



**HAL**  
open science

## Education and research projects for preparing young researchers for future career in Earth Observation

Josiane Mothe, Valentina Ciaccio, Fabio Del Frate, Davide De Santis, Mihai Ivanovici, Johan Leduc, Daniela Necşoi, Aude Nzeh Ndong, Nathalie Neptune, Marco Recchioni, et al.

### ► To cite this version:

Josiane Mothe, Valentina Ciaccio, Fabio Del Frate, Davide De Santis, Mihai Ivanovici, et al.. Education and research projects for preparing young researchers for future career in Earth Observation. International Geoscience and Remote Sensing Symposium (IGARSS 2023), IEEE: Institute of Electrical and Electronics Engineers; GRSS: Geoscience and Remote Sensing Society, Jul 2023, Pasadena, CA, United States. à paraître. hal-04085119

**HAL Id: hal-04085119**

**<https://hal.science/hal-04085119>**

Submitted on 28 Apr 2023

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

# EDUCATION AND RESEARCH PROJECTS FOR PREPARING YOUNG RESEARCHERS FOR FUTURE CAREER IN EARTH OBSERVATION

*Josiane Mothe<sup>1</sup>, Valentina Ciaccio<sup>3</sup>,  
Fabio Del Frate<sup>4</sup>, Davide De Santis<sup>4</sup>, Mihai Ivanović<sup>5</sup>,  
Johan Leduc<sup>1</sup>, Daniela Necsoi<sup>5</sup>, Aude Nzeh Ndong<sup>2</sup>,  
Nathalie Neptune<sup>1</sup>, Marco Recchioni<sup>3</sup>,  
Zia Ullah<sup>1</sup>, Giovanni Schiavon<sup>4</sup>, Federica Bassini<sup>4</sup>*

<sup>1</sup> Université de Toulouse, IRIT CNRS UMR5505, Toulouse, France

<sup>2</sup> Aérospatiale Valley, Toulouse, France

<sup>3</sup> ReMedia Group, Rome, Italy

<sup>4</sup> University of Rome "Tor Vergata", Rome, Italy

<sup>5</sup> Transilvania University of Brasov, România

The data availability and advances in Artificial Intelligence has led to a large increase in the market of Earth Observation (EO). It is now open to many fields and industries that look every day for new ways of operating those data. An increasing need of qualified employees is also developing, to manage at best EO data. InnEO'Space PhD programme, which aims at guiding young researchers in their future or starting career, has created modern and transferable PhD courses and learning resources to address these needs, and enhance and develop researchers' innovation-oriented skills through Earth Observation.

To contribute to PhD programs modernization, InnEO'Space created two programs, the InnEO Startech and the Machine Learning for Earth Observation InnEO Summer school. InnEO Startech aims to develop skills like innovative spirit, entrepreneurship, leadership and management, whereas the summer school focuses on open science (IPR, research management, ethics...), excellence in EO and Machine Learning, and soft and transversal skills. In support of these courses InnEO'Space PhD developed the open, integrated, and usable InnEO platform, boosting learning, professional and community resources. We developed SPOCs, Small Private Online Courses, asynchronous e-learning courses that use blended learning and short videos. Each of the SPOCs consists of 25 hours of pedagogical content in total, 1 hour for the final assessment, 8 hours are resources for students (mainly videos) and 16 hours for students' homework, intermediate tests with almost always automated correction, and individual study. Participants can acquire ECTS (European Credit Transfer Accumulation System). A SPOC is composed of a certain number of units, each unit being semantically coherent (See Figure 1). This general structure has been adapted for each SPOC.

A SPOC has a small number of participants who have to fulfil specific requirements and whose aim is to learn specific knowledge and skills. This, and the related closer relationship with instructors and tutors, differentiates it from MOOCs (Massive Open Online Courses) [1]. The small size of the group in SPOCs allows to remove the non-centrality of the students in the learning process identified as one of the main constraints in asynchronous e-learning. The blended learning course integrates collaborative and cooperative dimensions of learning, supporting individual interaction with the teacher into the learning process.

Three SPOCs have been developed and are available on the platform. One is on entrepreneurship based on our Startech program. It aims to develop skills like innovative spirit, leadership and management and relies on the Business Model Canvas. Two SPOCs are based on the lectures and practical work conceived for the summer schools: one focuses on technical skills related to Earth Observation and Machine Learning while the other is on soft and transversal skills. The importance of soft skills in the STEM (Science Technology Engineering Mathematics) field is increasingly emphasized in the era of the Industry 4.0 revolution [2]. We focused specifically on soft skills related to effective communication and the creation and management of a successful team. All teaching units are indexed, according to the skills, with ESCO-European Skills, Competences, Qualifications and Occupations indicator [3].

In addition, the InnEO PRO section allows PhD students and other members such as experts in the EO and ML fields to interact with each other. It also gives access to professional community resources and job ads, proposals and research streams and promote joint research and innovation. It contains digital and soft skills self-assessment tests, as well as a tool to create an Europass CV. This tool responds to the view that it is important to give PhDs and young researchers not only training in hard and soft skills, but also tools related to knowing how to

move within the working world by understanding, for example, how to handle conflicts or how to best present their own competences.

