# Erasmus Mundus Joint Master

PARIS LODRON UNIVERSITY SALZBURG

Université Bretagne Sud

COPERNICUS MASTER IN DIGITAL EARTH

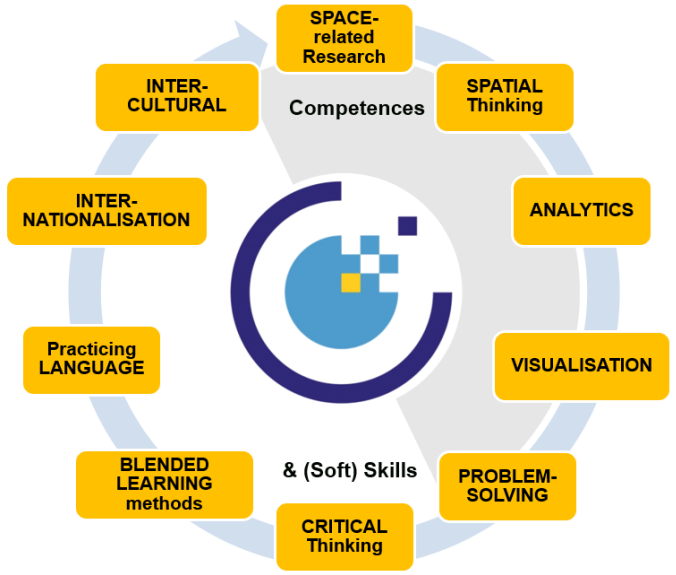
Palacký University Olomouc

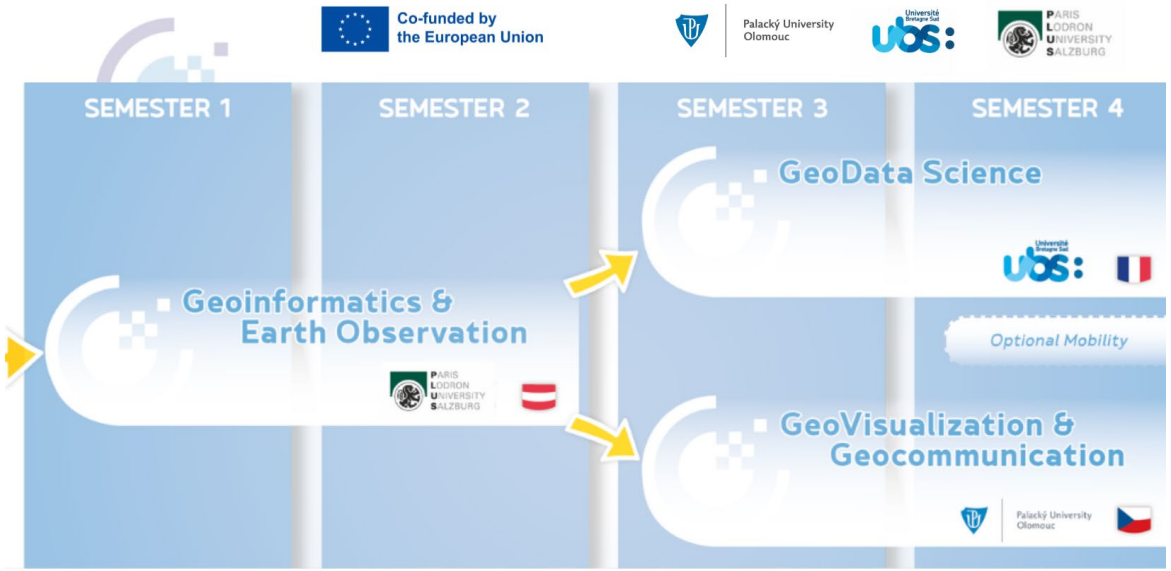
Co-funded by the European Union

www.master-cde.eu

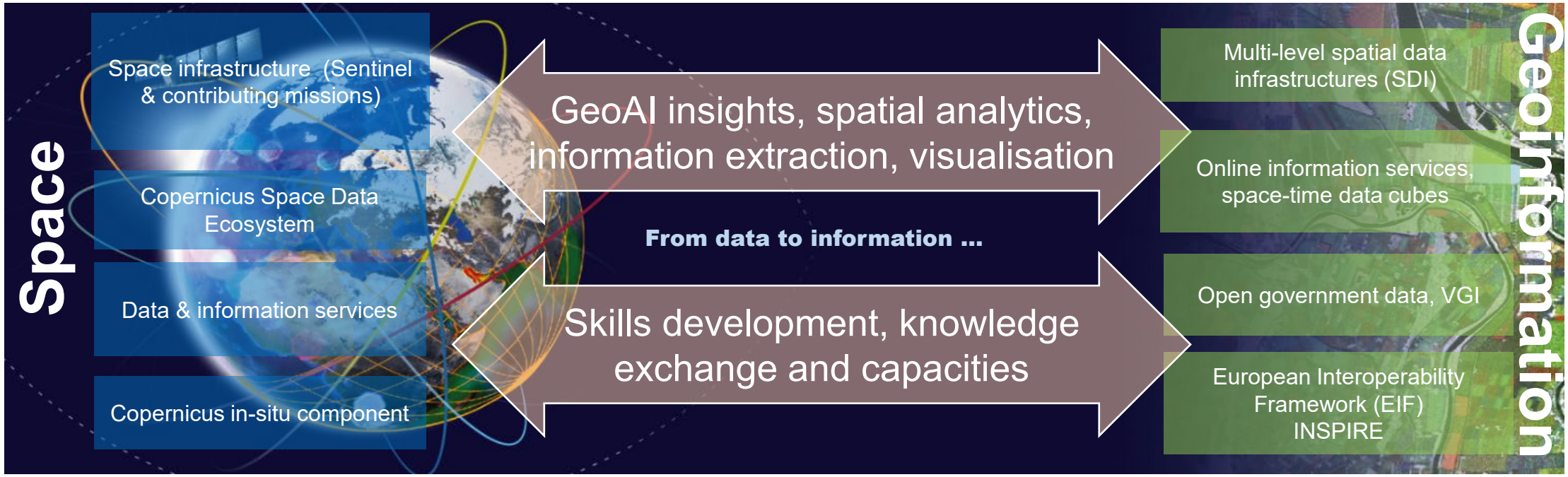
# Erasmus Mundus Joint Master

Key required EO*GI competences & skills of students enhance the employability of alumni worldwide, in Europe's space industry & the downstream sector.



