

# TP2GreenComputing\_new

October 30, 2025

1 =====

## 2 TP2 — Pandas Baseline

3 =====

```
[1]: import pandas as pd
import numpy as np
import re
import psutil
import time
from codecarbon import EmissionsTracker
from collections import Counter

# -----
# Helper function to measure each pipeline step
# -----
def measure_step(step_name, framework, func, log):
    rows_analyzed = None
    result = None
    co2_kg = 0.0
    tracker = EmissionsTracker(measure_power_secs=1, save_to_file=False)
    start = time.time()
    try:
        tracker.start()
        start = time.time()
        result = func()
        co2_kg = tracker.stop() # may be None or float
    except Exception as e:
        print(f" CodeCarbon failed for {step_name}: {e}")
        try:
            maybe_co2 = tracker.stop()
            if maybe_co2:
                co2_kg = maybe_co2
        except Exception:
            pass
```

```

finally:
    duration = time.time() - start
    memory_mb = psutil.virtual_memory().used / (1024 * 1024)

    # Handle None safely
    if co2_kg is None:
        co2_kg = 0.0

    if rows_analyzed is None:
        if isinstance(result, dict) and "rows_analyzed" in result:
            rows_analyzed = result["rows_analyzed"]
        elif isinstance(result, (int, float)) and not isinstance(result, bool):
            rows_analyzed = int(result)

        if rows_analyzed is None:
            rows_analyzed = 0

    # Estimate energy from CO (1 kWh 0.233 kg CO) = 0.233 * 1000 = 233watt
    energy_kwh = (co2_kg / 0.233) * 1000 if co2_kg and co2_kg > 0 else 0.0
    efficiency_ratio = (rows_analyzed / co2_kg) if co2_kg and co2_kg > 0 else None

    log.append({
        "Step": step_name,
        "Framework": framework,
        "Duration (s)": round(duration, 3),
        "Energy (Wh)": round(energy_kwh, 6),
        "CO2 (kg)": round(co2_kg, 6),
        "Memory (MB)": round(memory_mb, 2),
        "Total rows analysed": int(rows_analyzed),
        "Efficiency ratio": round(efficiency_ratio, 6) if efficiency_ratio
    })

```

4 =====

## 5 ————— TASK 1 : PANDAS PIPELINE —————

6 =====

```

[2]: log_pandas = []

def pandas_pipeline():
    print("Running Pandas pipeline...")

```

```

    global books, reviews, merged, author_ratings, reviews_per_publisher,
category_reviews, most_common_words

# ---- Load ----
def step_load_data():
    global books, reviews
    books = pd.read_csv("books_data.csv")
    reviews = pd.read_csv("Books_rating.csv")
    # measure_step("Load data", "Pandas", step_load_data, log_pandas)
    step_load_data()

# ---- Clean ----
def step_clean_data():
    books.fillna({"description": "", "publisher": "Unknown", "categories":
category_reviews, "authors": "[]"}, inplace=True)
    reviews.fillna({"Price": 0, "review/text": "", "review/summary": ""},
category_reviews, inplace=True)

    def clean_list_column(x):
        if pd.isna(x): return []
        x = re.sub(r"[\[\]]'", "", str(x))
        return [i.strip() for i in x.split(",") if i.strip()]

    books["authors"] = books["authors"].apply(clean_list_column)
    books["categories"] = books["categories"].apply(clean_list_column)
    # measure_step("Data cleaning", "Pandas", step_clean_data, log_pandas)
    step_clean_data()

# ---- Join ----
def step_join_data():
    global merged
    merged = pd.merge(reviews, books, on="Title", how="inner")
    # measure_step("Join datasets", "Pandas", step_join_data, log_pandas)
    step_join_data()

# ---- Compute metrics ----
def step_avg_rating_per_author():
    global author_ratings
    author_ratings = (
        merged.explode("authors")
        .groupby("authors")["review/score"]
        .mean()
        .reset_index()
        .rename(columns={"review/score": "avg_rating"})
    )
    return len(author_ratings)
    measure_step("Average rating per author", "Pandas",
category_reviews, step_avg_rating_per_author, log_pandas)

