



6TH SCHOOL ON HIGH-PERFORMANCE AND DISRUPTIVE COMPUTING IN REMOTE SENSING

HDCRS - Working Group of the IEEE GRSS Earth Science Informatics Technical Committee (ESI TC)

DORA BLANCO HERAS (UNIVERSITY OF SANTIAGO DE COMPOSTELA)

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SENIOR RESEARCHER CITIUS (CENTRO SINGULAR DE INVESTIGACIÓN EN TECNOLOGÍAS INTELIXENTES)





Centro Singular de Investigación
en Tecnologías Intelixentes



citius.gal



TEAM

+180 PEOPLE

35 SENIOR RESEARCHERS

SCIENTIFIC AREAS

Green and smart computing and devices



Electronic design of
intelligent devices



High Performance
Computing

Foundations of artificial intelligence



Data and process
science and engineering



Automatic learning
and reasoning

Intelligent technologies



Virtual and
augmented reality



Language
technologies



Computer vision



Robotics

Ethical, legal, social, economic
and cultural framework (ELSEC)



Trustworthy AI

R&D RESULTS 2023-25

ARTICLES



78% in **Q1**
45% in **D1**

22 M (€))))))

16% income from
european projects

10% in top 10% **most cited**

SOME INTERNATIONAL PROJECTS



ERC Consolidator Grant
Nanoscale design using Virtual Reality



Horizon Europe
MSCA Doctoral Networks
Hybrid intelligence to monitor, promote
and analyse transformations in good
democracy practices (Coordinator)



Horizon Europe
EIC Pathfinder Challenges
RePowerSiC: High-efficiency high-power
laser beaming in-space systems based on
sic (Coordinator)



Horizon Europe
EUROHPC-JU
QEX: Quantum Excellence Center



Horizon Europe
EIC Pathfinder Open
bLOSSom: Self-Sustained Photonic Systems
through Autonomous LOSS Harvesting



Horizon Europe
Sustainability Optimization for Secure Food Systems



Horizon Europe
Intelligent Reading Improvement
System for Fundamental and
Transversal Skills Development



Digital Europe
DIH for the deployment of AI and Data
Analytics in SMEs in the primary,
biotechnological and health sectors



EUROHPC AI Factories
1Health AI: European One Health
Artificial Intelligence Factory



'Numadelic' VR experiences for improving mental health
outcomes in patients facing life-threatening illness

SOME STRATEGIC PROJECTS



Artificial Intelligence
at the service of the
Galician Language



Cátedra USC-Plexus de IA aplicada a la
Medicina Personalizada de Precisión

Plexus Tech - USC Chair
in AI applied to personalised precision medicine



Cátedra Televes de
MICROELECTRÓNICA



Televes - USC Chip Chair in microelectronic design

AWARDS



SPIN-OFFS



CONGRESS



Santiago, the world capital of AI in 2024

CITIUS: SCIENTIFIC AREAS



High
performance
computing



Electronic design of
intelligent devices

Devices and
computing
resources

Earth
Observation



Computer
Vision



Virtual and
augmented
reality



Language
technologies



Robotics

Intelligent Technologies

Automatic
learning and
reasoning



Support to machine
intelligence

Natural and artificial
intelligence



Intelligent
systems and
environments

Trustworthy
AI



Social, economic, ethical
and political framework

APPLICATIONS OF REMOTE SENSING

Observing objects and phenomena from a distance without physical contact allows for numerous applications