# Space & Geoinformation




*Conventions, policy frameworks, global / regional commitments …*

United Nations Climate Change

SUSTAINABLE DEVELOPMENT GOALS

The European Green Deal

# Programme objectives

- ✓ To equip students with the **skills and knowledge to provide relevant geospatial information for addressing key societal challenges**, from climate change to digital transformation.
- ✓ To provide and address skill needs related to **turning data into value** for a variety of domains, as envisioned by the Copernicus mission.
- ✓ Complementary, matching these skills with the **more generic Digital Earth vision**, potentially impacting application scenarios on a global scale.
- ✓ To generate **'Copernicus' experts** in the fields Space and Geoinformation with a variety of occupational profiles, from technician to manager, to acquire key positions in industry and academia.

# Programme Accreditation

Accreditation under the **European Approach for Quality Assurance in Higher Education**

Agency for Quality Assurance and Accreditation Austria

The Agency for Quality Assurance and Accreditation Austria (AQ Austria) awards its quality seal

AQ Austria ACCREDITED

to the Joint Master's Programme

**Copernicus Master in Digital Earth (CDE)**

implemented at the following Universities:

**Paris Lodron University of Salzburg (PLUS) Austria**

**University of South Brittany (UBS) France**

**Palacký University Olomouc (UPOL) Czech Republic**

The Joint Master's Programme Copernicus Master in Digital Earth (CDE) complies with the "European Approach for Quality Assurance of Joint Programmes (2015)", approved by European Higher Education ministers in May 2015 in Yerevan (adopted by the Board of AQ Austria in its 36th meeting on 20th September 2016).

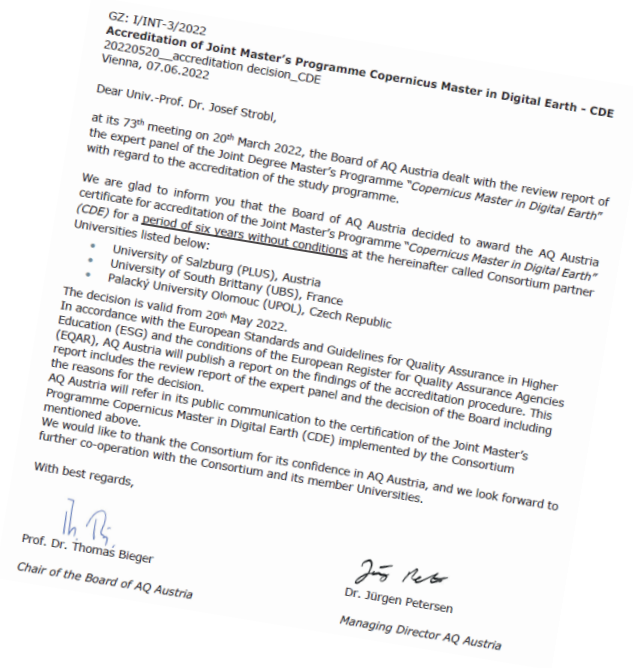
The accreditation is valid until 19th May 2028.

Vienna, 20th May 2022

Prof. Dr. Thomas Bieger
President of the Board of AQ Austria

Dr. Jürgen Petersen
Managing Director of AQ Austria

**awarded quality seal 2022-2028**



GZ: I/INT-3/2022

**Accreditation of Joint Master's Programme Copernicus Master in Digital Earth - CDE**

20220520__accreditation decision_CDE

Vienna, 07.06.2022

Dear Univ.-Prof. Dr. Josef Strobl,

at its 73th meeting on 20th March 2022, the Board of AQ Austria dealt with the review report of the expert panel of the Joint Degree Master's Programme "*Copernicus Master in Digital Earth*" with regard to the accreditation of the study programme.

We are glad to inform you that the Board of AQ Austria decided to award the AQ Austria certificate for accreditation of the Joint Master's Programme "*Copernicus Master in Digital Earth*" (CDE) for a period of six years without conditions at the hereinafter called Consortium partner Universities listed below:

- University of Salzburg (PLUS), Austria
- University of South Brittany (UBS), France
- Palacký University Olomouc (UPOL), Czech Republic

The decision is valid from 20th May 2022.

In accordance with the European Standards and Guidelines for Quality Assurance in Higher Education (ESG) and the conditions of the European Register for Quality Assurance Agencies (EQAR), AQ Austria will publish a report on the findings of the accreditation procedure. This report includes the review report of the expert panel and the decision of the Board including the reasons for the decision.

AQ Austria will refer in its public communication to the certification of the Joint Master's Programme Copernicus Master in Digital Earth (CDE) implemented by the Consortium mentioned above.

We would like to thank the Consortium for its confidence in AQ Austria, and we look forward to further co-operation with the Consortium and its member Universities.

