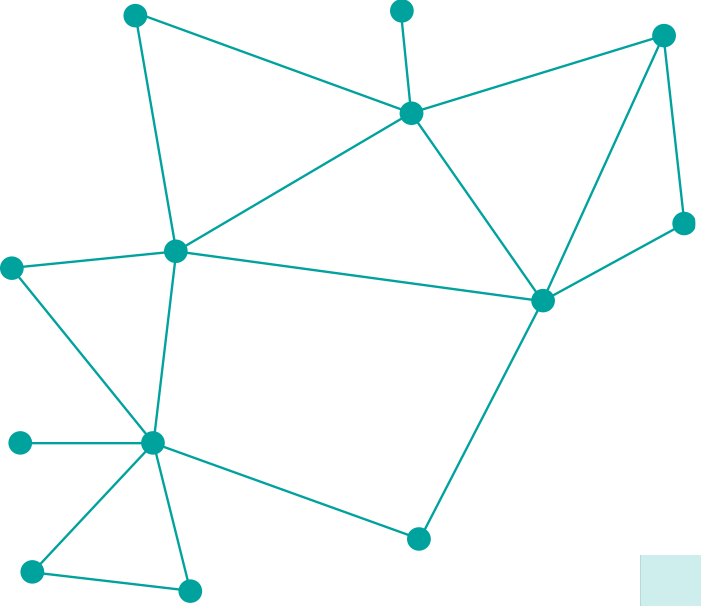

AgroParisTech
Talents for a sustainable planet

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LISTIC

My internship in 300s

Efficient implementation of learning algorithms for remote sensing

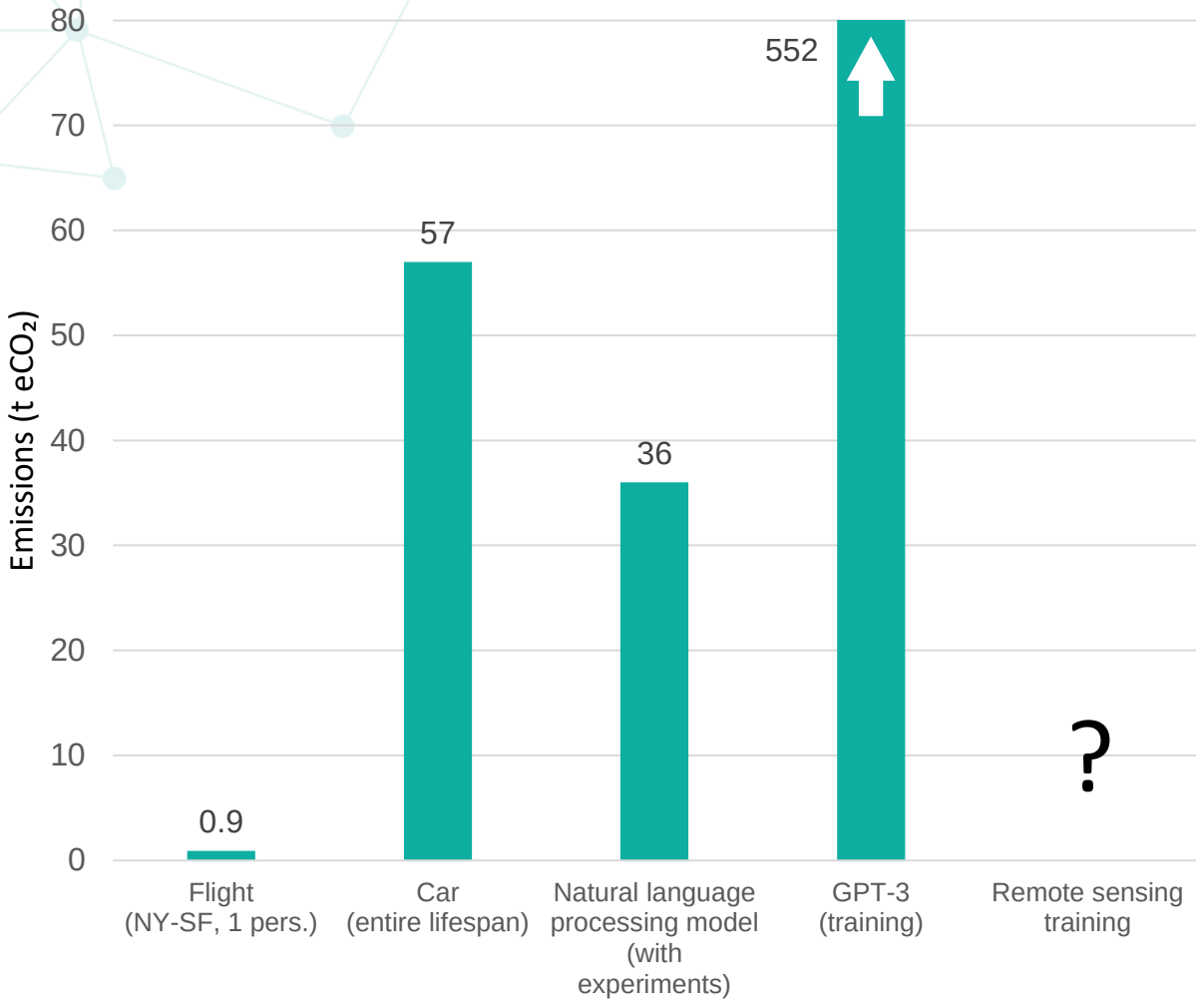
Matthieu Verlynde

19/06/2024

Supervisor : Ammar Mian
Academic tutor : Antoine Cornuéjols

Context and objectives

AI efficiency, a “must have” in data science



Specificities for remote sensing

- High dimensions
- Poorly labeled data
- Complexity of interpretation

Evaluation metrics
energy + performance

Optimization methods

State of the art

Runtime

Complexity

- Bachmann-Landeau descriptor (*Big O*)
- Lines of code, Halstead volume, cyclomatic number…

Empirical measurements

Performances of the model

On the targeted task

Ex : classification accuracy, F1 score…

