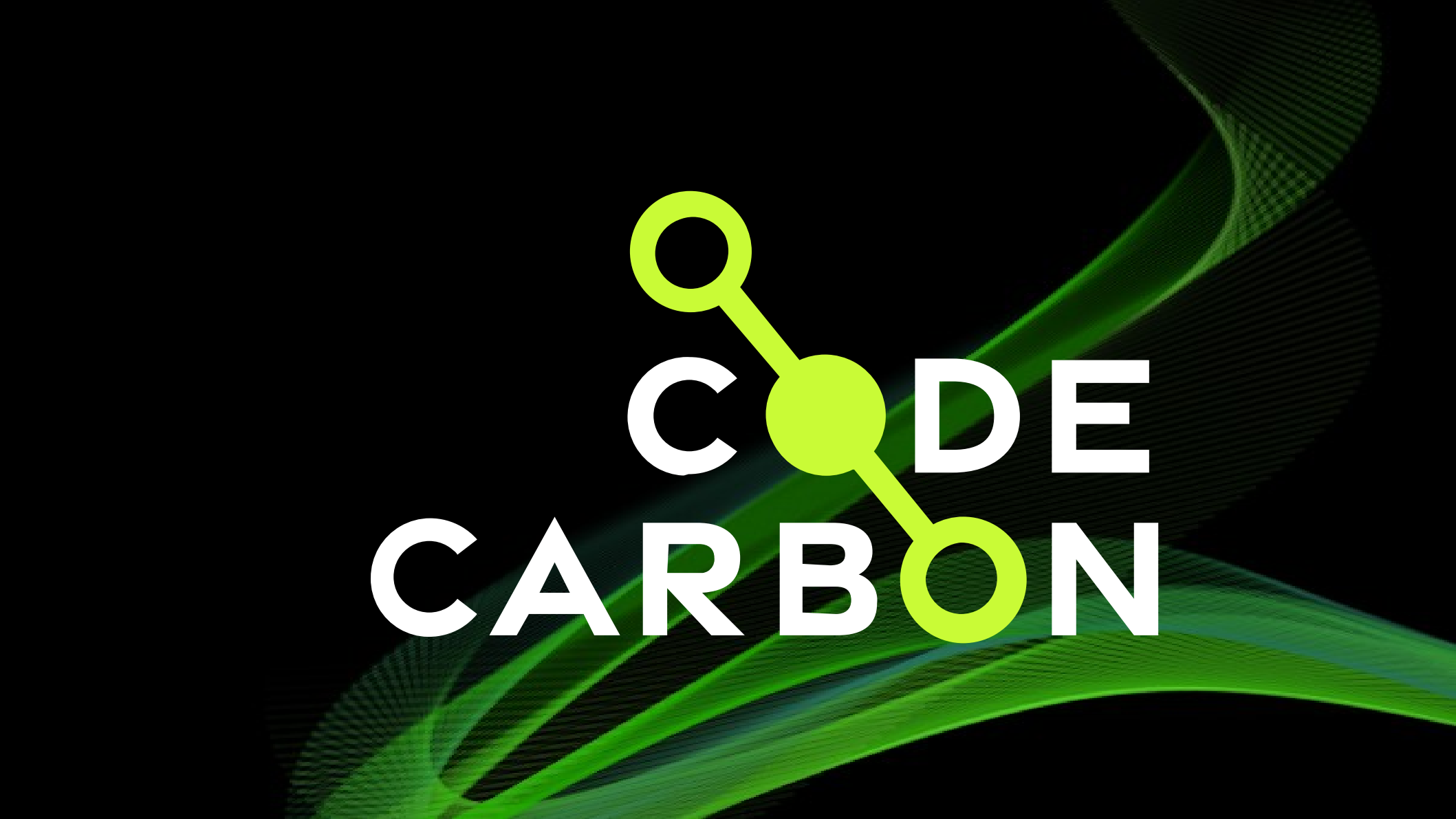

CODE
CARBON

Agenda

- The problems
- Our solution
- How to estimate
- CodeCarbon
- Demo
- Options
- How to reduce
- Things to avoid

Who am I ?

