

Summer School Report

By

Martin Dautriche

IEE Summer School:

High Performance and Disruptive Computing in Remote Sensing

May 29 to June 1, 2023

These four days summer school was held by the IEEE GRSS HDCRS Working Group during the last week of May 2023.

Here you can find the complete schedule and the names of all the speakers <https://www.hdc-rs.com/>

The various topics discussed during the different presentations can be grouped into four main themes: Cloud Computing, Foundation Model (Self-Supervised Model) HPC and Quantum Computing. You'll find more information in the following section below.

All themes are strongly interconnected and come together to address High Performance and Disruptive Computing to Remote Sensing.

Introduction Remote sensing by Researcher from Santiago de Compostela:

- CITIUS GROUP on RS and HPC
- Analysing and capturing
- Processing and storing
- Solving: Classification, change detection, anomaly detection,
- Different scope: Local, regional/national and global

Cloud Computing:

- Container technologies:
 - Docker Swarm
- DIY: Creating own cluster:
 - Start small.
 - Before expanding, create expansion policy.
 - Select low-cost solution.
- Support, community is important for building tools.

Foundation Model (Self-Supervised Model):

- Advantage of use of Foundation Model:
 - Efficient data utilization: Learns from unlabeled data, reducing need of labeled data.
 - Better generalization: Captures broader patterns and performs well on various tasks.
 - Pretraining benefits: Serves as a valuable starting point, requires smaller labeled datasets for fine-tuning.
 - Transfer learning: Transfers knowledge across domains and tasks.
 - Resource efficiency: Reduces manual labeling and computational costs.

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HPC:

- Optimization through parallel programming using Python Library Dash
- Introduction of HPC on-board Satellites:
 - Constraint of power, place in the satellite
 - On-board component has sensibility to radiation (Radiation effects mitigation).
 - Commercial satellite orbits lower to mitigate the radiation problem.
 - So far start satellites projects from scratch all the times.
 - No data from training your system on the new developed satellites because there is a new sensor unique for every satellite.

Quantum Computing:

- Faster processing: Quantum computing accelerates data processing in remote sensing.
- Improved analysis: Optimized algorithms enable more precise analysis.
- Handling large datasets: Quantum computers handle vast amounts of remote sensing data.
- Advanced insights: Quantum machine learning uncovers new patterns in data.
- Complex system simulation: Quantum simulation aids understanding of continent/worldwide environmental phenomena.