```

```

def step_reviews_per_publisher():
    global reviews_per_publisher
    reviews_per_publisher = (
        merged.groupby("publisher")["Id"]
        .count()
        .reset_index()
        .rename(columns={"Id": "num_reviews"})
    )
    return len(reviews_per_publisher)
    measure_step("Number of reviews per publisher", "Pandas",
    ↪step_reviews_per_publisher, log_pandas)

def step_top10_categories():
    global category_reviews
    category_reviews = (
        merged.explode("categories")
        .groupby("categories")["Id"]
        .count()
        .reset_index()
        .rename(columns={"Id": "num_reviews"})
        .sort_values(by="num_reviews", ascending=False)
        .head(10)
    )
    return len(category_reviews)
    measure_step("Top 10 most-reviewed categories", "Pandas",
    ↪step_top10_categories, log_pandas)

# ---- Text processing ----
def step_avg_review_length():
    merged["review_length"] = merged["review/text"].apply(lambda x:
    ↪len(str(x).split()))
    merged["review_length"].mean()
    return len(merged)
    measure_step("Average review length", "Pandas", step_avg_review_length,
    ↪log_pandas)

def step_most_common_words():
    global most_common_words
    all_words = " ".join(merged["review/text"]).lower().split()
    word_counts = Counter(all_words)
    most_common_words = pd.DataFrame(word_counts.most_common(10),
    ↪columns=["word", "count"])
    return len(most_common_words)
    measure_step("Most frequent keywords", "Pandas", step_most_common_words,
    ↪log_pandas)

```

```

# ---- Save ----
def step_save_results():
    author_ratings.to_csv("avg_rating_per_author.csv", index=False)
    reviews_per_publisher.to_csv("reviews_per_publisher.csv", index=False)
    category_reviews.to_csv("top10_categories.csv", index=False)
    most_common_words.to_csv("top10_keywords.csv", index=False)
    # measure_step("Save results", "Pandas", step_save_results, log_pandas)

pd.DataFrame(log_pandas).to_csv("emissions_pandas.csv", index=False)
print(" Pandas pipeline done → emissions_pandas.csv")

# Run Task 1
pandas_pipeline()

```

Running Pandas pipeline...

[codecarbon WARNING @ 12:03:12] Multiple instances of codecarbon are allowed to run at the same time.

[codecarbon INFO @ 12:03:12] [setup] RAM Tracking...

[codecarbon INFO @ 12:03:12] [setup] CPU Tracking...

[codecarbon WARNING @ 12:03:14] We saw that you have a Intel(R) Core(TM) Ultra 9 185H but we don't know it. Please contact us.

[codecarbon WARNING @ 12:03:14] No CPU tracking mode found. Falling back on estimation based on TDP for CPU.

Windows OS detected: Please install Intel Power Gadget to measure CPU

[codecarbon INFO @ 12:03:14] CPU Model on constant consumption mode: Intel(R) Core(TM) Ultra 9 185H

[codecarbon WARNING @ 12:03:14] No CPU tracking mode found. Falling back on CPU constant mode.

[codecarbon INFO @ 12:03:14] [setup] GPU Tracking...

[codecarbon INFO @ 12:03:14] No GPU found.

[codecarbon INFO @ 12:03:14] The below tracking methods have been set up:

RAM Tracking Method: RAM power estimation model

CPU Tracking Method: global constant

GPU Tracking Method: Unspecified

[codecarbon INFO @ 12:03:14] >>> Tracker's metadata:

[codecarbon INFO @ 12:03:14] Platform system: Windows-11-10.0.26200-SP0

[codecarbon INFO @ 12:03:14] Python version: 3.12.6

[codecarbon INFO @ 12:03:14] CodeCarbon version: 3.0.8

[codecarbon INFO @ 12:03:14] Available RAM : 31.435 GB

[codecarbon INFO @ 12:03:14] CPU count: 22 thread(s) in 22 physical CPU(s)

[codecarbon INFO @ 12:03:14] CPU model: Intel(R) Core(TM) Ultra 9 185H

[codecarbon INFO @ 12:03:14] GPU count: None

[codecarbon INFO @ 12:03:14] GPU model: None

[codecarbon INFO @ 12:03:17] Energy consumed for RAM : 0.000010 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:17] Delta energy consumed for CPU with constant : 0.000028 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:17] Energy consumed for All CPU : 0.000028 kWh

[codecarbon INFO @ 12:03:18] 0.000039 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:19] Energy consumed for RAM : 0.000016 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:19] Delta energy consumed for CPU with constant : 0.000013 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:19] Energy consumed for All CPU : 0.000042 kWh

[codecarbon INFO @ 12:03:19] 0.000058 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:21] Energy consumed for RAM : 0.000026 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:21] Delta energy consumed for CPU with constant : 0.000020 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:21] Energy consumed for All CPU : 0.000062 kWh

[codecarbon INFO @ 12:03:21] 0.000088 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:22] Energy consumed for RAM : 0.000035 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:22] Delta energy consumed for CPU with constant : 0.000019 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:22] Energy consumed for All CPU : 0.000082 kWh