- Data Scientist at the French National Assembly
- Member of the NGO Data For Good France
- Code Carbon main contributor

The problems

- Global warming is here
- All industries must reduce their carbon footprint
- Everybody must be part of it
- There is many attacks on IT impact, some are legitimate, some are not.

Not only CO_2...

Photo: The Carter Center / G. Dubourthoumieu

Water, resources, Child labor from mining to recycling.

Our solution

“Nothing exists until it is measured.”

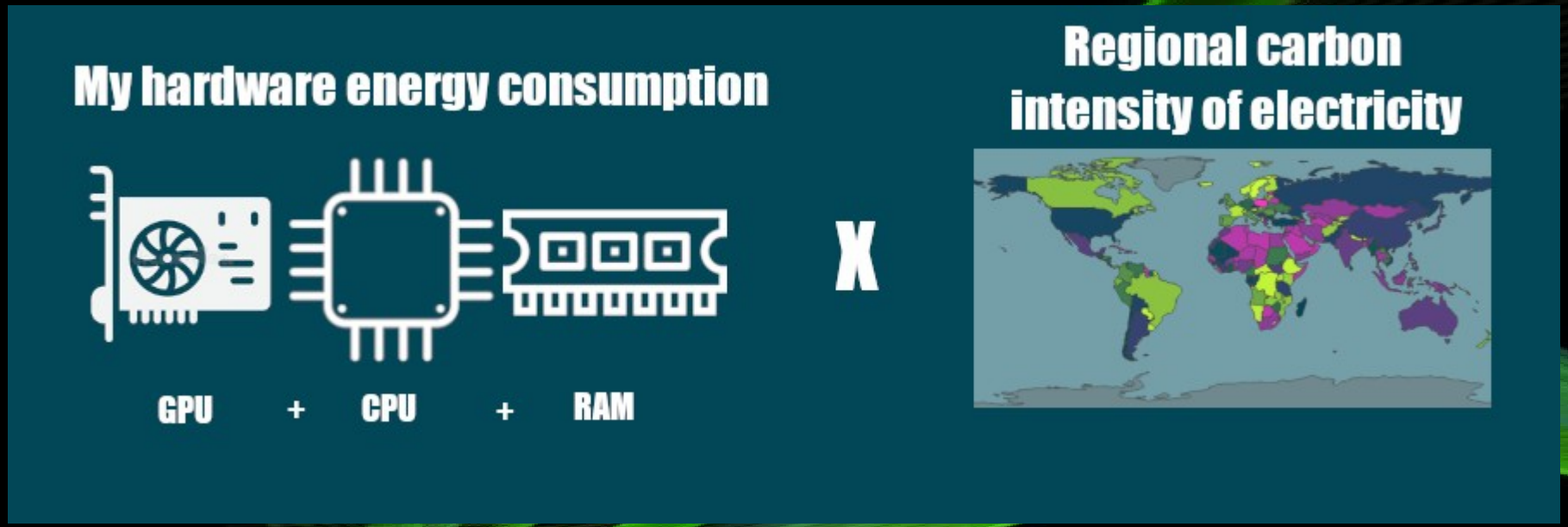
Niels Bohr

History

- 2019 : MLCO2 : online tool for Quantifying the Carbon Emissions of Machine Learning.
- 2020 : CodeCarbon launch
- 2021 : CodeCarbon API and DashBoard

