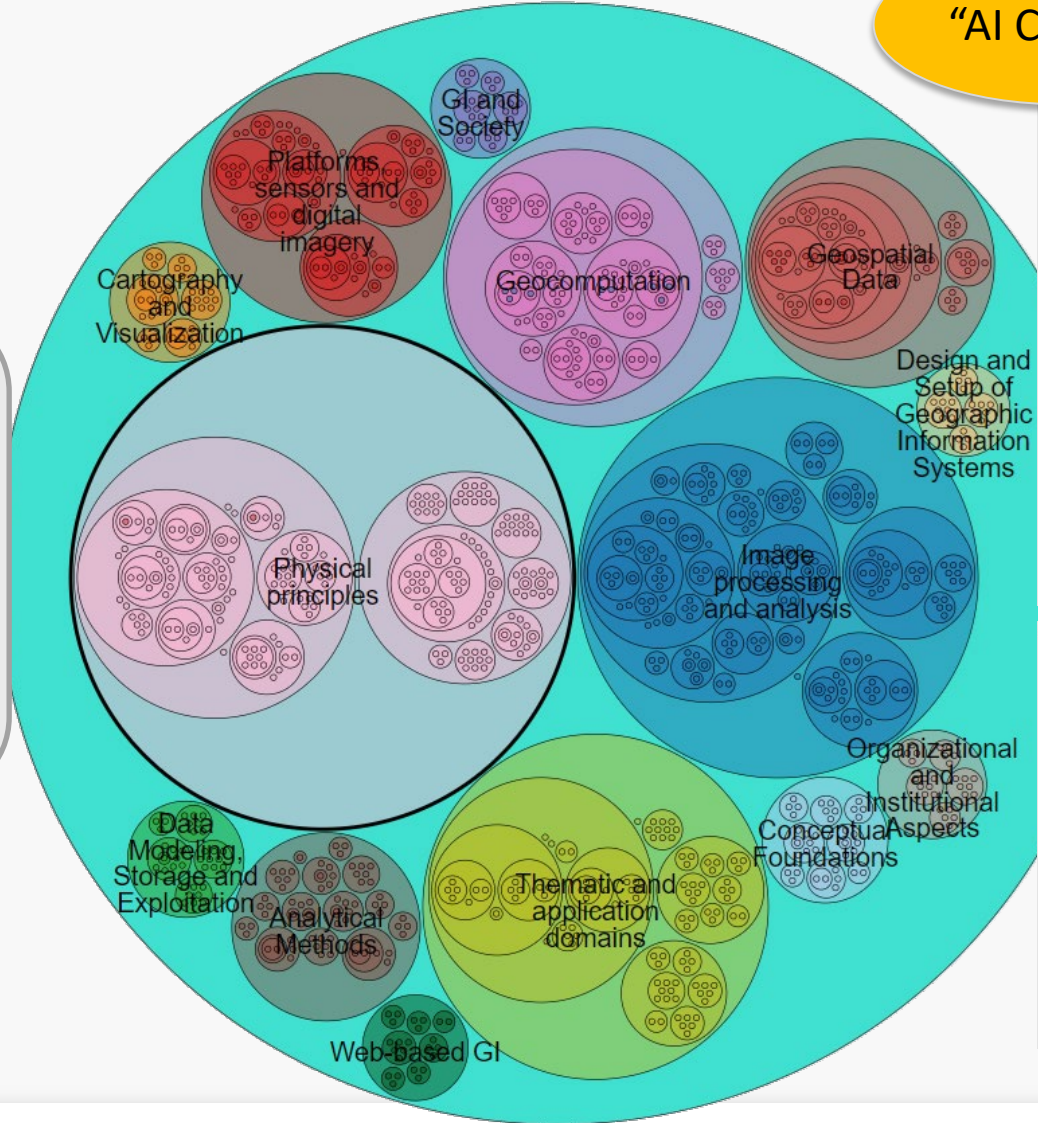
In November 2019, a **low-pressure system** over the Mediterranean carried heavy rainfall northwards into the Alps and **triggered landslides** in the province of Salzburg, Austria. The **landslides are visible in Sentinel-2 images** at some locations in Großarl Valley. So far, they have not been included in the official event documentation databases of Austrian authorities. Obviously, **optical Earth observation (EO) data can help to make landslide documentation more complete**. Challenges exist that concern the type and size of landslides that EO data can identify and whether the data quality can achieve a level that is sufficient for the needs of landslide risk management. **This workshop brings together landslide experts and EO specialists to discuss the benefits and limitations of EO data for landslide risk management.**