[codecarbon INFO @ 12:03:22] 0.000116 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:24] Energy consumed for RAM : 0.000042 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:24] Delta energy consumed for CPU with constant : 0.000016 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:25] Energy consumed for All CPU : 0.000098 kWh

[codecarbon WARNING @ 12:03:25] Background scheduler didn't run for a long period (3s), results might be inaccurate

[codecarbon INFO @ 12:03:26] 0.000140 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:26] Energy consumed for RAM : 0.000061 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:26] Delta energy consumed for CPU with constant : 0.000000 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:26] Energy consumed for All CPU : 0.000098 kWh

[codecarbon INFO @ 12:03:26] 0.000159 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:26] Energy consumed for RAM : 0.000064 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:26] Delta energy consumed for CPU with constant : 0.000007 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:26] Energy consumed for RAM : 0.000068 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:26] Energy consumed for All CPU : 0.000105 kWh

[codecarbon INFO @ 12:03:26] 0.000181 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:26] Delta energy consumed for CPU with constant : 0.000008 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:26] Energy consumed for All CPU : 0.000113 kWh

[codecarbon INFO @ 12:03:26] 0.000181 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon WARNING @ 12:03:27] Multiple instances of codecarbon are allowed to run at the same time.

[codecarbon INFO @ 12:03:27] [setup] RAM Tracking...

[codecarbon INFO @ 12:03:27] [setup] CPU Tracking...

[codecarbon WARNING @ 12:03:29] We saw that you have a Intel(R) Core(TM) Ultra 9 185H but we don't know it. Please contact us.

[codecarbon WARNING @ 12:03:29] No CPU tracking mode found. Falling back on estimation based on TDP for CPU.

Windows OS detected: Please install Intel Power Gadget to measure CPU

[codecarbon INFO @ 12:03:29] CPU Model on constant consumption mode: Intel(R) Core(TM) Ultra 9 185H

[codecarbon WARNING @ 12:03:29] No CPU tracking mode found. Falling back on CPU constant mode.

[codecarbon INFO @ 12:03:29] [setup] GPU Tracking..

[codecarbon INFO @ 12:03:29] No GPU found.

[codecarbon INFO @ 12:03:29] The below tracking methods have been set up:  
RAM Tracking Method: RAM power estimation model  
CPU Tracking Method: global constant  
GPU Tracking Method: Unspecified

[codecarbon INFO @ 12:03:29] >>> Tracker's metadata:

[codecarbon INFO @ 12:03:29] Platform system: Windows-11-10.0.26200-SP0

[codecarbon INFO @ 12:03:29] Python version: 3.12.6

[codecarbon INFO @ 12:03:29] CodeCarbon version: 3.0.8

[codecarbon INFO @ 12:03:29] Available RAM : 31.435 GB

[codecarbon INFO @ 12:03:29] CPU count: 22 thread(s) in 22 physical CPU(s)

[codecarbon INFO @ 12:03:29] CPU model: Intel(R) Core(TM) Ultra 9 185H

[codecarbon INFO @ 12:03:29] GPU count: None

[codecarbon INFO @ 12:03:29] GPU model: None

[codecarbon INFO @ 12:03:31] Energy consumed for RAM : 0.000005 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:31] Delta energy consumed for CPU with constant : 0.000010 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:31] Energy consumed for All CPU : 0.000010 kWh

[codecarbon INFO @ 12:03:31] 0.000014 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon WARNING @ 12:03:31] Multiple instances of codecarbon are allowed to run at the same time.

[codecarbon INFO @ 12:03:31] [setup] RAM Tracking..

[codecarbon INFO @ 12:03:31] [setup] CPU Tracking..

[codecarbon WARNING @ 12:03:33] We saw that you have a Intel(R) Core(TM) Ultra 9 185H but we don't know it. Please contact us.

[codecarbon WARNING @ 12:03:33] No CPU tracking mode found. Falling back on estimation based on TDP for CPU.

Windows OS detected: Please install Intel Power Gadget to measure CPU

[codecarbon INFO @ 12:03:33] CPU Model on constant consumption mode: Intel(R) Core(TM) Ultra 9 185H



[codecarbon WARNING @ 12:03:33] No CPU tracking mode found. Falling back on CPU constant mode.

[codecarbon INFO @ 12:03:33] [setup] GPU Tracking..

[codecarbon INFO @ 12:03:33] No GPU found.

