

CHORAL

RESEARCH PROJECT *(max. 5 pages)*

APPLICATION FORM TO REQUEST FOR FUNDING FOR JOINTLY SUPERVISED DOCTORAL THESIS

TITLE OF THE RESEARCH PROJECT

Earth Observation Data Analysis for the Assessment of Climate Change Impact on Agricultural Crops Defining Cultural Heritage Areas

SUPERVISORS

From recruiting University	First name	LAST NAME	University	Department
Supervisor	Mihai	Ivanovici	Universitat ea Transilvania din Braşov	Electronics and Computers
HDR or equiv.				
<input checked="" type="checkbox"/>				
	First name	LAST NAME	University	Department
Co-Supervisor	Enrico	BorgognoMondino	University of Torino	Dipartimento di Scienze Agrarie, Forestali e Alimentari
HDR or equiv.				
<input checked="" type="checkbox"/>				

5 main KEYWORDS

Remote sensing data; Earth Observation; hyperspectral; SAR data; climate change.

ABSTRACT (250 words max.)

Specific agricultural crops and practices define the culture and the cultural heritage of villages and people in particular areas in Romania and Italy. For instance, Brasov region is renowned for its potato (also sugar beet) crops, thus the name of "Potato Country". Due to climate changes, the respective agricultural crops are being replaced with different ones (e.g. rape), more robust and resistant to the new climate conditions in Brasov area. The impact of climate changes on the specific areas translates into impact on the culture of the regions, leading to a depreciation and loss of the cultural heritage. Remote Sensing, especially the Earth Observation data from the Copernicus program of European Commission, especially from the Sentinel 1 and Sentinel 2 satellites, offer invaluable data with free access for the monitoring of agricultural crops. In this project we aim at developing algorithms and approaches for remote sensing / EO data analysis for the quantification of the specific impact on traditional agricultural crops, estimate the water demands of the traditional crops, evaluate the natural-based solution to preserve soil quality and predict the evolution in time that will affect the cultural heritage of the chosen areas in Romania and Italy. By the joint collaboration between a Romanian and Italian research labs and universities, we aim at making steps towards the development of climate change-aware global solutions, which are independent of the specific location of the particular under-study crop and consider the causality provided by the climatic changes.

Research aims and methodology

- Analyze agricultural crops on the identified cultural heritage agricultural sites from Romania and Italy (Brasov + Torino)
- Perform EO data analysis for the assessment of climate change impact (Brasov + Torino)
- Design and implement (using Matlab or Python) remote sensing data analysis (hyperspectral image + SAR) for country-specific crop water demands monitoring, soil quality preservation solutions evaluation/assessments (Brasov + Torino)
- Create a specific data set of remote sensing data + meta data/ground truth (Torino)

Relevance and added-value of the proposed research in relation to the current state of knowledge

- Contribute to open data and open science by creating a specific data set
- Contribute to the refinement of crop monitoring for climate change impact evaluation on specific traditional agricultural crops in Romania and Italy

Interdisciplinary nature of the research together with the alignment with the CHORAL programme and complementarity expertise of the teams

The research project brings together electronics engineering, telecommunications and information technologies and farming and agriculture with particular focus on remote sensing data analysis for applications in agriculture, where a transdisciplinary approach is vital.

Prof. Mihai Ivanovici is expert on designing algorithms for Remote Sensing/Earth Observation (EO) data, image processing and analysis with application to agriculture.

Prof. Enrico Corrado Borgogno Mondino is expert on geomatics and application of satellite/aerial/drones remote sensing, GIS, digital photogrammetry to forestry, agriculture and environment.

Output plan including publication and dissemination activities

Publications in IEEE IGARSS and IEEE WHISPERS. Plus IEEE TRANSACTIONS ON GEOSCIENCE AND REMOTE SENSING or MDPI REMOTE SENSING (or similar)

Estimated schedule

September 2024 – August 2025: Brasov (R&D Institute of Transilvania University) – identify regions and applications of interest, perform data preparation / remote sensing and EO data download and construction of a data set of images

September 2025 – August 2026: Torino (University) – perform EO data analysis

September 2026 – February 2027: Brasov (R&D Institute of Transilvania University) – refined EO data analysis

March 2027 – August 2027: Torino (University) – writing PhD thesis