BoK for the EO*GI domain



“AI Cluster”



> 900 concepts

Lemmens et al. in press

- International summer school for 20 selected students and young professionals
- Virtual setting → duration of 4 weeks
- Emphasis of problem-based learning
- Presentation of results at International Conference (ISDE12 Symposium)

Intelligent Earth Observation

International Summer School (virtual mode) | From 08 June to 07 July 2021

We invite students, practitioners, EO service providers, CTOs of companies, teachers & VET providers interested in automation and online processing for Earth observation applications to participate in the **EO4GEO International Summer School**, which will take place in June/July in full virtual mode.

Start/End Date



From 08 June to 07 July 2021. Duration: 30 days.

Participants of the summer school are able to ...

- *select* and acquire **data** necessary for a predefined case study.
- *apply* preprocessing, classification, accuracy assessment and further steps of the satellite data **analysis workflow**.
- *develop* EO-based applications in **Jupyter Notebooks**.
- *explain* key principles of **artificial intelligence** in the context of Earth observation.
- *summarize* the current work procedures with satellite data and indicate **future developments**.
- *distribute* **tasks** in a team to achieve defined objectives.

Phase 1

Applications

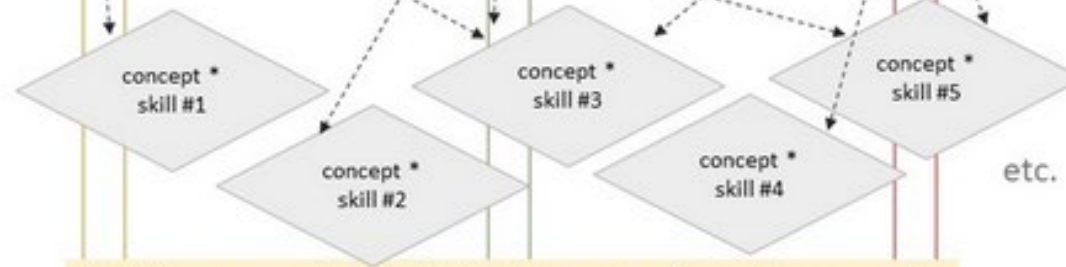


Case-based approach: translate information needs to technical requirements

Phase 2

Jigsaw cooperative learning

Initial intensive training component, AI transversal BoK component



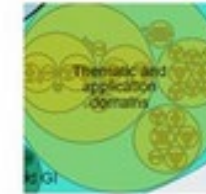
Solutions: re-match technical knowhow to address needs

Phase 3

Jupyter Notebooks
integrating a set of required tools and routines, self-organised



Terrascope
OpenEO interface, input to EO4GEO course material



Concept	Level	Support list
Artificial intelligence	1	AI
Computer vision	1	AI
Automated reasoning	1	AI
Machine learning	1	AI
Computational linguistics	1	AI
Hybrid AI	1	AI
Physics based AI	1	AI-1
Signal processing	1	AI-1
Production systems	2	AI-1
Knowledge representation	2	AI-2
Data Mining	1	AI
Digital twin	1	AI-2
Theory of mind	1	AI-2
Software AI	1	AI-2
Cybernetics	2	AI-2
AI mathematics	1	AI
AI philosophy	1	AI



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Phase 1 - Applications



Co-funded by the Erasmus+ Programme of the European Union

Thematic Application:
Atmosphere

CO2 Budgets
Anders Östman

Novogit AB

Thematic Application:
Climate Change

Urban Heat
Greger Lindenberg



Thematic Application:
Land

Garden Monitoring
Danny Vandembroucke,
Marc Olijslagers

KU LEUVEN

Thematic Application:
Emergency

Radar Remote Sensing
for Emergencies
Carsten Pathe

**FRIEDRICH-SCHILLER-
UNIVERSITÄT
JENA**

Selected Topic: CLIMATE CHANGE

PROBLEM DEFINITION
What do you want to solve?
Urban Heat Island: Multan
•Assess the urban heat island effect of the city over 8 years
•Compare the city of Delhi at the end of the project