[codecarbon INFO @ 12:03:33] The below tracking methods have been set up:  
RAM Tracking Method: RAM power estimation model  
CPU Tracking Method: global constant  
GPU Tracking Method: Unspecified

[codecarbon INFO @ 12:03:33] >>> Tracker's metadata:

[codecarbon INFO @ 12:03:33] Platform system: Windows-11-10.0.26200-SP0

[codecarbon INFO @ 12:03:33] Python version: 3.12.6

[codecarbon INFO @ 12:03:33] CodeCarbon version: 3.0.8

[codecarbon INFO @ 12:03:33] Available RAM : 31.435 GB

[codecarbon INFO @ 12:03:33] CPU count: 22 thread(s) in 22 physical CPU(s)

[codecarbon INFO @ 12:03:33] CPU model: Intel(R) Core(TM) Ultra 9 185H

[codecarbon INFO @ 12:03:33] GPU count: None

[codecarbon INFO @ 12:03:33] GPU model: None

[codecarbon INFO @ 12:03:36] Energy consumed for RAM : 0.000012 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:37] Delta energy consumed for CPU with constant : 0.000032 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:37] Energy consumed for All CPU : 0.000032 kWh

[codecarbon INFO @ 12:03:37] 0.000044 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:37] Energy consumed for RAM : 0.000012 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:38] Energy consumed for RAM : 0.000019 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:38] Delta energy consumed for CPU with constant : 0.000014 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:38] Delta energy consumed for CPU with constant : 0.000013 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:38] Energy consumed for All CPU : 0.000060 kWh

[codecarbon INFO @ 12:03:38] 0.000078 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:38] Energy consumed for All CPU : 0.000060 kWh

[codecarbon INFO @ 12:03:38] 0.000078 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:40] Energy consumed for RAM : 0.000027 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:40] Delta energy consumed for CPU with constant : 0.000019 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:40] Energy consumed for All CPU : 0.000078 kWh

[codecarbon INFO @ 12:03:40] 0.000106 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:42] Energy consumed for RAM : 0.000036 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:42] Delta energy consumed for CPU with constant : 0.000019 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:42] Energy consumed for All CPU : 0.000097 kWh

[codecarbon INFO @ 12:03:42] 0.000133 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:43] Energy consumed for RAM : 0.000042 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:44] Delta energy consumed for CPU with constant : 0.000025 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:44] Energy consumed for All CPU : 0.000123 kWh

[codecarbon INFO @ 12:03:44] 0.000165 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:44] Energy consumed for RAM : 0.000042 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:44] Delta energy consumed for CPU with constant : 0.000000 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:44] Energy consumed for All CPU : 0.000123 kWh

[codecarbon INFO @ 12:03:44] 0.000165 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:45] Energy consumed for RAM : 0.000046 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:45] Delta energy consumed for CPU with constant : 0.000009 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:45] Energy consumed for All CPU : 0.000132 kWh

[codecarbon INFO @ 12:03:45] 0.000178 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon WARNING @ 12:03:45] Multiple instances of codecarbon are allowed to run at the same time.

[codecarbon INFO @ 12:03:45] [setup] RAM Tracking...

[codecarbon INFO @ 12:03:45] [setup] CPU Tracking...

[codecarbon WARNING @ 12:03:47] We saw that you have a Intel(R) Core(TM) Ultra 9 185H but we don't know it. Please contact us.

[codecarbon WARNING @ 12:03:47] No CPU tracking mode found. Falling back on estimation based on TDP for CPU.

Windows OS detected: Please install Intel Power Gadget to measure CPU

[codecarbon INFO @ 12:03:47] CPU Model on constant consumption mode: Intel(R) Core(TM) Ultra 9 185H

[codecarbon WARNING @ 12:03:47] No CPU tracking mode found. Falling back on CPU constant mode.

[codecarbon INFO @ 12:03:47] [setup] GPU Tracking...

[codecarbon INFO @ 12:03:47] No GPU found.

[codecarbon INFO @ 12:03:47] The below tracking methods have been set up:  
RAM Tracking Method: RAM power estimation model  
CPU Tracking Method: global constant  
GPU Tracking Method: Unspecified

[codecarbon INFO @ 12:03:47] >>> Tracker's metadata:

[codecarbon INFO @ 12:03:47] Platform system: Windows-11-10.0.26200-SP0

[codecarbon INFO @ 12:03:47] Python version: 3.12.6

[codecarbon INFO @ 12:03:47] CodeCarbon version: 3.0.8

[codecarbon INFO @ 12:03:47] Available RAM : 31.435 GB

[codecarbon INFO @ 12:03:47] CPU count: 22 thread(s) in 22 physical CPU(s)

