Capabilities and Challenges of New AI methods

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Agenda

- Short deep learning presentation

- Deep learning perspectives in EO

- Deep learning limitations and challenges

AGENIUM IT & SYSTEMS

Specialists in the simulation of complex systems, our offer is based on three services: an extensive offer, from the selection to the distribution of technical and scientific software for the implementation of modelling solutions and mobile systems analysis.

AGENIUM INDUSTRIES

AGENIUM INDUSTRY is the specialist in the treatment of obsolescence of embedded systems.

AGENIUM

AGENIUM SPACE

Agenium Space has a team of experts in the following fields: satellite image processing and analysis (geometric, radiometric corrections, atmospheric corrections, lens flare treatment, image quality, image simulation, information extraction, classification...).

AGENIUM DRONES SOLUTION

The Agriload platform is an integrated application solution for biosolutions by drones.

www.agenium.group

European Space Agency

The business adventure has just started!

Image Processing

Geometry, atmospheric corrections, straylight, image quality simulation, information extraction

Initial background

Deep learning

General-purpose methodology applied to EO issues

Flight dynamics

Extrapolation and orbit restitution, positioning and station-keeping, SCAO

Expertise shared with AGENIUM group

Professional background working for, among others…

- A neural network method with numerous layers allowing to model or learn ingested data (machine learning) with a high level of abstraction …

- These AI methods, considered as black boxes, represent a very promising alternative to existing methods of physical inversion, prediction but also for classification, object detection, compression …

- They can be quickly developed on top of open source tools (prototyped), then optimized (distilled) and implanted on specific hardware
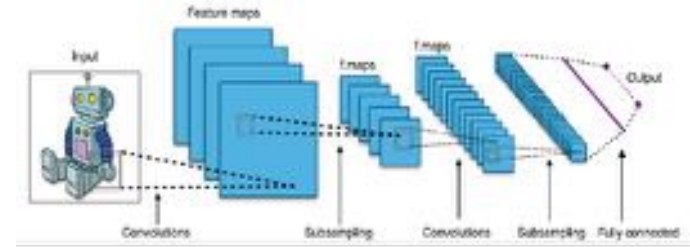
https://fr.wikipedia.org/wiki/Apprentissage_profond

Deep Learning: Perspectives

The exploitation of Sentinel data by these new AI methods, such as deep learning, their revisit time and coverage, jointly to the archives of past missions, should provide new useful **analysis for scientists in the domain of climate change observation and natural process understanding**.

They are also good candidates for :

- simplifying, and probably replacing, part of existing algorithms of **L1 data processing in the future ground segments**
- **processing on board** (cloud detection, compression, sharing on-board/on-ground processing, reactivity)

In the domain of high resolution data, AI opens the possibility of :

- **systematic analysis** of available data providing useful information for administration and general public applications (traffic and infrastructures management, economy development in local regions, etc.)

European Space Agency

Deep Learning : limitations and challenges

Efficient implementation requires:

- a combined expertise on methodology (AI) and thematic applications;
- collaboration with the scientific community specialised in the physical understanding of the data and the strong requirements on data quality (L1, L2 products).

Network learning needs:

- Huge ground-truth (training data) for model learning

These constraints make necessary :

- the support of the EO community, scientist and industrials to share existing validated databases for learning.
- references and expertise on the different application domains for
  - evaluating the results of these alternatives for the future ground segments (data quality expertise) and
  - a scientific agreement for their use in inversion problems.

The technologies and computing capabilities of new platforms provide the ideal environment for these new methodologies and should/could be the context of collaborative scientific and technological work allowing the consolidation of these methods.

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