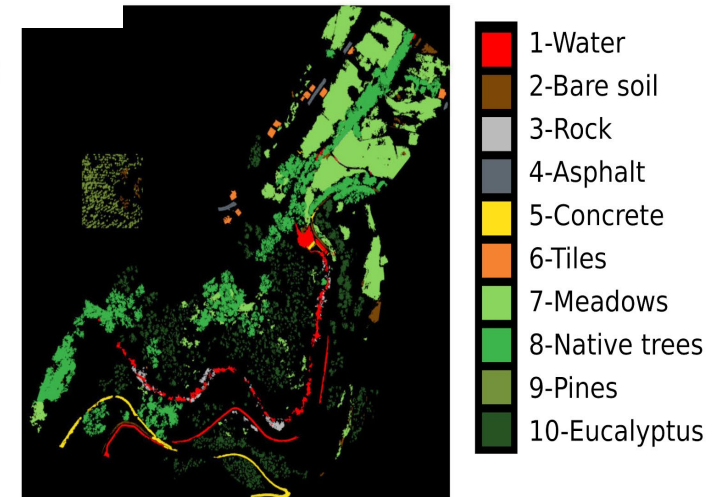
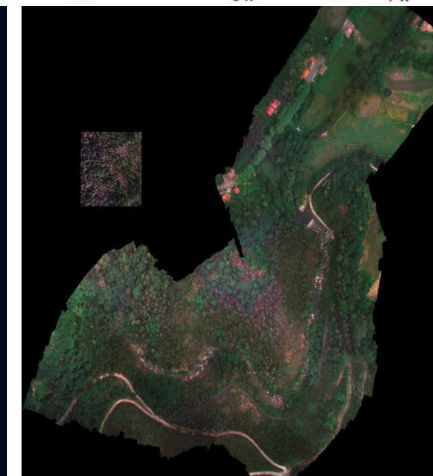
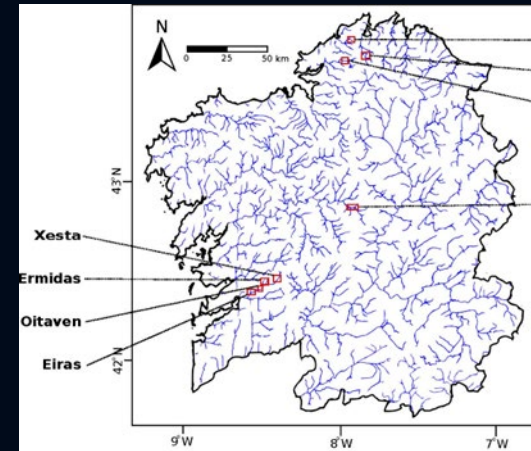
- Non invasive method in contrast to in situ or on-site observation
- Efficient and continuous observation of the Earth and its changes
- Satellite platforms provide repetitive and consistent view

THE EARTH OBSERVATION DATA LANDSCAPE IS EXPANDING

Dramatic increase in EO data:

- satellite missions and other EO initiatives;
- in situ sensors;
- airborne / drone imagery;
- citizen /field data;
- maps and forecasts;
- model outputs
- ...

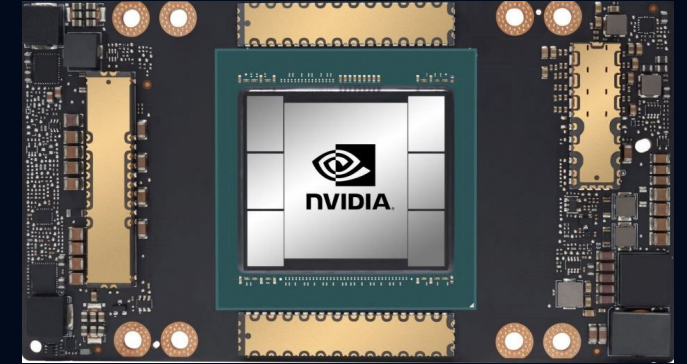
Multisource + multitemporal + multi-resolution data, with strong demands on access, preprocessing, storage, and reproducible computation.



AI HAS CHANGED THE COMPUTING REQUIREMENTS

Solving EO problems often exceeds the capabilities of personal computing resources:

- DL networks require high performance computing
 - o Foundation Models that generalize across geographies, sensors, and downstream tasks: Trained on vast amounts of unlabeled data through self-supervised training¹⁵.
- Highly specialized supercomputers are required
- Increasing popularity of GPUs (parallelizing matrix/tensor operations via vectorization), TPUs, specialized hardware as in-memory computing chips
- High interest in the promising solutions offered by Quantum computing



COMPUTING PARADIGMS AND INFRASTRUCTURES



Supercomputing



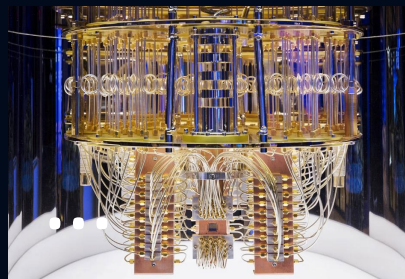
Specialized Hardware
Computing



Cloud computing



Edge Computing



Quantum Computing



Neuromorphic Computing

IEEE GRSS



IEEE is the largest academic and professional Society with ~430,000 members in 160 countries