With best regards,

Prof. Dr. Thomas Bieger
*Chair of the Board of AQ Austria*

Dr. Jürgen Petersen
*Managing Director AQ Austria*

# Our vision

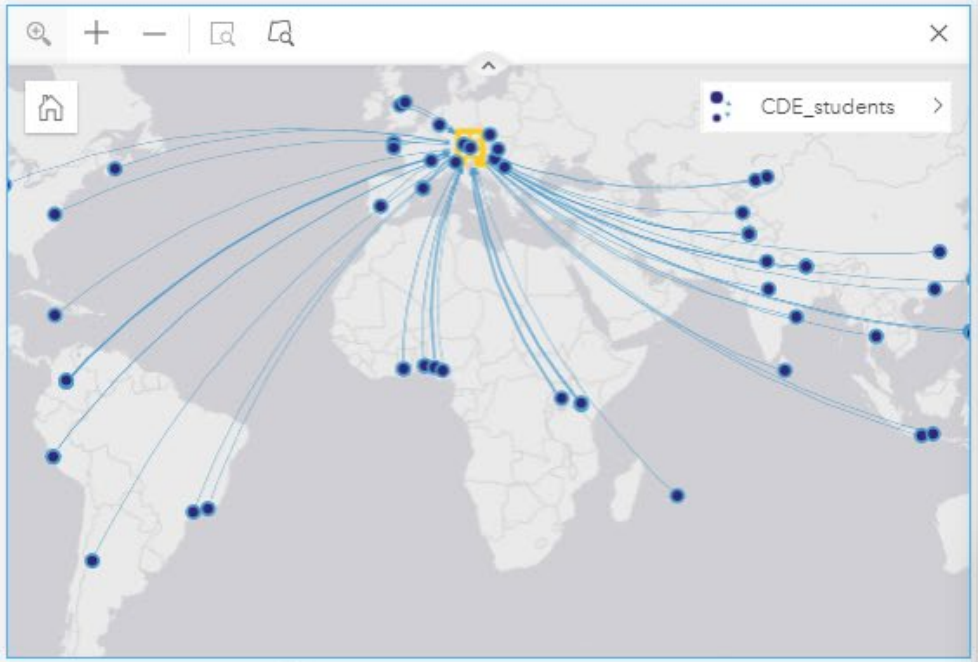
This Erasmus Mundus Joint Master shall be one of Europe's excellent postgraduate education, and a first choice programme for students worldwide in the fields Earth Observation and Geoinformation (EO*GI), Digital Earth, and Copernicus services.

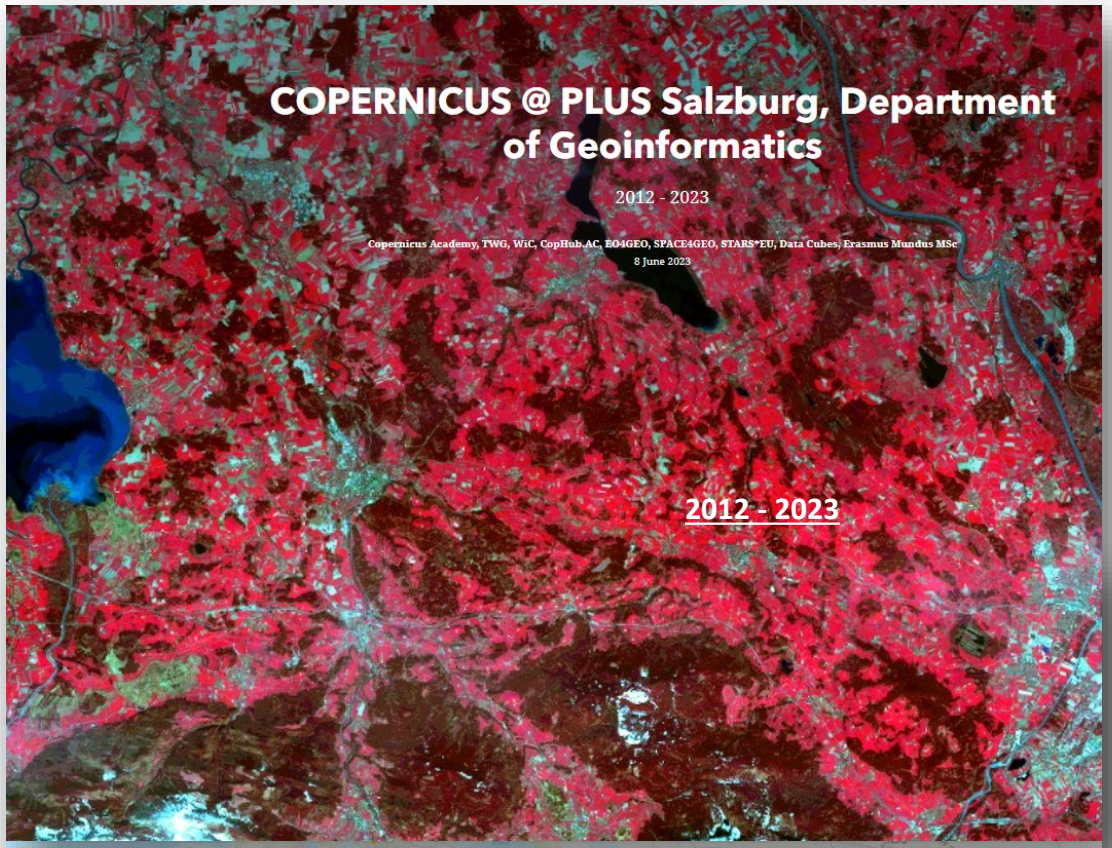
CDE Intakes

Wert suchen

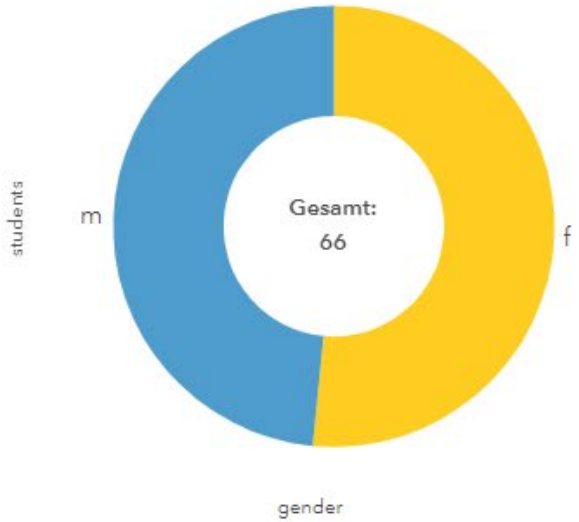
- Alle auswählen
- Intake 1
- Intake 2
- Intake 3
- Intake 4