TEAM & ROLES

NAME	SKILLS	TEAMROLE
Scott Dearden	Basic python, QGIS, SNAP, ArcGIS	leave empty
Hira Zafar	Python, QGIS, ArcGIS, eCognition	leave empty
Emeka Igwe	GIS, RS, & Basic Python	leave empty
Jessica Gutierrez	Participant 3	leave empty

Selected Topic: CLIMATE CHANGE

PROBLEM DEFINITION
What do you want to solve?
Urban heat island: Delhi
•Assess the urban heat island effect of the city over 8 years

TEAM & ROLES

NAME	SKILLS	TEAMROLE
Tanya Singh	GIS & RS	leave empty
Vitória Barbosa Ferreira	GIS, Python, RS	leave empty
Cesar Aybar	GEE & Python	leave empty
Pratichya Sharma	RS, GIS, Python	leave empty

Selected Topic: EMERGENCY

PROBLEM DEFINITION
What do you want to solve?
Detecting and predicting forest fires and impact using Sentinel-2 and Sentinel-3

TEAM & ROLES

NAME	SKILLS	TEAMROLE
Meryeme Boumahdi	Python (Jupyter), ML, SNAP	leave empty
Balogun Rufai	Machine Learning, Python, GEE	leave empty
Ahmed Moussa	Python Data Analysis, GEE/QGIS, ML	leave empty
Margret Azuma	Python, Machine learning, Sen 1 and 2	leave empty

Selected Topic: LAND

PROBLEM DEFINITION
What do you want to solve?
Crop Health & Yield modeling using remotely sensed data derived from Sentinel 1 and Sentinel 2, combined with terrain variables and soil & climatic data.

TEAM & ROLES

NAME	SKILLS	TEAMROLE
Simon D.	python (jupyter), GEE	leave empty
Adebowale	GEE, Python, GI Software	leave empty
Nesit	Arcgispro, FME/desktop, QGIS	leave empty
Ghada S.	ArcMap, ENVY IDL, R Studio, SNAP	leave empty

Selected Topic: LAND

PROBLEM DEFINITION
What do you want to solve?
The stability of the Giza Plateau and its surrounding is a crucial topic as it is a cultural heritage site, so we would like to monitor the area in terms of stability and detecting subsidence and assess the future impacts of the meteorological factors on the area.

TEAM & ROLES

NAME	SKILLS	TEAMROLE
Mario Moreno	GEE, Jupyter Notebook, GI software	leave empty
Ahmed Hamdo	ArcGIS, QGIS, Google Earth Pro & Matlab	leave empty
Nancy	ArcGIS, QGIS, Matlab, SNAP, Python	leave empty

Phase 2 – Skills and Concepts



Co-funded by the
Erasmus+ Programme
of the European Union

Concepts2Skills:

- Data preprocessing
- Classification
- Accuracy assessment
- Artificial intelligence
- Radar remote sensing
- Data cubes
- Terrascope and Jupyter Notebooks
- Reproducibility
- ..



Training Material

EO4GEO offers to
**educators/instructors and
students** and extensive
catalogue of specialised training
resources on how to use EO/GI
data.

[Learn more >](#)