<https://www.grss-ieee.org/>



GRSS location: All over the world



Beginnings: Founded in 1961



GRSS mission: Fosters engagement for the benefit of society through science, engineering, applications, and education related to geoscience and remote sensing



Scope: Includes theory, concepts, and techniques of remote sensing of the Earth, oceans, atmosphere, and space, as well as processing, interpretation, and dissemination of this information



GRSS members: ~4,200+ members in 94 countries



Chapters: 79 chapters worldwide (including 16 student chapters) and 11 ambassadors

Why join the Geoscience and Remote Sensing Society (GRSS)?



To **share** your ideas, methods, and datasets, and to **stay informed** about recent developments and job opportunities in your field.



To **enjoy discounts** when publishing in our top-tier journals and joining our conferences.



To propose and lead **special topic journal issues** in our high-impact publications.



To make **GRSS funds** available **for students** (GRSS schools, IGARSS student grants, GRSS student grand challenges), **and young professionals** (GRSS sponsorship).



To give back to the community by attending or **organizing meetings** in your local GRSS chapter and promoting activities in your geographical area.



To **organize workshops and events** sponsored by GRSS through local chapters.



To foster **collaborations** that build **community** through standards and conferences.



To take part in **exclusive mentoring** and young professional activities.



To **meet other communities** and learn from their perspectives.



To **access valuable content** available to members.

COME ABOARD

JOIN GRSS: <https://www.grss-ieee.org/about/membership/>



About GRSS

Publications

Conferences

Community

Resources



Membership

GRSS TECHNICAL COMMITTEES

Earth Science Informatics



Geoscience Spaceborne
Imaging Spectroscopy



Instrumentation and Future
Technologies



Remote sensing Environment,
Analysis and Climate Technologies



Frequency allocations
in Remote Sensing



Image Analysis and
Data Fusion



Modeling in Remote Sensing



Standards for
Earth Observations



Quantum Earth Science and
Technology



EARTH SCIENCE INFORMATICS TECHNICAL COMMITTEE (ESI TC)

Objectives

- Advance application of informatics to geosciences and remote sensing
- Evaluating technology to improve data management and governance
- Exchange ideas and share knowledge across interdisciplinary research communities
- Promote and implement best practices in research methodologies and technologies
- Support open science

Chairs



Manil Maskey



Iksha Gurum

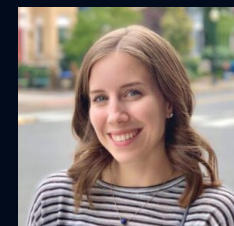


Sujit Roy



Gabriele Meoni

Secretary



Jerika Christman

ESI WORKING GROUPS

High-Performance and Disruptive Computing in Remote Sensing (HDCRS)



Dora Blanco Heras



Rocco Sedona



Iksha Gurung

Remote Sensing Databases (RSDS)



Muthukumaran
Ramasubramanian



Sudan Jha



Navaneeth Selvaraj

Earth2 (E2)



Sujit Roy



Rajat Shinde



Johannes Schmude

QUANTUM EARTH SCIENCE AND TECHNOLOGY (QUEST TC)



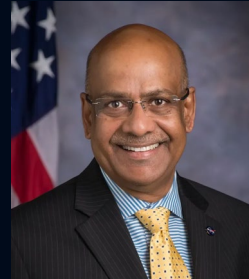
Objective

- Promotes the knowledge and application of quantum-based methods and solutions in geosciences and remote sensing

