HELMHOLTZ AI Artificial Intelligence Cooperation Unit

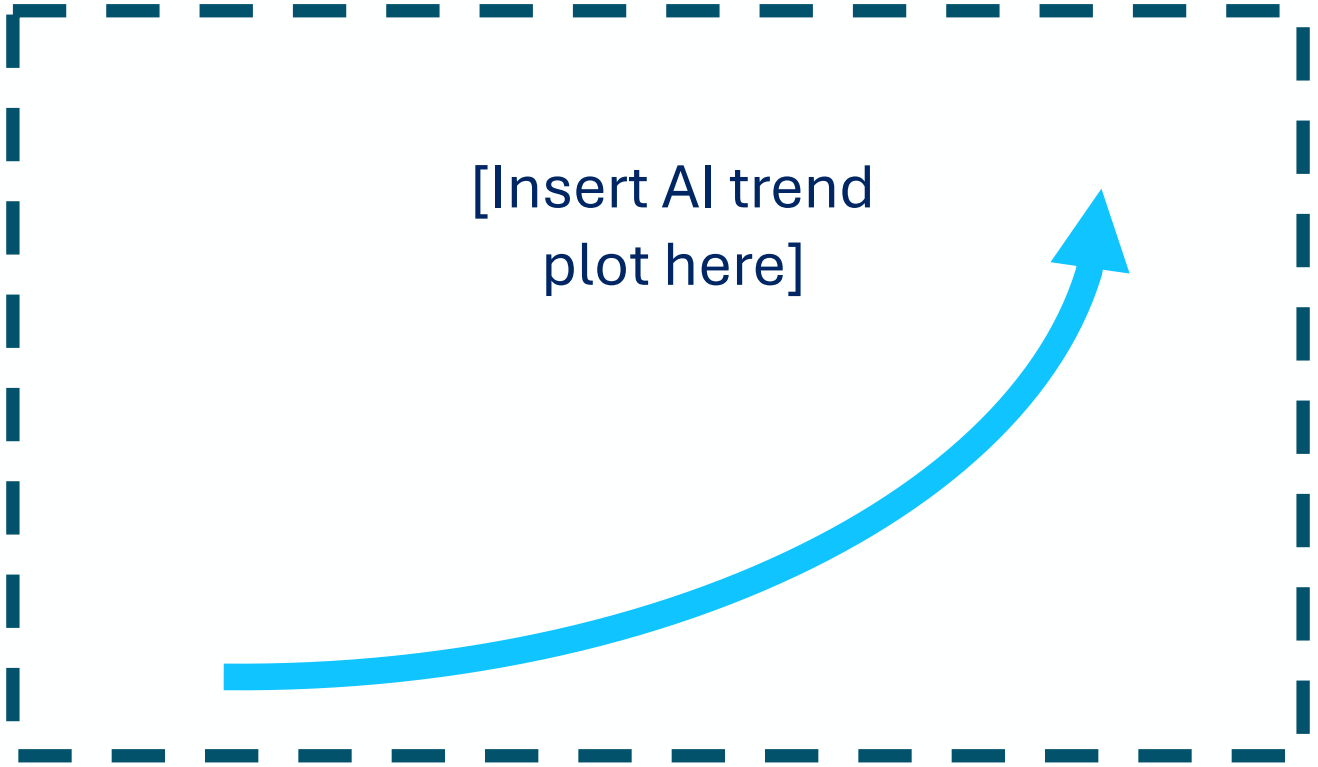
THINKING THE PATH TO SUSTAINABLE AI IN THE ERA OF FOUNDATION MODELS

Marie Piraud (Helmholtz Munich), Markus Götz (KIT), Charlotte Debus (KIT)

