

**CODE
CARBON**

The image features a stylized chemical structure of carbon dioxide (O=C=O) in a vibrant yellow-green color. The central carbon atom is represented by a solid yellow-green circle, while the two oxygen atoms are represented by hollow yellow-green circles. The structure is positioned over the text 'CODE CARBON', which is written in a bold, white, sans-serif font. The 'C' in 'CODE' is partially obscured by the central carbon atom, and the 'O' in 'CARBON' is partially obscured by the bottom-right oxygen atom. The background is black with abstract, flowing green lines that create a sense of movement and depth.

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 CO₂...



Photo: The Carter Center / G. Dubourthoumieu

Water, resources, Child labor from mining to recycling.



Our solution

“Nothing exists until it is measured.”

Niels Bohr



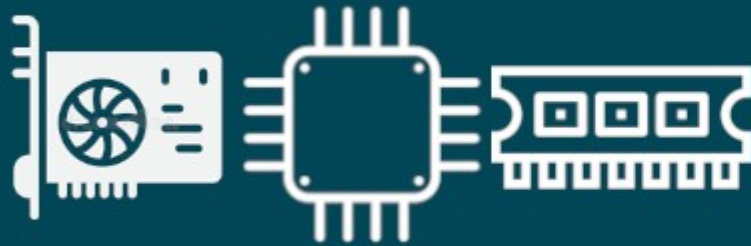
History

- 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 CO₂ equivalent

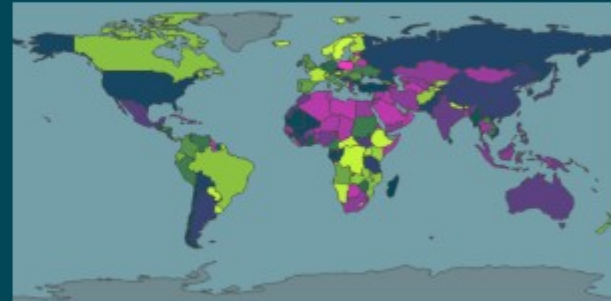
My hardware energy consumption



GPU + CPU + RAM

X

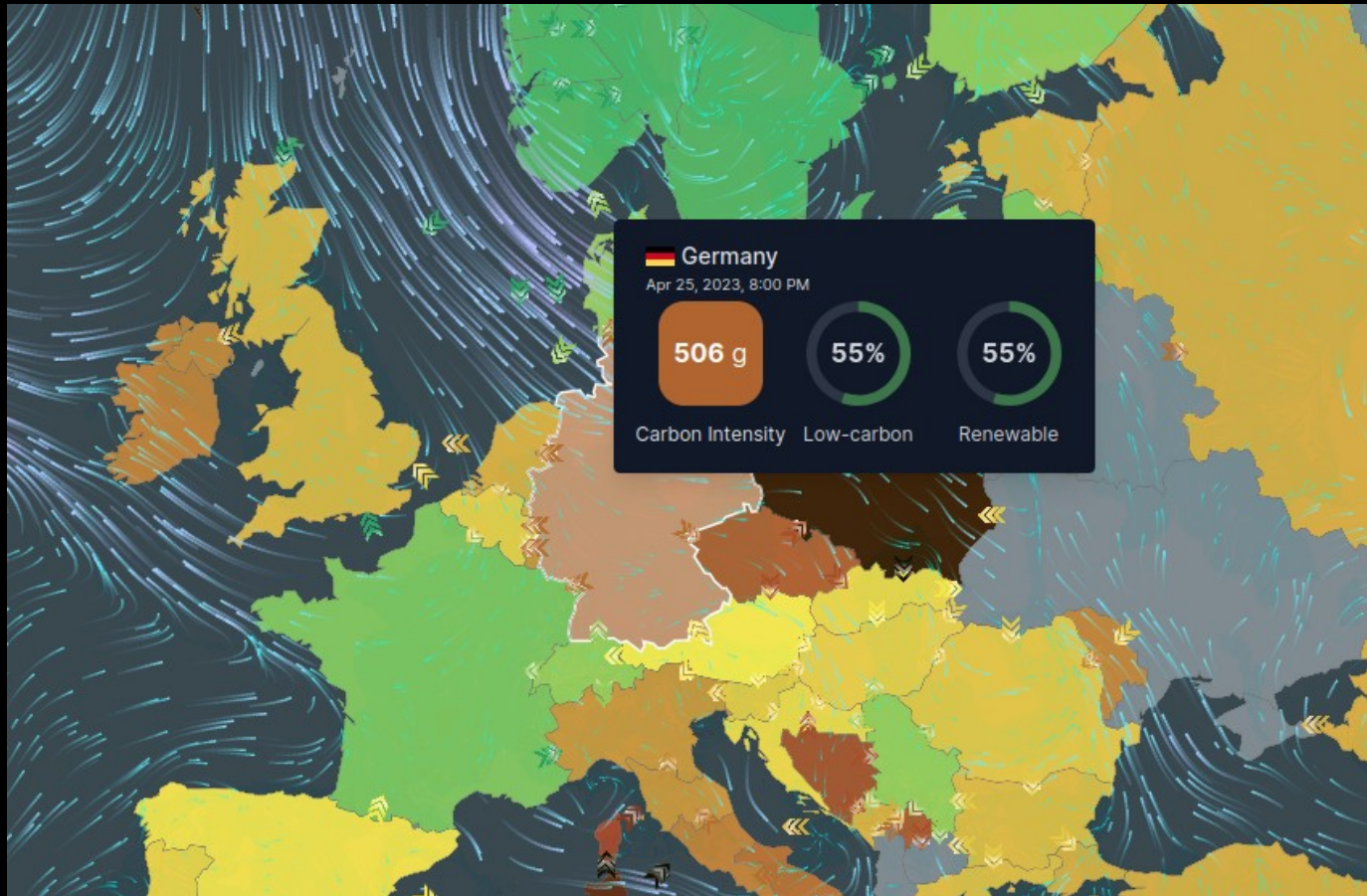
Regional carbon intensity of electricity