Chairs



Gabriele Cavallaro



Upendra N. Singh



Arthur Miroszewski

<https://www.grss-ieee.org/about/membership/>

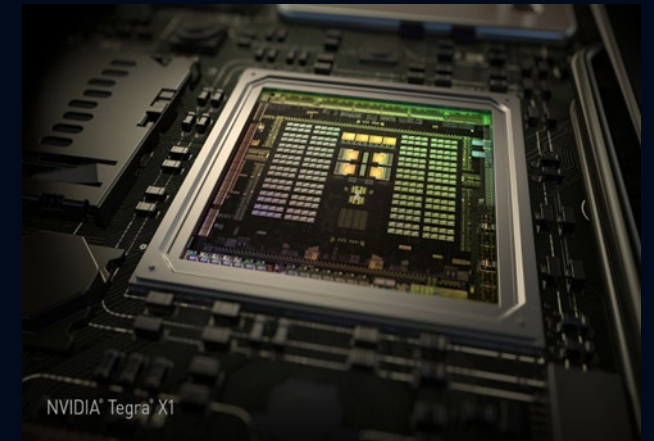
High Performance and Disruptive Computing in Remote Sensing (HDCRS) Working Group

High Performance and Disruptive Computing in Remote Sensing (HDCRS) Working Group

Objectives:

Connect and support the community of interdisciplinary researchers in remote sensing who are specialized in emerging computing paradigms

Promote developments at the intersection of EO and HPC while reducing barriers to the adoption of advanced and efficient computing technologies



<https://www.grss-ieee.org/community/groups-initiatives/high-performance-and-disruptive-computing-in-remote-sensing-hdcrs/>

HDCRS WORKING GROUP



- Organizing different activities:
 - special sessions at IGARSS (International IEEE International Geoscience and Remote Sensing Symposium)
 - tutorials and webinars
 - workshops
 - podcasts
 - paper journals
 - 6 editions of the Summer School,...



High Performance and Disruptive Computing in Remote Sensing | A podcast from the IEEE GRSS...

Join us on this journey with experts from top institutions worldwide along our 'High Performance and Disruptive Computing in Remote Sensing' School



Quantum Machine Learning
in Remote Sensing | HDCRS...

Remote Sensing & High-
Performance Computing |...

Large-Scale AI in
Geosciences | HDCRS Scho...

<https://www.youtube.com/citiususc>

IEEE GRSS ESI-TC Webinar



Accelerating Remote Sensing with Google Earth Engine



Emma Izquierdo-Verdiguier
BOKU University
GDE in Earth Engine



Álvaro Moreno
University of Valencia
GDE in Earth Engine



Eric Smit
BOKU University

31 March 2026

9:00 AM UTC



Register now

<https://loom.ly/dIMUP-U>

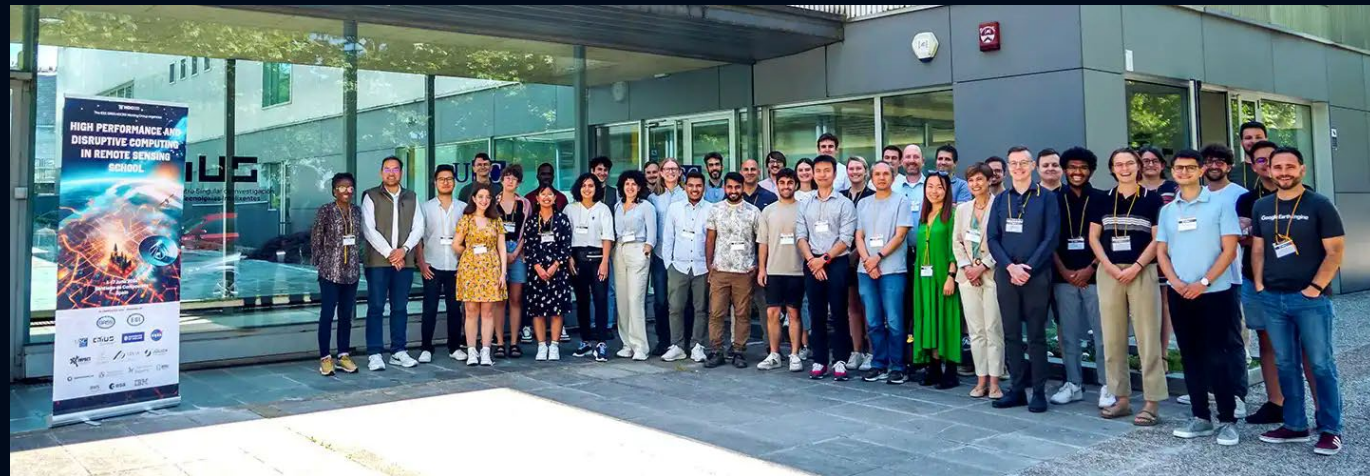
6TH EDITION OF THE HDCRS SCHOOL

Networking with students, young professionals, and senior researchers and professors who work on interdisciplinary research in remote sensing.