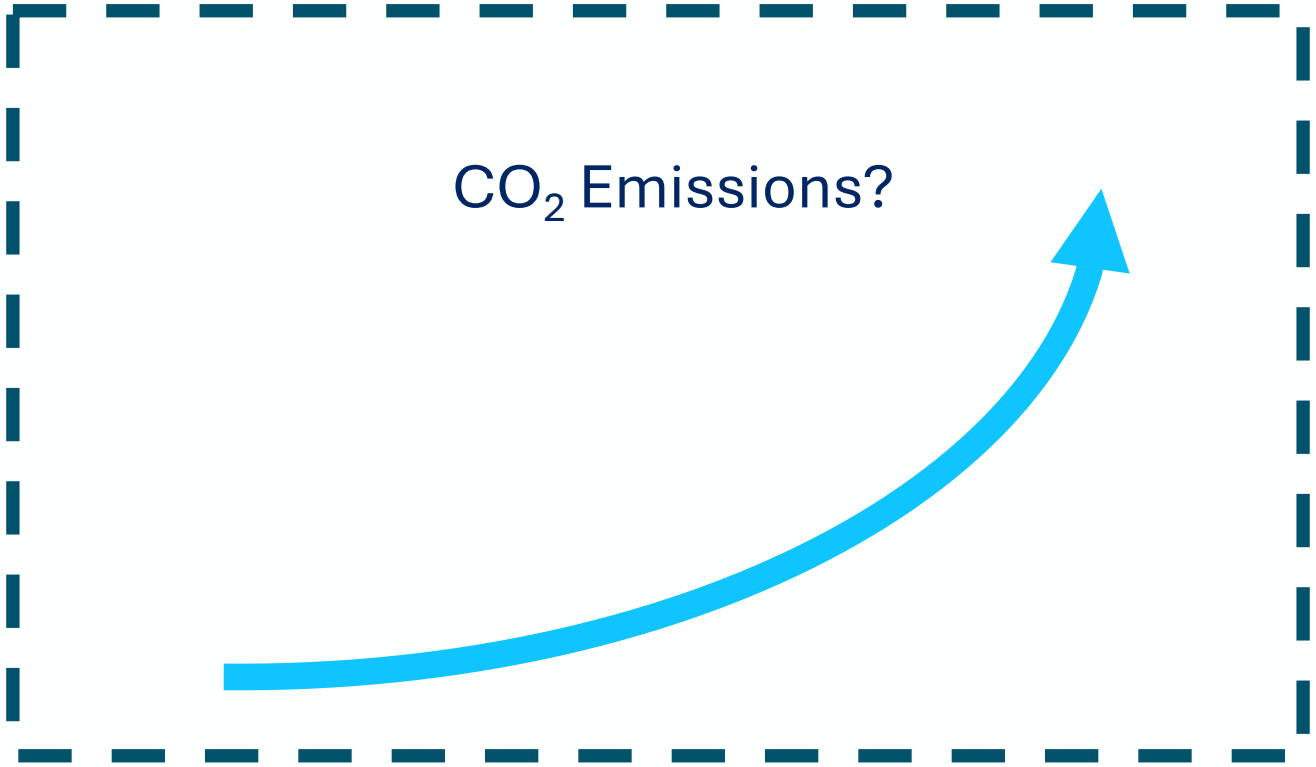
AI TREND

[Insert AI trend plot here]