Emissions in eCO_2

Energy (kWh) × carbon intensity (eCO_2/kWh)

Methods

I. Standard algorithms

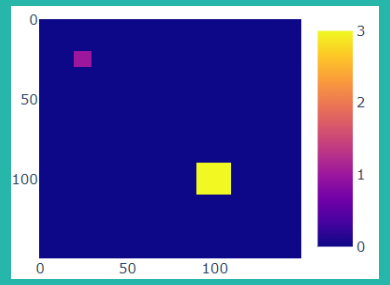
Consumption data :

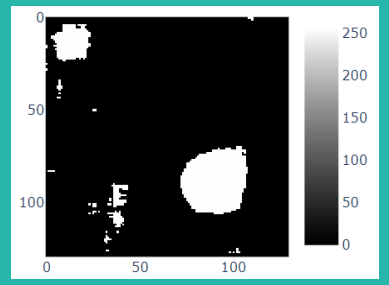
kWh CPU GPU

Model performances :

Acc. AUC SSIM

Statistical analysis





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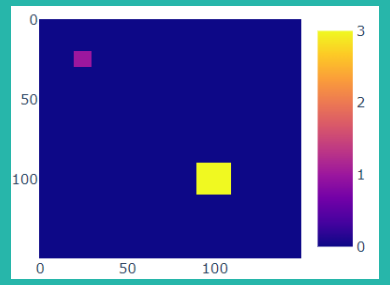

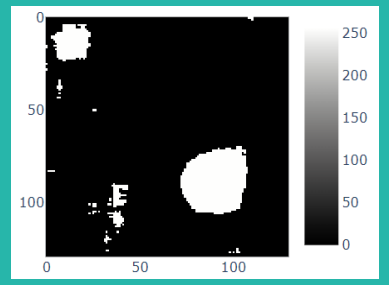

II. Standard deep learning

1. Training from scratch

2. Transfer learning

ImageNet → BigEarthNet

3. Looking for new information

BigEarth

Sumbul et al. (2019)

Methods

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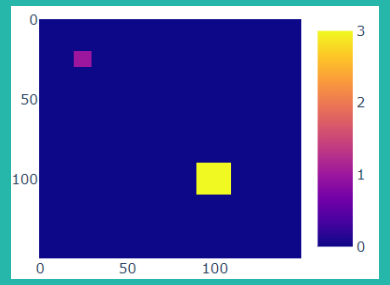

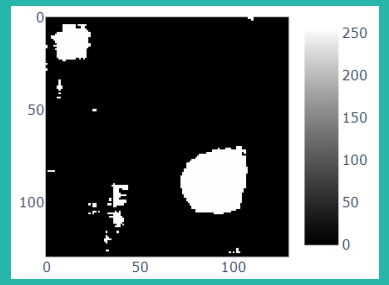

II. Standard deep learning

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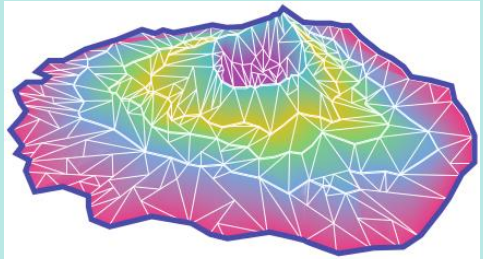
Sumbul et al. (2019)