Provide understanding on current large AI solutions applied to RS using quantum computing, supercomputing, and cloud computing.

Teaching material and videos will be available at

<https://www.grss-ieee.org/community/groups-initiatives/high-performance-and-disruptive-computing-in-remote-sensing-hdcrs/>



AGENDA – TUESDAY JUNE 9TH

Remote Sensing and High-Performance Computing

09:00 – 09:30 (CEST)	Welcome at the University of Santiago de Compostela and Opening of the Summer School	Dora B. Heras and Paula López
09:30 - 10:00	CESGA: High Performance and Disruptive Computing	Lois Orosa
10:00 – 10:45	Edge Computing for Remote Sensing	Gabriele Meoni
10:45 - 11:15	Break	-
11:00 - 12:00	Introduction to Google Earth Engine	Gabriele Meoni
12:00 – 13:00	Google Earth Engine for Earth Observation. Introduction.	Emma Izquierdo Álvaro Moreno
13:00 – 14:30	Lunch break (Group photo)	-
14:30 - 15:30	Machine Learning in Google Earth Engine (Hands-on)	Emma Izquierdo Álvaro Moreno
15:30 - 16:00	Coffee break	-
16:00 – 17:00	Time Series Analysis in Google Earth Engine (Hands-on)	Emma Izquierdo Álvaro Moreno
20:30 - 22:00	Social Dinner	-

AGENDA – WEDNESDAY JUNE 10TH

Quantum Computing for Earth Observation

9:30 – 10:30 (CEST)	Introduction to Quantum Computation
10:30 - 11:00	Hands-on session 1: Hello Quantum World
11:00 - 11:30	Break / Poster session I
11:30 – 13:00	Hands-on Session 2: Quantum Algorithms with PennyLane
13:00 – 14:30	Lunch break
14:30 - 15:30	Hands-on Session 3: Quantum Kernels for Earth Observation
15:30 - 16:00	Break
16:00 – 17:00	Hands-on Session 4: Hybrid Quantum-Classical Neural Networks for Earth Observation
18:30 - 19:30	Guided visit to the Galician Supercomputing Center (CESGA))

Speakers: Artur Miroszewski (European Space Agency), and Amer Delilbasic (Forschungszentrum Jülich and University of Iceland)

AGENDA – THURSDAY JUNE 11TH

Multimodal Foundation Models for EO

09:30 – 11:00 (CEST)	Introduction to Geospatial Foundation Models for EO
11:00 - 11:30	Break / Poster Session 2
11:30 - 13:00	Hands-on Session 1: TerraMind on Downstream Tasks
13:00 – 14:30	Lunch break
14:30 - 15:30	Hands-on Session 2: TerraMind on Downstream Tasks
15:30 - 16:00	Coffee break
16:00 – 17:00	Hands-on Session 3: Embeddings for Crop Yield Prediction
19:30 - 20:30	Guided Tour of the Old Town

Speakers: Rocco Sedona (Forschungszentrum Jülich), Benedikt Blumenstiel (IBM Research Europe), Kennedy Adriko (Forschungszentrum Jülich and University of Iceland)

AGENDA – FRIDAY JUNE 12TH

Agentic computing

09:30 – 11:00 (CEST)	Agentic computing and Blablador
11:00 - 11:30	Coffee break / Poster Session 3
11:30 - 13:00	Introduction on Agentic Workflows for Scientific Discovery
13:00 – 14:30	Lunch break
14:30 - 15:30	Hands-on: End-to-End - from Design to Deployment
15:30 - 16:00	Coffee break
16:00 – 17:00	Hands-on: Build your own Agentic Stack

Speakers: Alexandre Strube (Forschungszentrum Jülich), Muthukumaran Ramasubramanian (NASA).

Thanks to the local organizing team



Pablo Quesada



Javier López



Alberto Suárez



Álvaro Ordóñez

Thanks for your attention