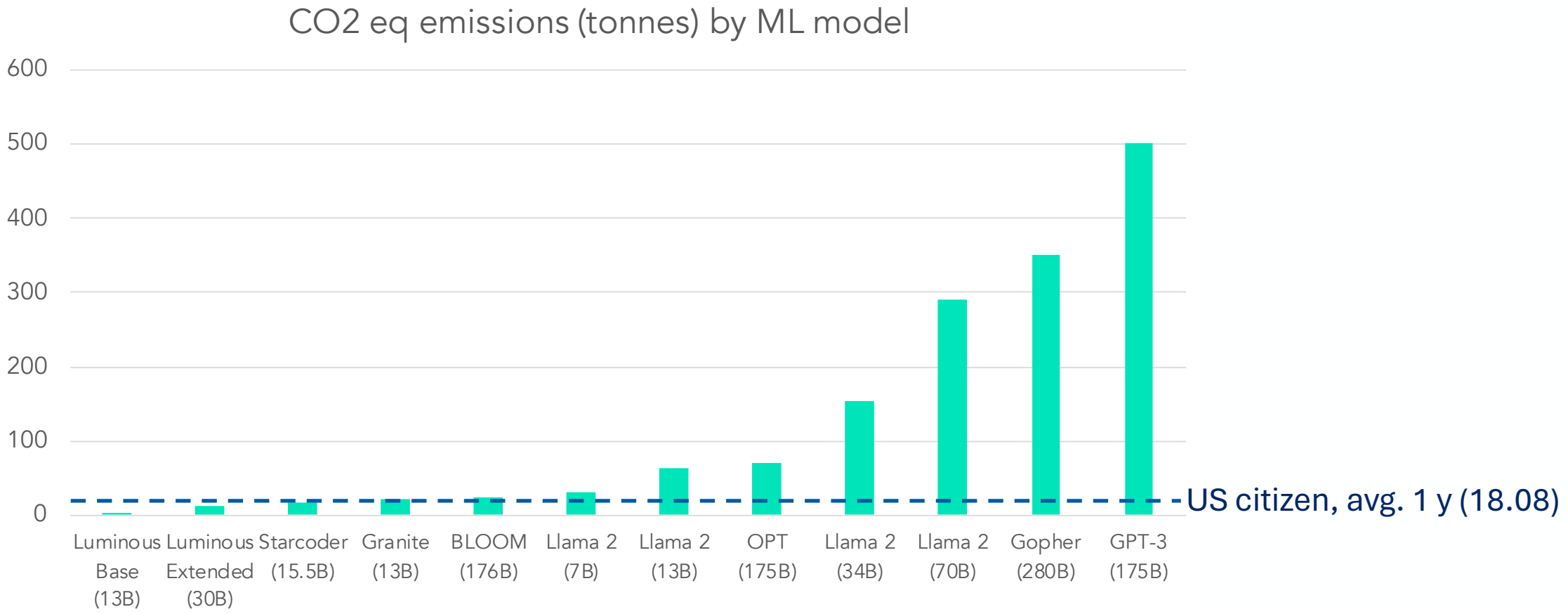
AI TREND



AI TREND



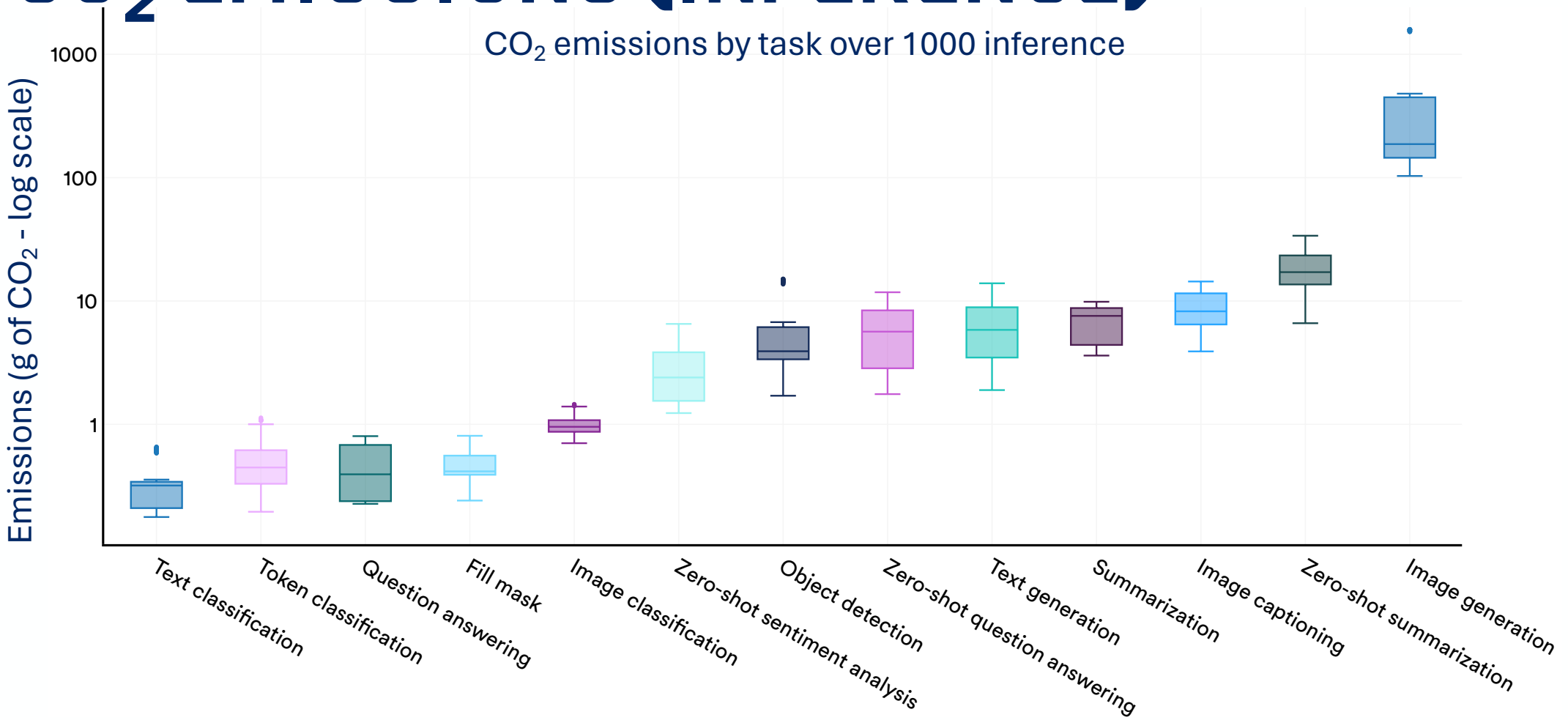
CO_2 EMISSIONS (TRAINING)