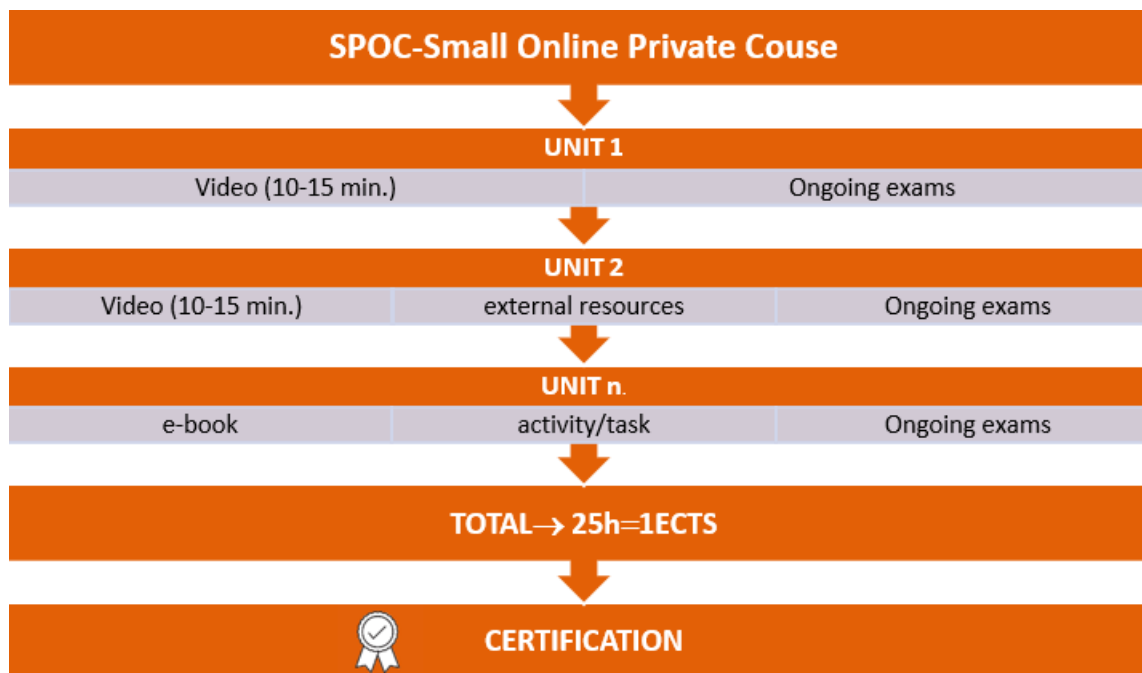


Figure 1 SPOC structure

The platform and the SPOCs have been evaluated by a first series of users. After each unit, the participants answered a questionnaire about the contents and the way it is provided as well as a survey to evaluate the platform and the interaction tools.

Satisfaction surveys enlighten potential areas for improvement.

The development of Earth Observation, Artificial Intelligence, and Machine Learning bring a whole new range of possibilities, concerning several markets. The program we have developed aims to develop e-learning tools and processes which are transferable for any PhD program wishing to support students and young researchers in their starting career, by teaching both technical and soft skills, to improve their employability, in agreement with the current needs of the market.

The Startech modules have been reused for the European project UNIVERSEH<sup>1</sup>, that aims to create a European university focus on space thematic. The SPOCs have been promoted by FabSpace<sup>2</sup>, an innovation network focused on the exploitation of geo-spatial data in universities. Resources produced will be exploited by AI4AGRI, Artificial Intelligence and Earth Observation for Romania’s agriculture, which aims to create a dedicated research center for AI in EO for the agricultural sector, to develop administrative and management skills for research and innovation, and to enhance the networking activities between partners through joint research, joint summer schools and workshops. The research component of the AI4AGRI<sup>3</sup> project implements the principle of “learning by doing” for training the young generations of researchers in the EO domain. Addressing top priorities of EU (like agriculture, open data and open science) is an important aspect of the afore-mentioned projects.

<sup>1</sup> UNIVERSEH, European Space University for Earth and Humanity Grant agreement ID; 101035795 <https://universeh.eu/>

<sup>2</sup> Fabspace, Grant agreement ID; 101006275, is an innovative network based on EO data analysis within universities <https://www.irit.fr/FabSpace/>

<sup>3</sup> AI4AGRI, Romanian Excellence Center on Artificial Intelligence on Earth Observation Data for AGRiculture, <https://ai4agri.unitbv.ro/> Grant agreement ID; 101079136

## REFERENCES

- [1] J. Ruiz-Palmero, J. Fernández-Lacorte, E. Sánchez-Rivas et e. al., «The implementation of Small Private Online Courses (SPOC) as a new approach to education,» *International Journal of Educational Technology in Higher Education*, vol. 27, 2020.
- [2] M. Marsono, F. Khasanah et Y. Yoto, «Integrating STEM (Science Technology Engineering and Mathematics) Education on Advancing Vocational Student's Creative Thinking Skills,» chez *Proceedings of the 2nd International Conference on Vocational Education and Training (ICOVET 2018)*, 2018.
- [3] E. Commission, «The ESCO Classification,» [En ligne]. Available: <https://esco.ec.europa.eu/en/classification>. [Accès le January 2023].