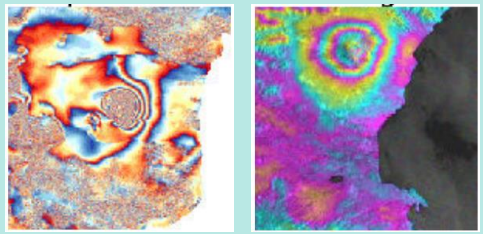
III. Semi-supervised learning

Complex scenario :

Poorly labeled data

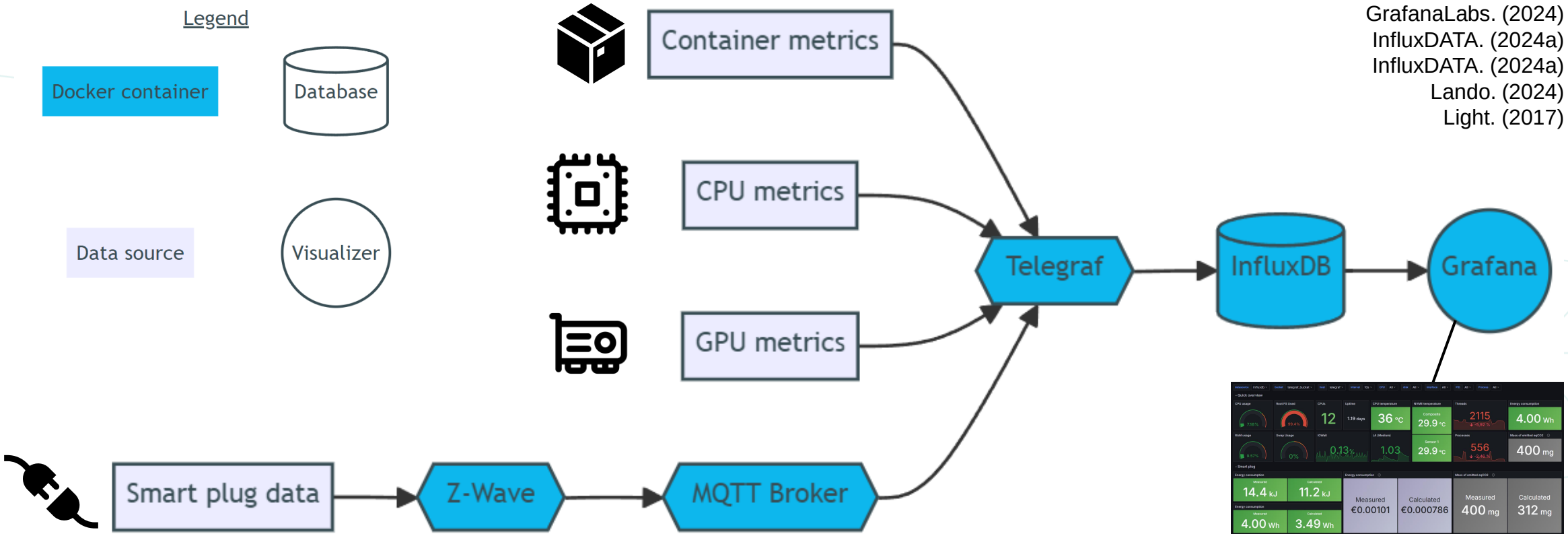


Hephaestus



Sumbul et al. (2019)

Accessing consumption data



GrafanaLabs. (2024)
InfluxDATA. (2024a)
InfluxDATA. (2024a)
Lando. (2024)
Light. (2017)

Results

datasource influxdb
bucket telegraf_bucket
host telegraf
Interval 10s
CPU All
disk All
interface All
PID All
Process All
Quick overview
CPU usage
7.16%
Root FS Used
99.4%
CPUs
12
Uptime
1.19 days
CPU temperature
36 °C
NVME temperature
Composite
29.9 °C
Threads
2115
-5,92 %
Energy consumption
4.00 Wh
RAM usage
9.57%
Swap Usage
0%
IOWait
0.13%
LA (Medium)
1.03
Sensor 1
29.9 °C
Processes
556
-2,46 %
Mass of emitted eqCO2
400 mg
Smart plug
Energy consumption
Measured
14.4 kJ
Calculated
11.2 kJ
Energy consumption
Measured
4.00 Wh
Calculated
3.49 Wh
Energy consumption
Measured
€0.00101
Calculated
€0.000786
Mass of emitted eqCO2
Measured
400 mg
Calculated
312 mg

What is next ?

- Compromise performance v. consumption
- Variables influencing consumption
- Compare implementations

➡ Suggest optimizations

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