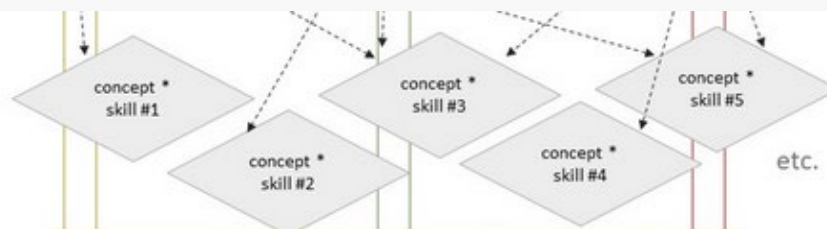
European Environment Agency



Phase 2

Jigsaw cooperative learning

Initial intensive training component, AI transversal BoK component



Solutions: re-match technical knowhow to address needs

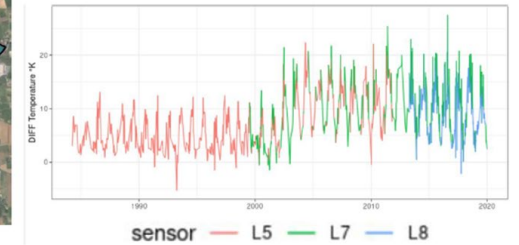
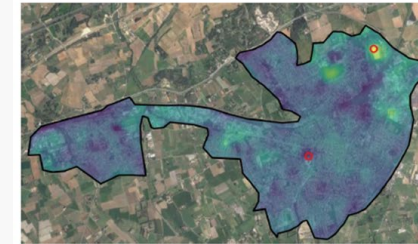
Physics course II	2	AA.1
Signal processing	2	AA.1
Production systems	2	AA.1
Knowledge representation	2	AA.2
Data mining	2	AA
Digital twin	2	AA.2
Theory of mind	2	AA.2.1
Software IV	2	AA.2.2
Colombia	2	AA.2
AI in education	2	AA
AI in industry	2	AA



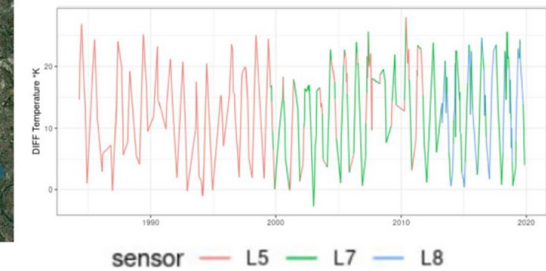
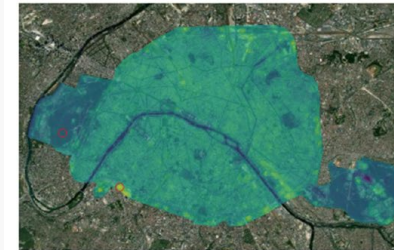
Phase 3 – Solutions

Thematic application domain	Topic	Problem statement	Data / Tools
Climate change	urban heat islands	land surface temperature in the study area Lunel (F)	Landsat 8 imagery, ArcGIS Pro
Climate change	urban heat islands	land surface temperature in the study area Paris (F)	Landsat 8 imagery, Google Earth Engine, Terrascope
Emergency	forest fire impacts	Mapping burn severity for Californian wildfires	Sentinel 2, Google Earth Engine
Land	subsidence of Giza plateau	Monitoring the Stability of Giza Plateau and its Surroundings using SAR interferometry	Sentinel 1 data, the SNAP toolbox, Google Earth Pro
Land	agricultural yield	crop yield prediction over agricultural areas in Kenya	Sentinel-1 SAR and Sentinel-2 MSI time series data; Terrascope, ArcGIS, Jupyter notebooks

Google Earth Engine (Lunel, 2019)



Google Earth Engine (Paris, 2019)