CDE statistics

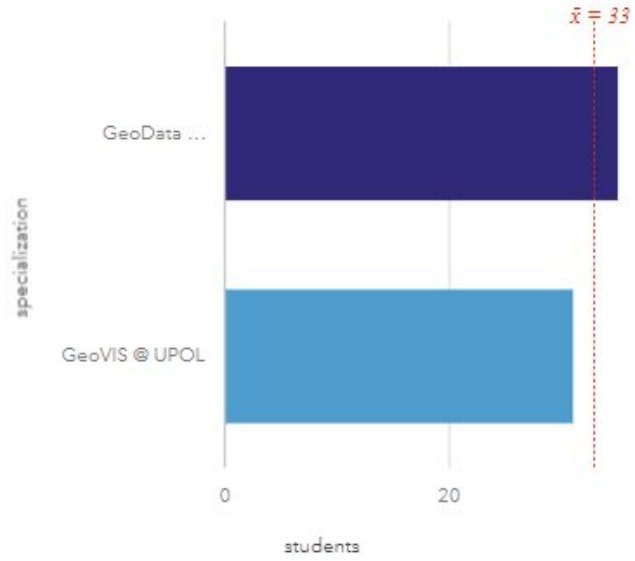


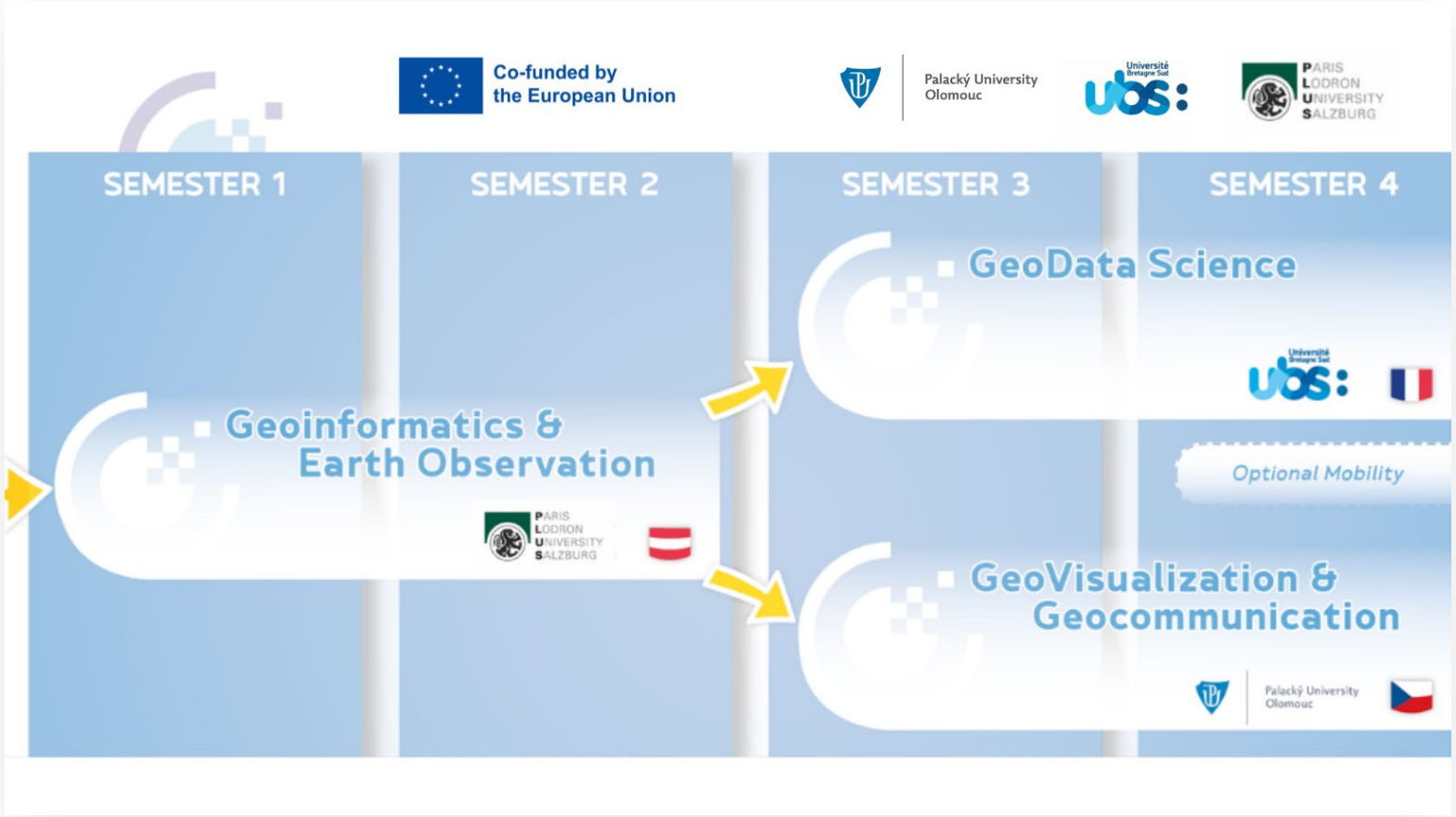

Student gender




2nd year specialization

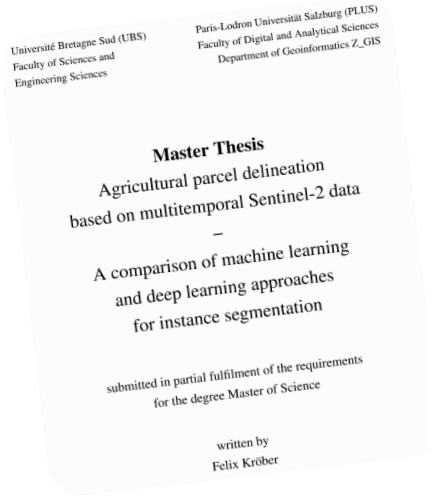


# EMJMD to EMJM: revised curriculum 2023



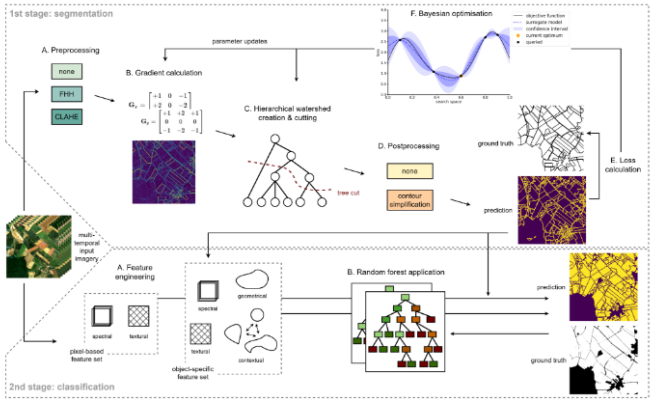

PROGRAMME STRUCTURE
COPERNICUS MASTER IN DIGITAL EARTH

| | ECTS |
|---|---|
| B1 – Orientation Project | 6 |
| B2 – Space-Time Models & Representations | 6 |
| B3 – Digital Earth Observation & Technologies | 12 |
| B4 – Spatial Image Analysis | 6 |
| B5 – Integrated Applications | 12 |
| SIP – Short Intensive Programmes | 9 \| 3 |
| UBS: GeoData Science & AI4EO | 30 |
| UPOL: Geovisualisation & Geocommunication | 30 |
| ES - Elective Subjects | 6 \| 12 |
