



Horizon Europe Brokerage Event  
Cluster 6 Calls 2024

Brussels, 26 September 2023

# AI-based solutions for understanding multimodal and multitemporal remote sensing data

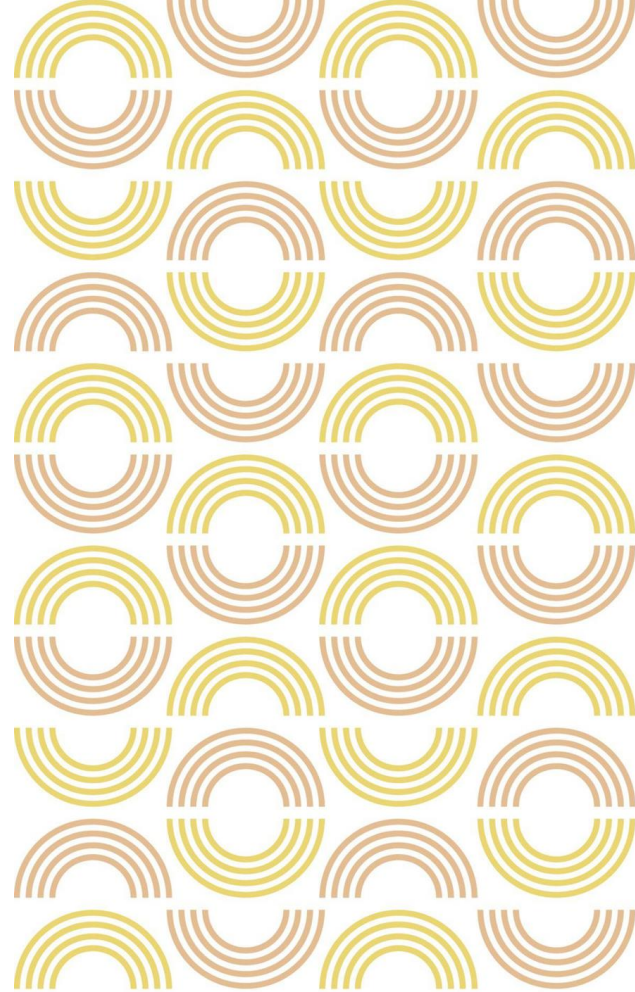
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## Topic addressed:

- HORIZON-CL6-2024-CLIMATE-01-4: Land use change and local / regional climate

## Other topics of interest:

- HORIZON-CL6-2024-GOVERNANCE-01-6: Develop innovative applications to support the European Green Deal, building on meteorological satellite data
- HORIZON-CL6-2024-BIODIV-01-2: Digital for nature
- HORIZON-CL6-2024-GOVERNANCE-01-7: Enhancing working conditions and strengthening the work force through digital and data technologies – the potential of robotics and augmented reality in agriculture
- HORIZON-CL6-2024-FARM2FORK-01-4: Climate change and food safety: effects of climate change on food safety across food systems
- HORIZON-CL6-2024-FARM2FORK-01-6: Citizens' science as an opportunity to foster the transition to sustainable food systems

## Expertise offered:

Artificial Intelligence / Remote Sensing /  
Multimodal Data Analysis / Time Series Analysis / Edge AI

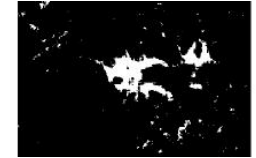
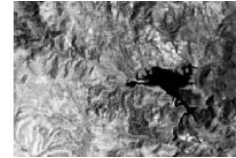
## Project idea

AI-based solutions for understanding multimodal and monomodal time series of remote sensing data

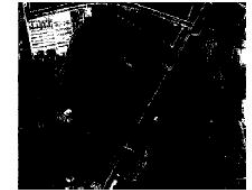
- Data collected by multiple sensors characterized by different physical properties (e.g., SAR / optical sensors, very high to low spatial resolution)
- Improved temporal resolution
- Continuous monitoring
- Data complementarity and heterogeneity
- Need for multimodal data processing and information extraction tools → **Multimodal data mining**