How to estimate

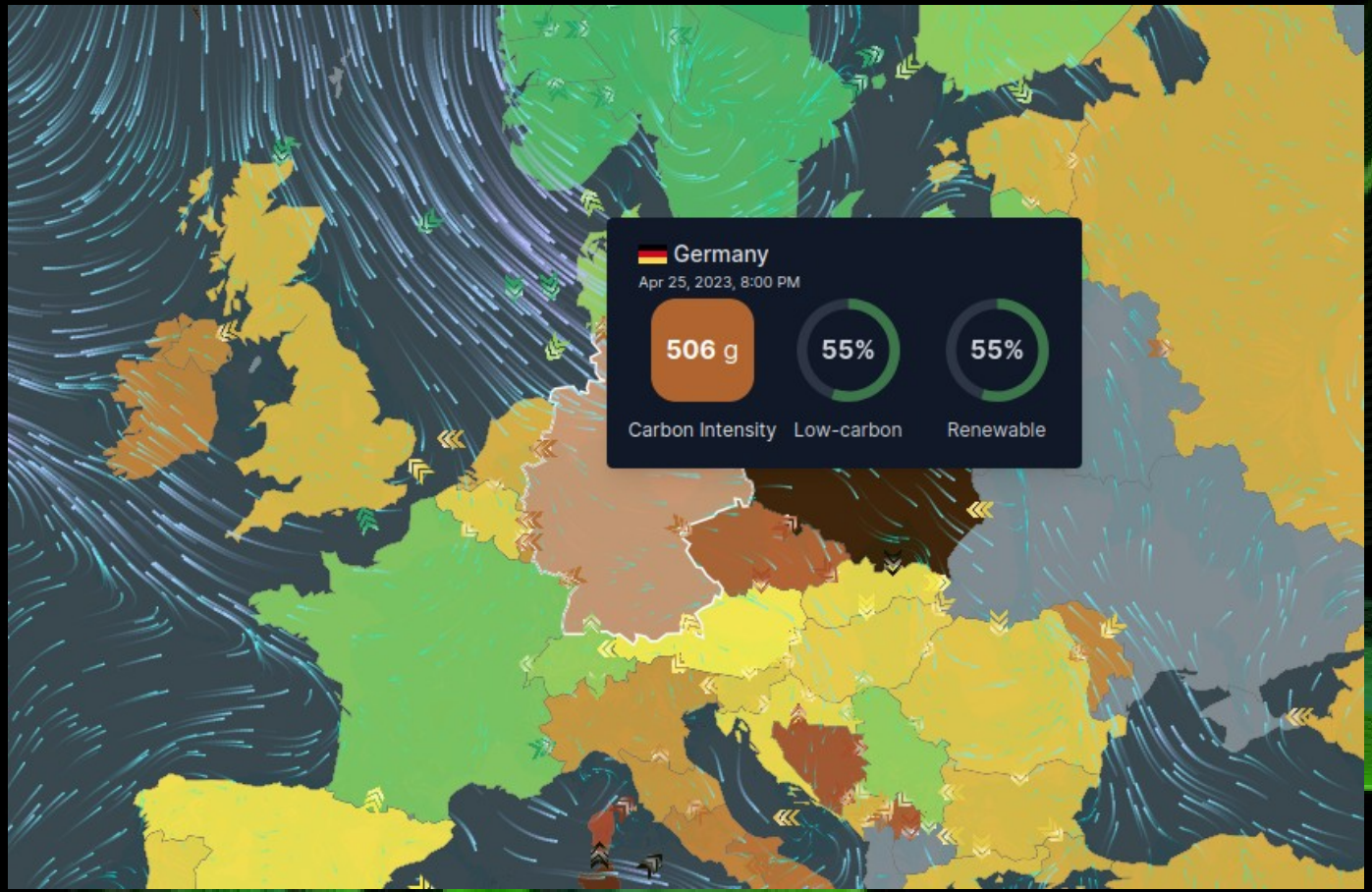
- Measure the power consumption of the hardware
- Estimate CO_2 equivalent



Energy consumed

- CPU : RAPL, Intel Power Gadget, TDP...
- GPU : Nvidia API
- RAM : psutil
- Disk : We don’t do it