| Master Thesis (incl Master's exam) | 21 |
| Work Placement / Internship | 12 \| 18 |
| **Total** | **120** |

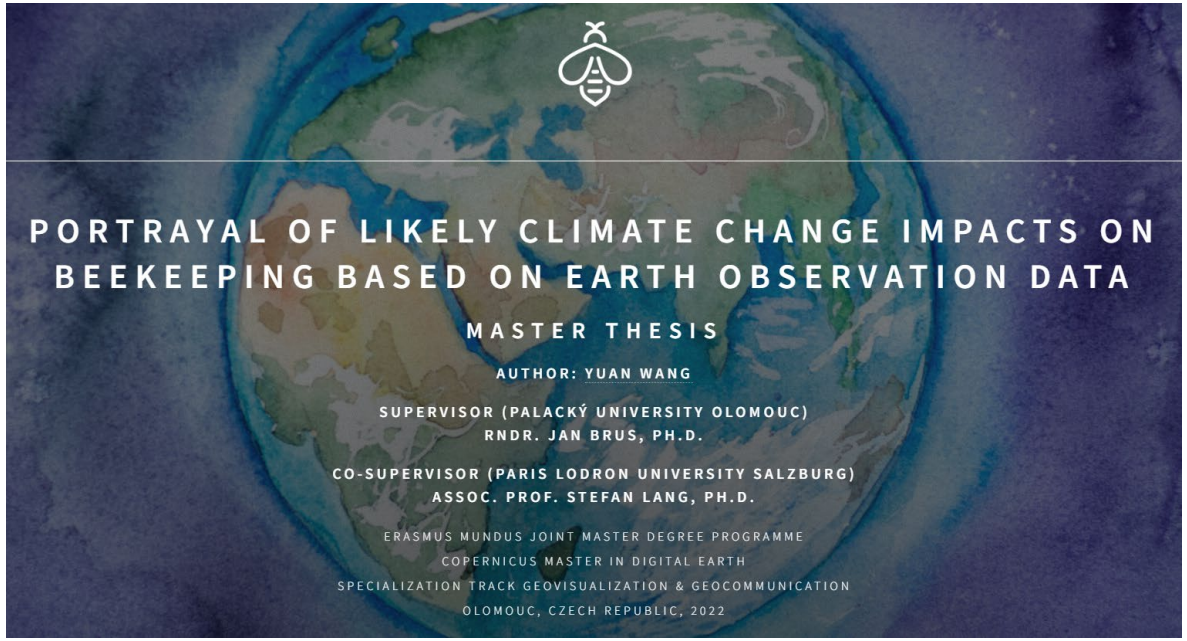



## Model A: Machine learning driven OBIA

As for the machine learning based approach, this work utilises an edge-based segmentation with a watershed tree at its core. This is followed by a Random Forest (RF) classifier to distinguish between agricultural and non-agricultural land. Due to the two stage character of this approach consisting of segmentation followed by classification – both parts incorporating knowledge about scene understanding and carried out in a supervised manner – we refer to this as a machine learning driven OBIA approach.