- Change detection algorithms in mono-modal (i.e., same sensor) and multi-modal (i.e., different sensors) setups → Land use change

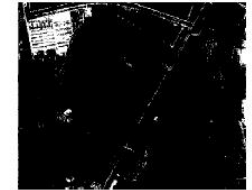
Flooding /  
disaster assessment\*



Urban development\*



Land use change\*



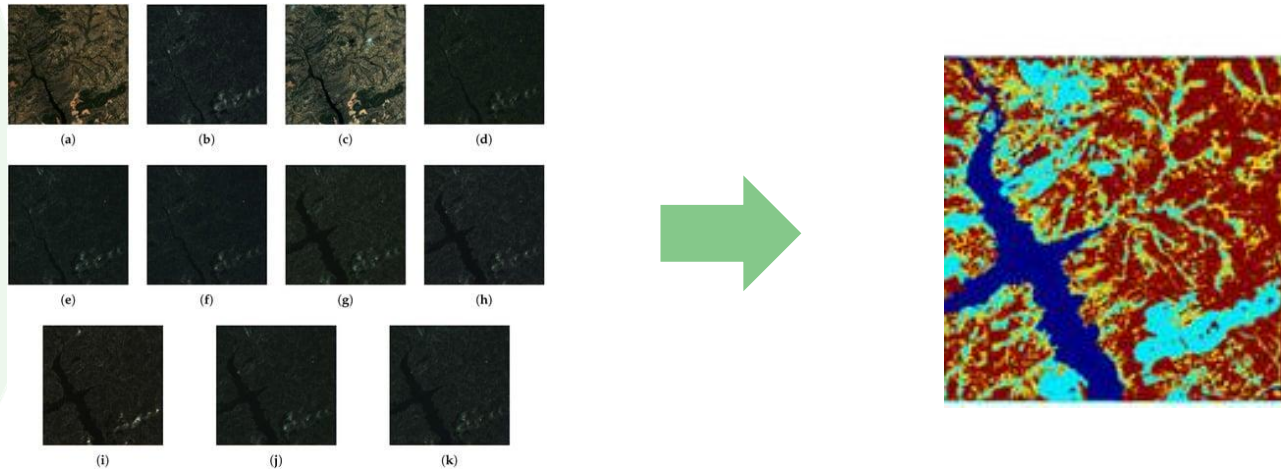
\*<https://sites.google.com/view/mdm-sits>

[1] A. Radoi, „Generative Adversarial Networks under CutMix Transformations for Multimodal Change Detection,” in IEEE Geoscience and Remote Sensing Letters, 2022, doi: 10.1109/LGRS.2022.3201003, ISI Q1, , Impact Factor 4.8

[2] A. Radoi, M. Unsalan, „Convolutional Neural Network-Based Fractal Coding Method For Image Translation In Multimodal Change Detection”, 2022 IEEE International Geoscience and Remote Sensing Symposium IGARSS, July 2022.

[3] A. Rădoi, M. Datcu, „Automatic Change Analysis in Satellite Images Using Binary Descriptors and Lloyd-Max Quantization,” IEEE Geoscience and Remote Sensing Letters, vol. 12, no. 6, pp.1223-1227, June 2015, ISSN: 1545-598X, DOI: 10.1109/LGRS.2015.2389144, , Impact Factor 4.8