[codecarbon INFO @ 12:03:47] CPU model: Intel(R) Core(TM) Ultra 9 185H

[codecarbon INFO @ 12:03:47] GPU count: None

[codecarbon INFO @ 12:03:47] GPU model: None

[codecarbon INFO @ 12:03:50] Energy consumed for RAM : 0.000006 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:50] Delta energy consumed for CPU with constant : 0.000016 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:50] Energy consumed for All CPU : 0.000016 kWh

[codecarbon INFO @ 12:03:50] 0.000022 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:51] Energy consumed for RAM : 0.000008 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:51] Delta energy consumed for CPU with constant : 0.000006 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:51] Energy consumed for All CPU : 0.000022 kWh

[codecarbon INFO @ 12:03:51] 0.000030 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:52] Energy consumed for RAM : 0.000013 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:52] Delta energy consumed for CPU with constant : 0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:52] Energy consumed for All CPU : 0.000033 kWh

[codecarbon INFO @ 12:03:52] 0.000046 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:53] Energy consumed for RAM : 0.000017 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:53] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:53] Energy consumed for All CPU : 0.000045 kWh

[codecarbon INFO @ 12:03:53] 0.000062 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:54] Energy consumed for RAM : 0.000021 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:54] Delta energy consumed for CPU with constant : 0.000009 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:54] Energy consumed for All CPU : 0.000054 kWh

[codecarbon INFO @ 12:03:54] 0.000074 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:55] Energy consumed for RAM : 0.000025 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:55] Delta energy consumed for CPU with constant : 0.000010 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:55] Energy consumed for All CPU : 0.000064 kWh

[codecarbon INFO @ 12:03:55] 0.000089 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:56] Energy consumed for RAM : 0.000029 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:56] Delta energy consumed for CPU with constant : 0.000010 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:56] Energy consumed for All CPU : 0.000074 kWh

[codecarbon INFO @ 12:03:56] 0.000103 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:57] Energy consumed for RAM : 0.000033 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:57] Delta energy consumed for CPU with constant : 0.000009 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:57] Energy consumed for All CPU : 0.000083 kWh

[codecarbon INFO @ 12:03:57] 0.000116 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:58] Energy consumed for RAM : 0.000038 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:58] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:58] Energy consumed for All CPU : 0.000095 kWh

[codecarbon INFO @ 12:03:58] 0.000134 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:03:59] Energy consumed for RAM : 0.000041 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:03:59] Delta energy consumed for CPU with constant : 0.000008 kWh, power : 42.5 W

[codecarbon INFO @ 12:03:59] Energy consumed for All CPU : 0.000103 kWh

[codecarbon INFO @ 12:03:59] 0.000144 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:00] Energy consumed for RAM : 0.000045 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:00] Delta energy consumed for CPU with constant : 0.000008 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:00] Energy consumed for All CPU : 0.000111 kWh

[codecarbon INFO @ 12:04:00] 0.000156 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:01] Energy consumed for RAM : 0.000049 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:01] Delta energy consumed for CPU with constant :  
0.000010 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:01] Energy consumed for All CPU : 0.000122 kWh

[codecarbon INFO @ 12:04:01] 0.000171 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:04:02] Energy consumed for RAM : 0.000053 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:04:02] Delta energy consumed for CPU with constant :  
0.000008 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:02] Energy consumed for All CPU : 0.000130 kWh

[codecarbon INFO @ 12:04:02] 0.000183 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:04:03] Energy consumed for RAM : 0.000058 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:04:03] Delta energy consumed for CPU with constant :  
0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:03] Energy consumed for All CPU : 0.000141 kWh

[codecarbon INFO @ 12:04:03] 0.000199 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:04:04] Energy consumed for RAM : 0.000063 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:04:04] Delta energy consumed for CPU with constant :  
0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:04] Energy consumed for All CPU : 0.000152 kWh

[codecarbon INFO @ 12:04:04] 0.000214 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:04:05] Energy consumed for RAM : 0.000067 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:04:05] Delta energy consumed for CPU with constant :  
0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:05] Energy consumed for All CPU : 0.000163 kWh

[codecarbon INFO @ 12:04:05] 0.000230 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:04:06] Energy consumed for RAM : 0.000072 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:04:06] Delta energy consumed for CPU with constant :  
0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:06] Energy consumed for All CPU : 0.000174 kWh

[codecarbon INFO @ 12:04:06] 0.000246 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:07] Energy consumed for RAM : 0.000078 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:07] Delta energy consumed for CPU with constant : 0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:07] Energy consumed for All CPU : 0.000185 kWh

[codecarbon INFO @ 12:04:07] 0.000263 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:08] Energy consumed for RAM : 0.000082 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:08] Delta energy consumed for CPU with constant : 0.000010 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:08] Energy consumed for All CPU : 0.000196 kWh