Carbon intensity



https://app.electricitymaps.com/map

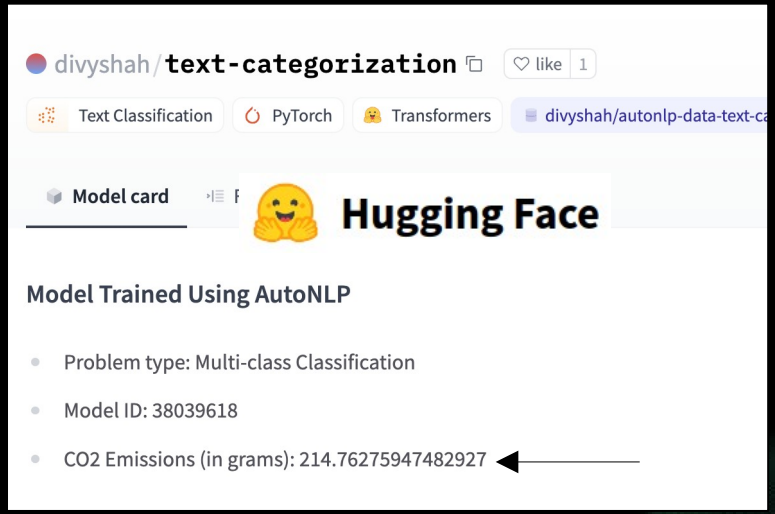
DEMO

CodeCarbon compatibility

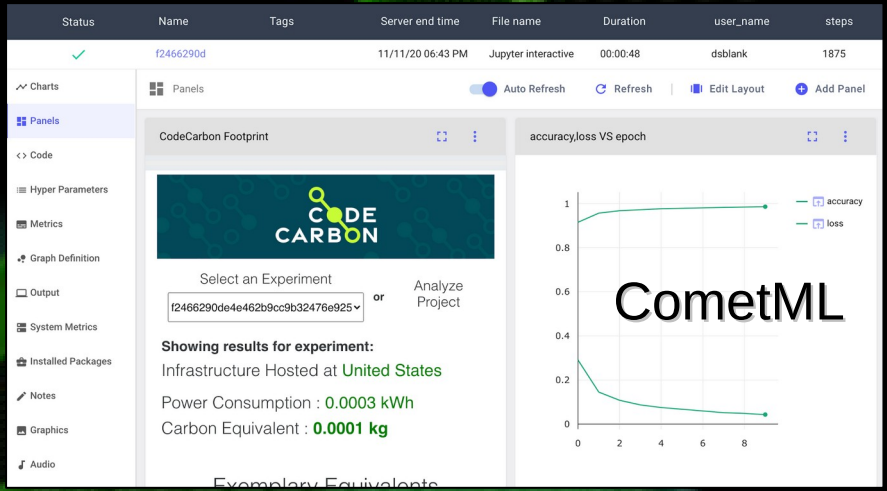
- **Package** : PyPi and Conda
- **Usage** : command line or Python Package
- **OS** : Windows, OSX and Linux
- **Mode** : Whole machine or only one process
- Online and Offline support
- Many fallbacks for CPU consumption
- **Estimations** : annual mean or CO2 Signal
- **Outputs** : CSV, WebHook, API, GCP Cloud Logging, CometML, Prometheus
- **Visualization** : local dashboard and online dashboard

Users

- 45 contributors
- 20 000 downloads per month



Ekimetrics.



BigScience

Mila

Edinburgh Napier UNIVERSITY

Way to reduce

- Carbon intensity based localization
- Do you really need this new project ?
- Measure to compare
- Fine-tunning
- Caching
- Do not go to SOTA, stop when you meet requirements
- GPU instead of CPU
- Bayesian search instead of brute force parameter tuning
- Model pruning to reduce inference cost

Don’t go too far

- Reducing the carbon footprint of your project must not increase it elsewhere : for example moving the computation to the client is worst. It’s better to change a server than thousand client computer.

Let's keep in touch

- Website: codecarbon.io
- Source-code: GitHub
- Documentation: Github.io
- Youtube channel
- Live Chat on Gitter (no login needed to read)