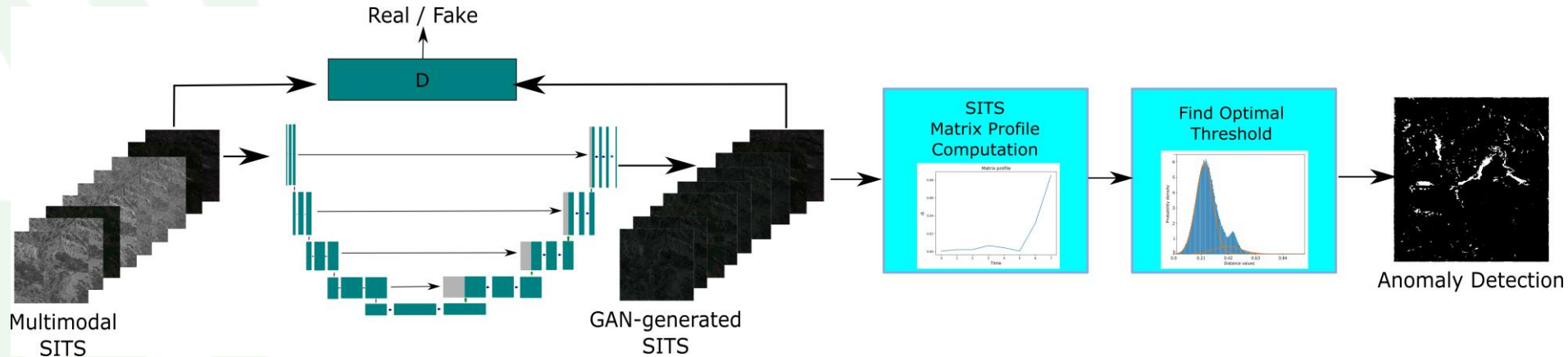
- Multi-modal and multi-temporal data analysis tools, e.g., unsupervised **identification of spatio-temporal evolutions** using Dynamic Time Warping



[4] A. Radoi, „Multimodal Satellite Image Time Series Analysis Using GAN-Based Domain Translation and Matrix Profile." Remote Sensing, 2022; 14(15):3734. <https://doi.org/10.3390/rs14153734>, ISI Q1, Impact Factor 5.0

[5] A. Rădoi, C. Burileanu, "Retrieval of Similar Evolution Patterns from Satellite Image Time Series", MDPI Applied Sciences, Vol. 8, 2018, 21 pag., <https://doi.org/10.3390/app8122435>, ISI Q2, Impact Factor 2.7

- Multi-modal and multi-temporal data analysis tools, e.g. anomaly detection using time series analysis tools





- **EDGE AI**
  - Deployment of AI models onto resource-limited hardware platforms (e.g. embedded systems with NVIDIA Jetson GPUs or NXP Risc V);
- **Multimodal Data Analysis**
  - Fusion of multimodal information;
  - Deep Learning for multimodal data interpretation.



## Main expertise offered:

Domains of research: Artificial Intelligence / Remote Sensing / Multimodal Data Analysis / Time Series Analysis / Edge AI

- > 50 publications (more than half as main author)
- Project coordinator / university responsible for national projects funded by Ministry of Research, Innovation and Digitization :
  - Multimodal Data Mining in Satellite Image Time Series for Earth Observation (<https://sites.google.com/view/mdm-sits>, 2020-2022)
  - Transforming a Massive Volume of Data and Geospatial Information in Actionable Intelligence (2021-2023)
  - Multimodal Embedded System for Emotion Recognition (2022-present)
- Team member in numerous national / international projects:
  - EELISA European Engineering Learning Innovation and Science Alliance (ERAMUS+)
  - Key person @ Data Mining For Analysis and Exploitation of Next Generation of Time Series (ESA funded project, 2015-2016)
  - Open Source Image Retrieval – Integration of Developed Tools (ESA funded project, 2015-2016)
  - RISC V-based hardware-software system for Machine Learning Applications (NXP funded project, 2019)
  - UAV platform (unmanned aerial vehicle) with dedicated capabilities and support infrastructure with applications in national security missions (Ministry of Research, Innovation and Digitization, 2017-2020)
  - Technologies and innovative video systems for person re-identification and analysis of dissimulated behavior (Ministry of Research, Innovation and Digitization, 2017-2020)
  - Long-Term Exploitation of Satellite Image Time Series (Romanian Space Agency, 2014-2015)
- Role in project: **partner**.



## Contact details

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