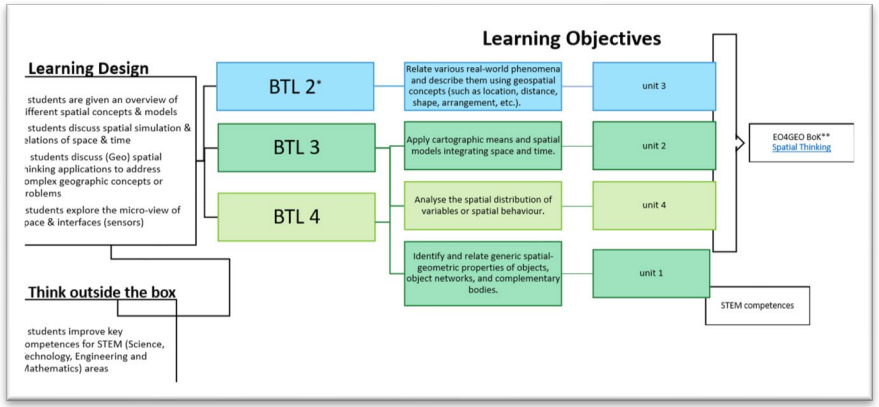

*Machine-learning driven OBIA workflow*

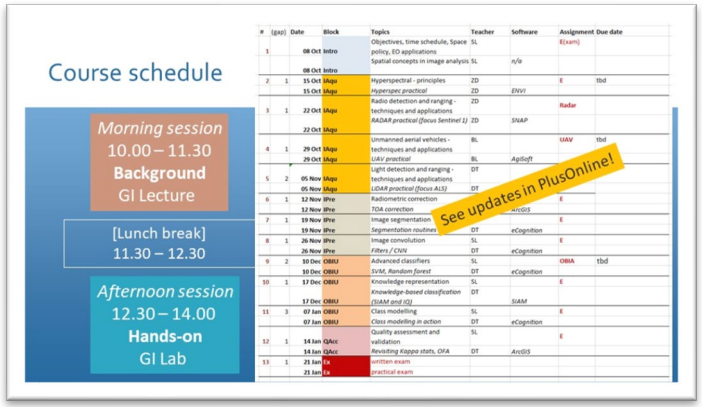


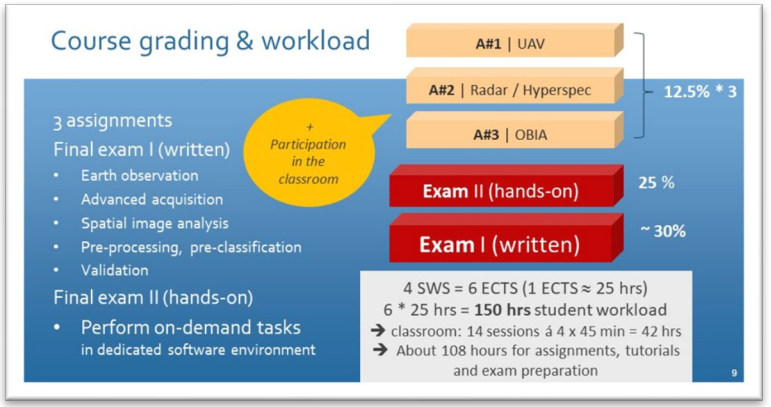

# Quality Assurance

- EO4GEO EO*GI Body of Knowledge
- Standardized joint syllabus & Blooms Taxonomy
- Joint teaching guidelines
- MSc supervision guidelines for students & supervisors
- Joint programme compliance with standards of EU Approach for QA in Higher Education