[codecarbon INFO @ 12:04:08] 0.000278 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:09] Energy consumed for RAM : 0.000087 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:09] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:09] Energy consumed for All CPU : 0.000207 kWh

[codecarbon INFO @ 12:04:10] 0.000295 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:10] Energy consumed for RAM : 0.000091 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:10] Delta energy consumed for CPU with constant : 0.000009 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:10] Energy consumed for All CPU : 0.000216 kWh

[codecarbon INFO @ 12:04:10] 0.000307 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:11] Energy consumed for RAM : 0.000096 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:11] Delta energy consumed for CPU with constant : 0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:11] Energy consumed for All CPU : 0.000227 kWh

[codecarbon INFO @ 12:04:11] 0.000324 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:12] Energy consumed for RAM : 0.000102 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:12] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:13] Energy consumed for All CPU : 0.000239 kWh

[codecarbon INFO @ 12:04:13] 0.000341 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:13] Energy consumed for RAM : 0.000106 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:13] Delta energy consumed for CPU with constant : 0.000010 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:14] Energy consumed for All CPU : 0.000250 kWh

[codecarbon INFO @ 12:04:14] 0.000356 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:14] Energy consumed for RAM : 0.000110 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:15] Delta energy consumed for CPU with constant : 0.000009 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:15] Energy consumed for All CPU : 0.000259 kWh

[codecarbon INFO @ 12:04:15] 0.000368 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:15] Energy consumed for RAM : 0.000113 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:16] Delta energy consumed for CPU with constant : 0.000009 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:16] Energy consumed for All CPU : 0.000267 kWh

[codecarbon INFO @ 12:04:16] 0.000380 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:16] Energy consumed for RAM : 0.000118 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:16] Delta energy consumed for CPU with constant : 0.000009 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:16] Energy consumed for All CPU : 0.000276 kWh

[codecarbon INFO @ 12:04:17] 0.000394 kWh of electricity and 0.000000 L of water were used since the beginning.



[codecarbon INFO @ 12:04:18] Energy consumed for RAM : 0.000123 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:18] Delta energy consumed for CPU with constant : 0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:18] Energy consumed for All CPU : 0.000287 kWh

[codecarbon INFO @ 12:04:18] 0.000410 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:19] Energy consumed for RAM : 0.000128 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:19] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:19] Energy consumed for All CPU : 0.000299 kWh

[codecarbon INFO @ 12:04:19] 0.000427 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:20] Energy consumed for RAM : 0.000133 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:20] Delta energy consumed for CPU with constant : 0.000010 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:20] Energy consumed for All CPU : 0.000309 kWh

[codecarbon INFO @ 12:04:20] 0.000441 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:21] Energy consumed for RAM : 0.000138 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:21] Delta energy consumed for CPU with constant : 0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:21] Energy consumed for All CPU : 0.000319 kWh

[codecarbon INFO @ 12:04:21] 0.000457 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:04:21] Energy consumed for RAM : 0.000138 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:04:21] Delta energy consumed for CPU with constant : 0.000000 kWh, power : 42.5 W

[codecarbon INFO @ 12:04:21] Energy consumed for All CPU : 0.000320 kWh

[codecarbon INFO @ 12:04:21] 0.000457 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon WARNING @ 12:04:21] Multiple instances of codecarbon are allowed to run at the same time.

```

[codecarbon INFO @ 12:04:21] [setup] RAM Tracking..
[codecarbon INFO @ 12:04:21] [setup] CPU Tracking..
[codecarbon WARNING @ 12:04:23] We saw that you have a Intel(R) Core(TM) Ultra 9
185H but we don't know it. Please contact us.
[codecarbon WARNING @ 12:04:23] No CPU tracking mode found. Falling back on
estimation based on TDP for CPU.
  Windows OS detected: Please install Intel Power Gadget to measure CPU

[codecarbon INFO @ 12:04:23] CPU Model on constant consumption mode: Intel(R)
Core(TM) Ultra 9 185H
[codecarbon WARNING @ 12:04:23] No CPU tracking mode found. Falling back on CPU
constant mode.
[codecarbon INFO @ 12:04:23] [setup] GPU Tracking..
[codecarbon INFO @ 12:04:23] No GPU found.
[codecarbon INFO @ 12:04:23] The below tracking methods have been set up:
    RAM Tracking Method: RAM power estimation model
    CPU Tracking Method: global constant
    GPU Tracking Method: Unspecified

[codecarbon INFO @ 12:04:23] >>> Tracker's metadata:
[codecarbon INFO @ 12:04:23]   Platform system: Windows-11-10.0.26200-SP0
[codecarbon INFO @ 12:04:23]   Python version: 3.12.6
[codecarbon INFO @ 12:04:23]   CodeCarbon version: 3.0.8
[codecarbon INFO @ 12:04:23]   Available RAM : 31.435 GB
[codecarbon INFO @ 12:04:23]   CPU count: 22 thread(s) in 22 physical CPU(s)
[codecarbon INFO @ 12:04:23]   CPU model: Intel(R) Core(TM) Ultra 9 185H
[codecarbon INFO @ 12:04:23]   GPU count: None
[codecarbon INFO @ 12:04:23]   GPU model: None
[codecarbon WARNING @ 12:05:38] Background scheduler didn't run for a long
period (74s), results might be inaccurate
[codecarbon WARNING @ 12:09:07] Background scheduler didn't run for a long
period (283s), results might be inaccurate
[codecarbon INFO @ 12:09:07] Energy consumed for RAM : 0.001576 kWh. RAM Power :
20.0 W
[codecarbon INFO @ 12:09:07] Energy consumed for RAM : 0.003152 kWh. RAM Power :
20.0 W