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>

The background features several overlapping, wavy, translucent green lines that sweep across the frame from the bottom left towards the top right. These lines vary in opacity and thickness, creating a sense of depth and movement. The overall aesthetic is modern and digital.

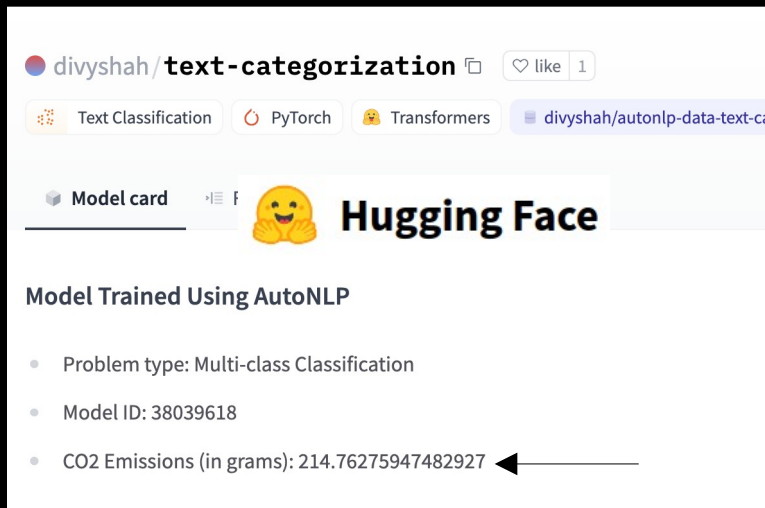
DEMO

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



divyshah/text-categorization

Text Classification PyTorch Transformers

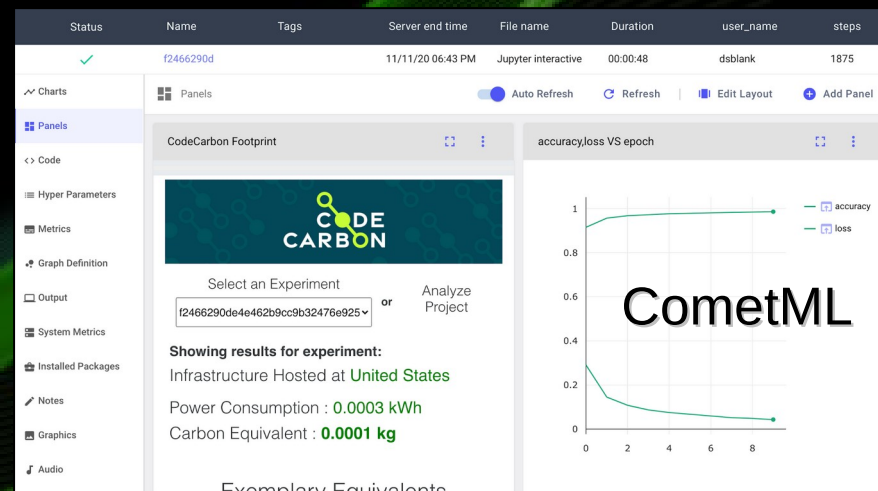
Model card

 **Hugging Face**

Model Trained Using AutoNLP

- Problem type: Multi-class Classification
- Model ID: 38039618
- CO2 Emissions (in grams): 214.76275947482927

Ekimetrics.



BigScience



Edinburgh Napier
UNIVERSITY

Way to reduce

- Carbon intensity based localization
- Do you really need this new project ?
- Measure to compare
- Fine-tuning
- 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)