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Abstract Theme: Space 4.0 / AI and Data Analytics /**C1.01 Technologies and Applications**

Oral Presentation

Author: Migdall, Silke (VISTA GmbH, migdall@vista-geo.de)

Co-authors: Bach, Heike (VISTA GmbH, bach@vista-geo.de)
Appel, Florian (VISTA GmbH, appel@vista-geo.de)
Koubarakis, Manolis (National and Kapodistrian University of Athens, koubarak@di.uoa.gr)
Bereta, Konstantina (National and Kapodistrian University of Athens, konstantina.bereta@di.uoa.gr)
Stamoulis, George (National and Kapodistrian University of Athens, gstam@di.uoa.gr)
Eltoft, Torbjørn (UiT - The Arctic University of Norway, torbjorn.eltoft@uit.no)
Kraemer, Thomas (UiT - The Arctic University of Norway, thomas.kramer@uit.no)
Fleming, Andrew (British Antarctic Survey, ahf@bas.ac.uk)
Bruzzone, Lorenzo (University of Trento, lorenzo.bruzzone@unitn.it)
Paris, Claudia (University of Trento, claudia.paris@unitn.it)
Dowling, Jim (Logical Clocks AB, jim@logicalclocks.com)
Kakantousis, Theofilos (Logical Clocks AB, theo@logicalclocks.com)
Haridi, Seif (Royal Institute of Technology Sweden, seif@sics.se)
Vlassov, Vladimir (Royal Institute of Technology Sweden, vladv@kth.se)
Arthurs, David (Polar View Earth Observation Ltd., david.arthurs@polarview.org)
Dumitru, Octavian (German Aerospace Center, corneliu.dumitru@dlr.de)
Datcu, Mihai (German Aerospace Center, Mihai.Datcu@dlr.de)
Hughes, Nick (Meteorologisk Institute Norway, nick.hughes@met.no)
Karkaletsis, Vangelis (National Center for Scientific Research – Demokritos, vangelis@iit.demokritos.gr)
Konstantopoulos, Stasinos (National Center for Scientific Research – Demokritos, konstant@iit.demokritos.gr)
Charalambidis, Angelos (National Center for Scientific Research – Demokritos, acharal@iit.demokritos.gr)

Abstract title: ExtremeEarth – extreme data analytics to manage an extremely dynamic planet

Keywords:

- Food Security
- Polar
- Run-Off Simulation
- Data Assimilation
- Extreme Analytics
- Neural Networks
- Linked Data
- Cloud Computing

Satellite and data used:

- Sentinel-2
- Sentinel-1
- In-situ

Abstract text (300-1500 words):

ExtremeEarth is a H2020 project that aims at developing **Extreme Earth Analytics techniques and technologies** that scale to the petabytes of big Copernicus data, information and knowledge, and applying these technologies in two of the ESA TEPs (Food Security and Polar), demonstrating two highly societal and environmental relevant use cases.

Opening up the TEPs and DIASs by extracting information and knowledge hidden in the data, publishing this information and knowledge using **linked data technologies**, and interlinking it with data in other TEPs and DIASs and other non-EO data, information and knowledge can be an important way of making the development of downstream applications easy for both EO and non-EO experts.

Contrary to multimedia images, for which highly scalable Artificial Intelligence techniques based on **deep neural network architectures** have been developed recently, similar architectures for satellite images, that can manage the extreme scale and characteristics of Copernicus data, do not exist in Europe or elsewhere today. Training datasets consisting of millions of data samples in the Copernicus context do not exist today and published deep learning architectures for Copernicus satellite images typically run using one GPU and do not take advantage of recent advances like distributed scale-out deep learning.

The ExtremeEarth technologies will be demonstrated in two use cases with societal, environmental and financial value: The **Food Security use** case will develop high resolution water availability maps for agricultural area allowing a new level of detail for wide-scale **irrigation support**. The maps will be available as linked data together with other geospatial layers (e.g., OpenStreetMap, field boundaries, crop types etc.) and made available to farmers. The main objective of the **Polar use case** is to produce high resolution sea ice maps from massive volumes of heterogeneous Copernicus data. The maps will be made available as linked data and will be combined with other information such as sea surface temperature and wind information for informing maritime users.

The technologies to be developed will extend the **European Hops data platform** to offer unprecedented scalability to extreme data volumes and scale-out **distributed deep learning** for Copernicus data. The extended Hops data platform will run on a DIAS selected after the project starts and will be available as open source to enable its adoption by the strong European Earth Observation downstream services industry.

The technical approach of the project as well as the results of the first user workshop will be presented. This work has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 825258.