Model application in Test Area

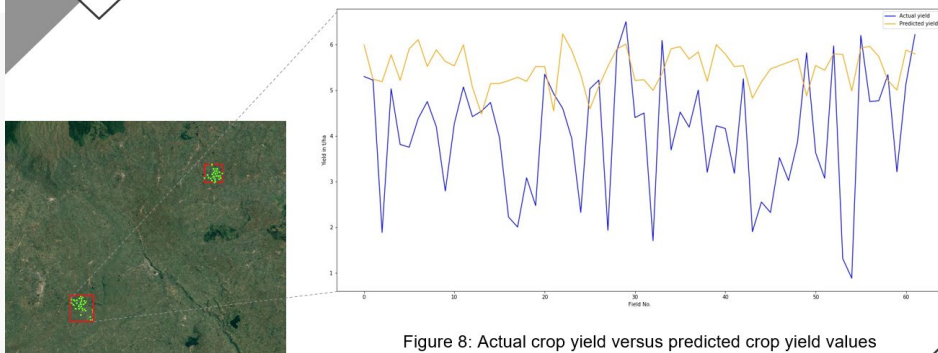
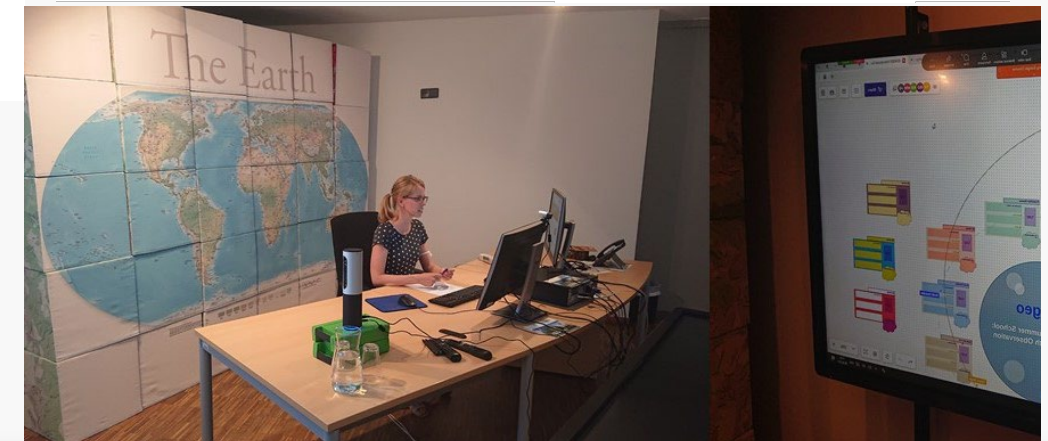


Figure 8: Actual crop yield versus predicted crop yield values using the calibrated model on test area.



Evaluation results

I particularly liked...

- The session on working with SAR data. Moreso, the meetups and feedbacks from the instructors to track progress.
- The technical part of remote sensing application
- Teamwork. The project objectives
- lectures, case studies
- Presenters, the topics and the interesting group work
- lectures
- bringing different remote-sensing topics along with multi-cultural participants and experts together
- group work and knowledge shared with experts
- Workgroup
- Lectures, presenting
- groupwork and the entire learning process

The following topic(s) gained my special interest...

- Learning more about python and Jupyter Notebook SAR data processing
- EO Datacubes, Crop mapping
- Land Surface Temperature Mapping
- crop classification, emergency, fires
- terrascopes and SAR data processing
- Terrascopes, Jupyter Notebook
- utilization of Terrascopes and VMs in remote sensing and data cubes
- SAR processing
- crop classification

I wish to learn more about...

- sentinel-1 preprocess
- EO Datacubes, Crop mapping, Time series analysis
- terrascopes Time series
- Time Series Processing
- Jupyter notebooks, Python in machine learning and Data cubes
- Data cubes, time series
- Terrascopes and predictive modeling
- Jupyter
- Data cubes, time series model calibration and problem solving tips in case of overfitting, underfitting, collinearity and data redundancy

There was too much of...

- assignment work
- Theoretical presentations
- tasks to do
- assignment too much work
- Luci.app
- data acquisition and self exploration of different platforms and how to use them properly
- Data processing, model tuning, variables consideration in terms of importance and relevance towards the topic of interest.
- Too much work, too little time

What is your takeaway message from the summer school? If you had to name 1 thing that you took away from the summer school, what is this?

- terrascopes and A bit of depth knowledge on LST
- Teamwork and collaborations are so crucial in research to make a project works. Everything is possible with just putting a bit of effort to learn and to try harder.
- The importance of responsive collaboration and how it impacts project outcomes.
- Delimiting and delegating responsibilities
- Motivation to get more involved in self learning related to remote sensing
- a learning experience
- Terrascopes, knowledge about urban heat island and new friends
- Great organization, and gentle people. Sharing of different experiences

Suggestions for improvement/ I Missed...