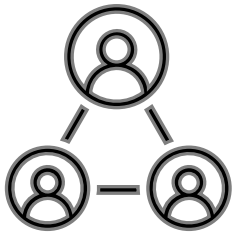
**Joint teaching QA coordinator**



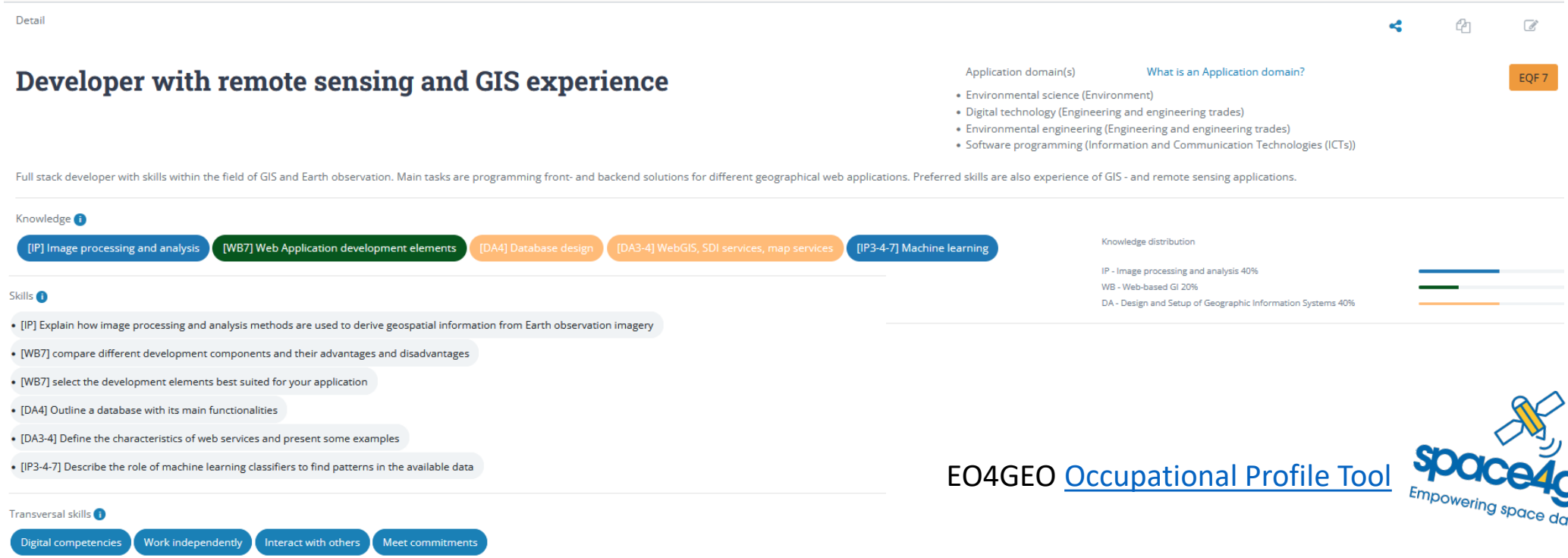




# Course level QA



- **Joint teaching quality assurance coordinator**
- **Teaching assistant**
- **Course tutor**




EO4GEO [Occupational Profile Tool]

space4geo
Empowering space data users

# International Standard Classification of Education (ISCED)

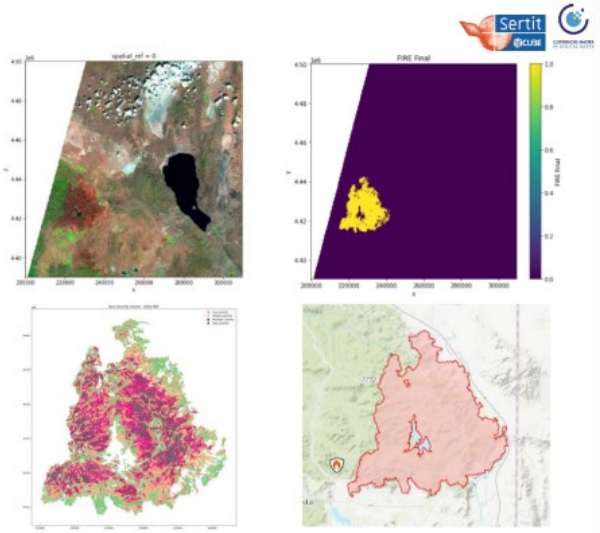
**ISCED 7: Master's or equivalent level:** designed to provide participants with advanced academic and/or professional knowledge, skills and competencies, leading to a second degree or equivalent qualification.

Programmes at this level may have a substantial research component but do not yet lead to the award of a doctoral qualification.

Typically, programmes at this level are theoretically-based but may include practical components and are informed by state of the art research and/or best professional practice.

They are traditionally offered by universities and other tertiary educational institutions. (see ISCED 2011 Manual, paragraph 241)

# Internship experience at ICube-SERTIT



Diamond Mountains, California – United States (July – August, 2021)

## RSS-Hydro Internship 2023

July to September 2023

RSS-Hydro

### Overview

I secured this internship by networking with individuals on LinkedIn. The internship, officially titled Geospatial Analyst, was carried out over two months, with a full-time schedule onsite at the company's offices in Luxembourg. RSS-Hydro operates across geospatial fields for a more sustainable and resilient future. The company uses the newest remote sensing, Earth Observation, computer models and drones to achieve industry impact and inform decision-makers in meeting the Sustainable Development Goals.

### Objectives

The main objectives of the internship included:

- Working with and analysing remotely sensed datasets from satellites and drones
- Operating drones, specifically the company's LiDAR drone and associated data
- Introduction to numerical modelling of hydrological processes for water risk

MASTERS ACTIVITIES

## ISCED 7

## EO*GI Scientists

postgraduate education

CDE graduates are confident in using key technologies pertinent to spatial information handling & upcoming trends in the field of Copernicus & Digital Earth. Answer research questions, including the development of hypotheses, definition of objectives, selection of methods, implementation of workflows, collection, analysis & interpretation of data as well as a written & oral communication & interpretation of outcomes in a decision support context.

INTERNATIONAL JOURNAL OF HUMAN–COMPUTER INTERACTION
https://doi.org/10.1080/10447318.2023.2272078

Taylor & Francis
Taylor & Francis Group

Check for updates

## Design Aspects for COVID-19 Dashboards – Evidence from Eye-Tracking Evaluation

Anna Porti Suarez and Stanislav Popelka

Department of Geoinformatics, Palacký University Olomouc, Olomouc, Czechia

**ABSTRACT**

The outbreak of the COVID-19 pandemic caused dashboards to become widely used by the public and decision-makers. Nevertheless, dashboard interfaces have been related to business intelligence since their origins, and the search for improvements in their design is not new. This article's objective is to conduct a user evaluation of COVID-19 dashboards that contain geospatial information. This is done through a formative study to identify problematic aspects of user/dashboard interaction. This is enhanced by comparing two self-developed dashboards that, according to previous tests, have functionalities with different appearances. User evaluation is performed through mixed research that combines objective (eye-tracking) and subjective (a questionnaire and an interview) methods. The results generate recommendations for better-designed dashboard interfaces that can transfer information appropriately. The vital elements needed to achieve this are interactivity, the option to choose the metrics, and the distribution of the elements in the layout, [illegible] a role in a more user-friendly interaction between the user and the dashboard.