```

[codecarbon INFO @ 12:09:07] Delta energy consumed for CPU with constant : 0.003353 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:07] Delta energy consumed for CPU with constant : 0.003354 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:08] Energy consumed for All CPU : 0.006707 kWh

[codecarbon WARNING @ 12:09:08] Background scheduler didn't run for a long period (284s), results might be inaccurate

[codecarbon INFO @ 12:09:08] Energy consumed for All CPU : 0.006707 kWh

[codecarbon INFO @ 12:09:08] 0.009859 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:09:08] Energy consumed for RAM : 0.004734 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:09:08] 0.011441 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:09:24] Energy consumed for RAM : 0.004734 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:09:24] Energy consumed for RAM : 0.004734 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:09:24] Delta energy consumed for CPU with constant : 0.000000 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:24] Delta energy consumed for CPU with constant : 0.000000 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:24] Delta energy consumed for CPU with constant : 0.000000 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:24] Energy consumed for All CPU : 0.006707 kWh

[codecarbon INFO @ 12:09:24] Energy consumed for All CPU : 0.006707 kWh

[codecarbon INFO @ 12:09:24] Energy consumed for All CPU : 0.006707 kWh

[codecarbon INFO @ 12:09:24] 0.011441 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:09:24] 0.011441 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:09:24] 0.011441 kWh of electricity and 0.000000 L of water were used since the beginning.

Pandas pipeline done → emissions\_pandas.csv

7

8

## TASK 2 : PYSPARK PIPELINE

9

```

[3]: from pyspark.sql import SparkSession
from pyspark.sql.functions import col, explode, split, size, lower,
    ↪ regex_replace, avg, count
from pyspark.sql.types import StructType, StructField, StringType, LongType

log_spark = []

def spark_pipeline():
    print("\nRunning PySpark pipeline...")

    spark = SparkSession.builder \
        .appName("Books Reviews Spark CodeCarbon") \
        .master("local[*]") \
        .getOrCreate()

    # ---- Load ----
    def step_load_data():
        global books_df, reviews_df
        books_df = spark.read.option("header", True).csv("books_data.csv")
        reviews_df = spark.read.option("header", True).csv("Books_rating.csv")
    step_load_data()

    # ---- Clean ----
    def step_clean_data():
        global books_df_clean, reviews_df_clean
        books_df_clean = books_df.fillna({
            "description": "",
            "publisher": "Unknown",
            "categories": "[]",
            "authors": "[]"
        })
        reviews_df_clean = reviews_df.fillna({
            "Price": "0",
            "review/text": "",
            "review/summary": ""
        })
        books_df_clean = books_df_clean \
            .withColumn("authors", regex_replace(col("authors"), r"[\[\]']",
    ↪ "")) \
            .withColumn("categories", regex_replace(col("categories"),
    ↪ r"[\[\]']", "")) \