- Social interaction maybe with some online platforms
- Try different approaches and perspectives to enhance our model accuracy. Work with less variables to overcome some complications when building the model.
- Time for relaxation and ability to process the huge amount of info we go throughout Phase 2 and trying the platforms I wanted to explore
- Scheduling special time for social interaction and speed networking.
- Meeting with a tutor and classmates
- wonder how this summer school would be in offline setting
- Specific meeting with a tutor for the group item
- not enough time to bring the group work to a final stage, there was more that could have been done



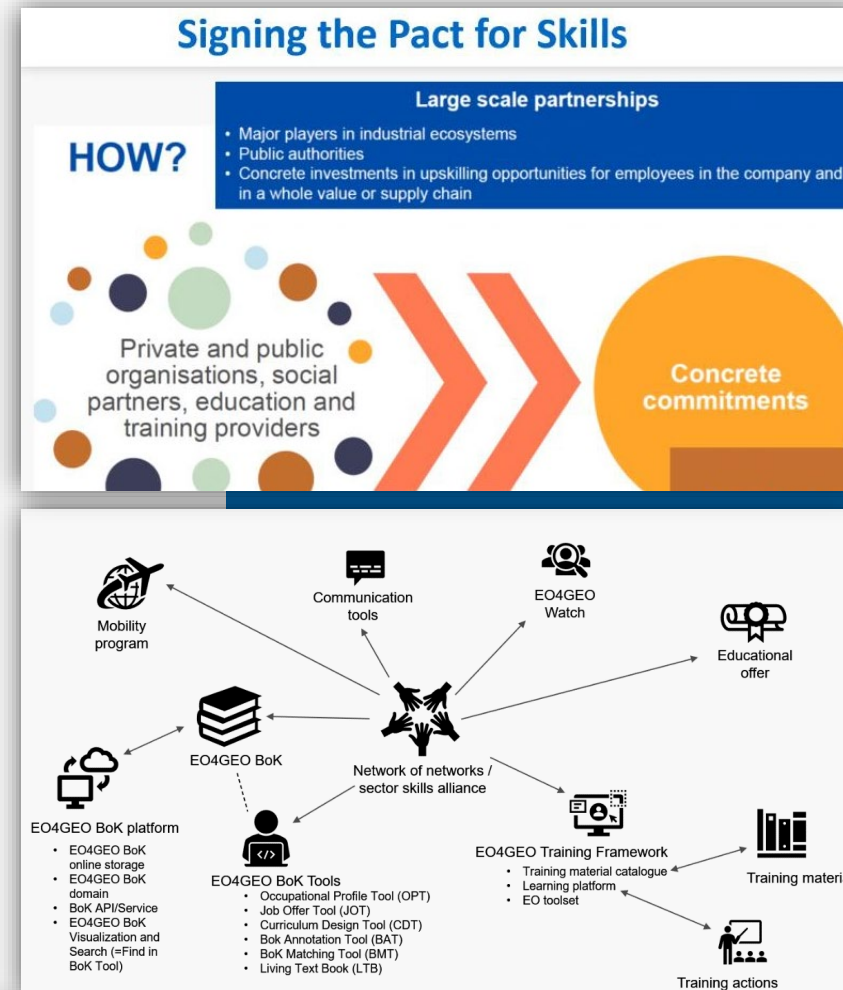
Towards a sustainable skills alliance

EO4GEO TRAINING FRAMEWORK



By accessing this link, you will find:

- a [training material catalogue](#), containing the training material developed in EO4GEO together with pointers to external training material. It acts as a user interface and retrieves information from a training material repository;
- a link to a [Moodle learning platform](#), including all the [training actions](#) organized both by EO4GEO and by external organizations;
- a link to an [EO Toolset](#), intended to support the training actions. The toolset include the following resources:
 - [PROBA-V MEP](#)
 - [Terrascope Viewer](#)
 - [Jupyter Notebooks](#)
 - [User Virtual Machine](#)



THE ALLIANCE

The [Space/Geospatial Sector Skills Alliance](#) is a network of experts and stakeholders from academia, private and public sector to ensure the strategic cooperation among stakeholders on skills development in the EO*GI sector.

The Alliance will generate synergies between stakeholders that otherwise would experience difficulties in cooperation. It will bring solutions together in a challenge-oriented way, and, in the end, will help bridging the skills gap between the supply and demand of education and training in the Space/Geospatial sector.

The Space/Geospatial Sector Skills Alliance will have a strategic role in the coordination and management of the project outputs, in order to guarantee that they are constantly updated.

Thank you!

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