2024 AI Index Report

Extended from Luccioni et al, 2022; Strubell et al, 2019

CO_2 EMISSIONS (INFERENCE)



2024 AI Index Report from Luccioni et al, 2023

HOW TO MEASURE?

CO_2 emissions = (Σ energy consumption) x emission factor

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- CPUs
- GPUs
- Memory
- ...

Hardware dependent

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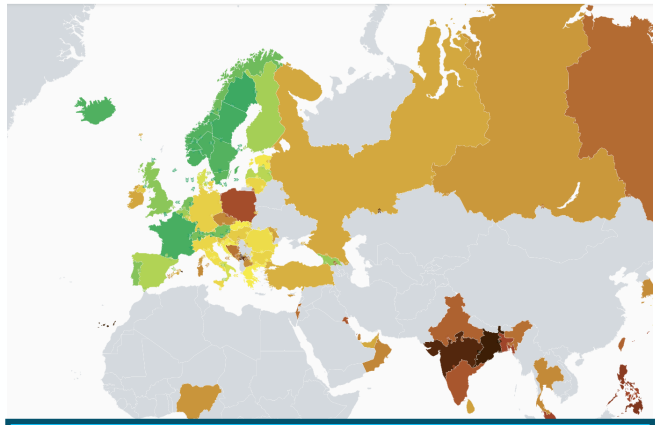
kWh → kg CO_2 eq



Location dependent

https://app.electricitymaps.com/map

HOW TO MEASURE?

CO_2 emissions = (Σ energy consumption) x emission factor x PUE

- CPUs
- GPUs
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- ...

Hardware dependent

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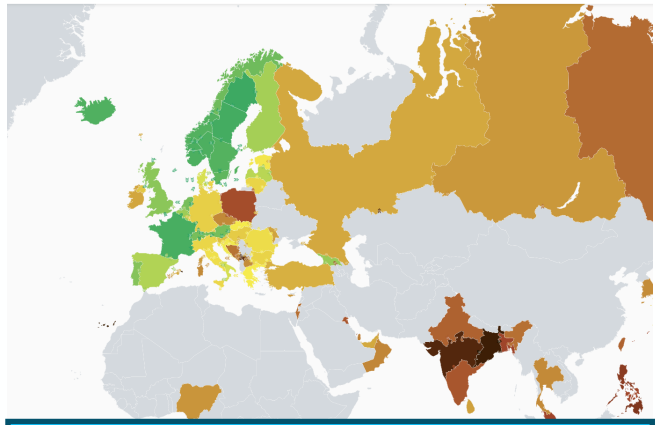

Location dependent

Power Usage Effectiveness

=

$$\frac{\text{Power consumption of the center}}{\text{Power consumption of IT equipment}}$$

Computing center dependent

https://app.electricitymaps.com/map

Comment | Published: 10 November 2023

Reporting electricity consumption is essential for sustainable AI

Charlotte Debus ✉, Marie Piraud, Achim Streit, Fabian Theis & Markus Götz

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