**KEYWORDS**

Dashboard; eye-tracking; geospatial information; qualitative methods; usability testing; user interface

ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume V-2-2022
XXIV ISPRS Congress (2022 edition), 6–11 June 2022, Nice, France

## CROCO: CROSS-MODAL CONTRASTIVE LEARNING FOR LOCALIZATION OF EARTH OBSERVATION DATA

Wei-Hsin Tseng[1] Hoàng-Ân Lê[1,*] Alexandre Boulch[2] Sébastien Lefèvre[1] Dirk Tiede[3]

[1] IRISA, Université Bretagne Sud, France
[2] Valeo.ai, France
[3] Department of Geoinformatics - Z_GIS, University of Salzburg, Austria

Earth Science Informatics (2022) 15:2031–2049
https://doi.org/10.1007/s12145-022-00832-5

SOFTWARE ARTICLE

Check for updates

## ET2Spatial – software for georeferencing of eye movement data

Minha Noor Sultan[1] · Stanislav Popelka[1] · Josef Strobl[2]

Received: 23 February 2022 / Accepted: 13 June 2022 / Published online: 24 June 2022
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**Abstract**

The paper focuses on the development of an open-source utility tool for the analysis of eye-tracking data recorded on interactive web maps. The tool simplifies the labor-intensive task of frame-by-frame analysis of screen recordings with overlaid eye-tracking data in the current eye-tracking systems. The tool's main functionality is to convert the screen coordinates of the participant's gaze to real-world coordinates and allow exports in commonly used spatial data formats. The paper explores the existing state-of-art in an eye-tracking analysis of dynamic cartographic products as well as the research and technology aiming at improving the analysis techniques. The developed software, called ET2Spatial, is tested in-depth in terms of performance and accuracy. The capabilities of GIS software for visualizing and analyzing recorded eye-tracking data are investigated. The tool aims to enhance the research capabilities in the field of eye-tracking in geovisualization.

**Keywords** Utility · Eye-tracking · Georeferencing · Interactivity · User-logging · GIS

Open Access Article

## Crop Type Mapping from Optical and Radar Time Series Using Attention-Based Deep Learning

by Stella Ofori-Ampofo [1,2], Charlotte Pelletier [1,*] and Stefan Lang [2]

[1] IRISA UMR CNRS 6074, Campus de Tohannic, Université Bretagne Sud, 56000 Vannes, France
[2] Christian Doppler Laboratory for Geospatial and EO-Based Humanitarian Technologies, Department of Geoinformatics—Z_GIS, University of Salzburg, 5020 Salzburg, Austria
* Author to whom correspondence should be addressed.

*Remote Sens.* **2021**, *13*(22), 4668; **https://doi.org/10.3390/rs13224668**

COPERNICUS MASTER IN DIGITAL EARTH

Co-funded by the European Union

PARIS LODRON UNIVERSITY SALZBURG

Palacký University Olomouc

Université Bretagne Sud

# Global Responsibility

"Geospatial technologies, including satellite Earth observation, are key enabler in addressing the grand challenges of our one world and offering possible solutions. For several decades, we have worked on R&D and innovation in the EO*GI domain, fostering sustainable development for enhancing and safeguarding the diversity and integrity of our environment and society. The current CDE programme is clearly positioned towards this global endeavour. As teachers and students, we commit ourselves to a responsible usage of tools and algorithms, which we shall actively shape for the sake of a peaceful and a sustainable future." *Programme Board*

# International consortium

Palacký University Olomouc

PARIS LODRON UNIVERSITY SALZBURG

Université Bretagne Sud

INPE

space4geo

GISIG
Geographical Information Systems International Group

UNIVERSIDAD DE MÁLAGA

ETC UMA

UiB

EARSC
European Association of Remote Sensing Companies

terranea

tracasa global

UNU EHS

UNIVERSITÄT BONN

UNIVERSITY OF BUCHAREST
VIRTUTE ET SAPIENTIA

spatial services
WHERE **GEOINFORMATION** MEETS **TECHNOLOGY**

Sertit ICUBE

EBERHARD KARLS UNIVERSITÄT TÜBINGEN

MAKERERE UNIVERSITY

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msc-cde@plus.ac.at

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LinkedIn

join & participate

# Programme & Project Management

Stefan Lang

**Joint Programme Coordinator & Academic Lead**

Barbara Schernthanner-Hofer

**Programme Board**

Dirk Tiede

**Programme Board**

Barbara Brunner-Maresch

**Project Management & Student support**

## Department of Geoinformatics

## Earth Observation & Geoinformatics

B1 - Orientation Project

B2 - Space-Time Models & Representations

B3 - Digital Earth Observation & Technologies

B4 - Spatial Image Analysis

B5 - Integrated Applications

PARIS LODRON UNIVERSITY SALZBURG

# Programme & Project Management

Sébastien Lefèvre
**Programme & Selection Committe Co-Chair**

Charlotte Pelletier
**Programme Board**

Sandra Vessier
**Head of International Office**

Pernelle Blaise
**Student support**

## Mathematics, Computer Science, Statistics Department

## GeoData Science & AI4EO

Fundamentals of Data Science

- Machine Learning
- Foundations of Deep Learning
- Big Data

Artificial Intelligence for Earth Observation

- Efficient Remote Sensing Image Processing
- Deep Learning for Computer Vision
- Geospatial Data Analytics Project

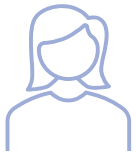
# Programme & Project Management

Vít Vozenílek

**Programme & Selection Committe Chair**

Alena Vondrakova

**Programme Board**



Dana Gronychová

**Coordinator of International Mobility**

Jakub Koníček

**Student support**

## Department of Geoinformatics

## Geovisualisation & Geocommunication

Geovisualisation

- Systematic Geovisualisation
- Advanced Methods of Geovisualisation
- Design in Geovisualisation

Geocommunication

- Cognitive Cartography
- Web Cartography

Electives

Palacký University Olomouc

# Contact

Paris-Lodron University Salzburg
**Department of Geoinformatics**
Schillerstrasse 30
5020 Salzburg
Austria

47.82380499847819, 13.039431310898214

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**Erasmus Mundus Joint Master**

**Project & Programme Office**
**Email:** msc-cde@plus.ac.at
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