```

```

        .withColumn("authors", split(col("authors"), ",")) \
        .withColumn("categories", split(col("categories"), ","))
step_clean_data()

# ---- Join ----
def step_join_data():
    global merged_df
    merged_df = reviews_df_clean.join(books_df_clean, on="Title",
    ↪how="inner")
    step_join_data()

# ---- Compute metrics ----
def step_avg_rating_per_author():
    global author_ratings_df
    author_ratings_df = merged_df.withColumn("author",
    ↪explode(col("authors"))) \
        .groupby("author").agg(avg(col("review/score").cast("float")).
    ↪alias("avg_rating"))
    return author_ratings_df.count()
    measure_step("Average rating per author", "PySpark",
    ↪step_avg_rating_per_author, log_spark)

def step_reviews_per_publisher():
    global reviews_per_publisher_df
    reviews_per_publisher_df = merged_df.groupby("publisher").
    ↪agg(count("Id").alias("num_reviews"))
    return reviews_per_publisher_df.count()
    measure_step("Number of reviews per publisher", "PySpark",
    ↪step_reviews_per_publisher, log_spark)

def step_top10_categories():
    global category_reviews_df
    category_reviews_df = merged_df.withColumn("category",
    ↪explode(col("categories"))) \
        .groupby("category").agg(count("Id").alias("num_reviews")) \
        .orderBy(col("num_reviews").desc()).limit(10)
    return category_reviews_df.count()
    measure_step("Top 10 most-reviewed categories", "PySpark",
    ↪step_top10_categories, log_spark)

# ---- Text processing ----
def step_avg_review_length():
    tmp = merged_df.withColumn("review_length", size(split(col("review/
    ↪text"), " ")))
    tmp.selectExpr("avg(review_length)").collect()
    return tmp.count()

```

```

    measure_step("Average review length", "PySpark", step_avg_review_length,
↳log_spark)

def step_most_common_words():
    global top_words_df

    def _partition_top_words(rows):
        from collections import Counter
        import re

        counter = Counter()
        for row in rows:
            text = row[0]
            if text:
                tokens = re.findall(r"[\w']+", text.lower())
                counter.update(token for token in tokens if token)

        for word, count_value in counter.most_common(2000):
            yield word, count_value

    token_counts = (
        merged_df
        .select("review/text")
        .where(col("review/text").isNotNull())
        .rdd
        .mapPartitions(_partition_top_words)
        .reduceByKey(lambda a, b: a + b)
    )

    top_words = token_counts.takeOrdered(10, key=lambda kv: -kv[1])
    schema = StructType([
        StructField("word", StringType(), False),
        StructField("count", LongType(), False),
    ])
    if top_words:
        top_words_df = spark.createDataFrame(top_words, schema=schema)
    else:
        top_words_df = spark.createDataFrame([], schema=schema)
    return len(top_words)

    measure_step("Most frequent keywords", "PySpark", step_most_common_words,
↳log_spark)

# ---- Save ----
def step_save_results():
    author_ratings_df.toPandas().to_csv("avg_rating_per_author_spark.csv",
↳index=False)

```

```

        reviews_per_publisher_df.toPandas().to_csv("reviews_per_publisher_spark.
↪ csv", index=False)
        category_reviews_df.toPandas().to_csv("top10_categories_spark.csv",
↪ index=False)
        top_words_df.toPandas().to_csv("top10_keywords_spark.csv", index=False)

    spark.stop()

    pd.DataFrame(log_spark).to_csv("emissions_spark.csv", index=False)
    print(" PySpark pipeline done → emissions_spark.csv")

# Run Task 2
spark_pipeline()

```

Running PySpark pipeline...

[codecarbon WARNING @ 12:09:44] Multiple instances of codecarbon are allowed to run at the same time.

[codecarbon INFO @ 12:09:44] [setup] RAM Tracking...

[codecarbon INFO @ 12:09:44] [setup] CPU Tracking...

[codecarbon WARNING @ 12:09:46] We saw that you have a Intel(R) Core(TM) Ultra 9 185H but we don't know it. Please contact us.

[codecarbon WARNING @ 12:09:46] No CPU tracking mode found. Falling back on estimation based on TDP for CPU.

Windows OS detected: Please install Intel Power Gadget to measure CPU

[codecarbon INFO @ 12:09:46] CPU Model on constant consumption mode: Intel(R) Core(TM) Ultra 9 185H

[codecarbon WARNING @ 12:09:46] No CPU tracking mode found. Falling back on CPU constant mode.

[codecarbon INFO @ 12:09:46] [setup] GPU Tracking...

[codecarbon INFO @ 12:09:46] No GPU found.

[codecarbon INFO @ 12:09:46] The below tracking methods have been set up:

RAM Tracking Method: RAM power estimation model

CPU Tracking Method: global constant

GPU Tracking Method: Unspecified

[codecarbon INFO @ 12:09:46] >>> Tracker's metadata:

[codecarbon INFO @ 12:09:46] Platform system: Windows-11-10.0.26200-SP0

[codecarbon INFO @ 12:09:46] Python version: 3.12.6

```

[decodercarbon INFO @ 12:09:46] CodeCarbon version: 3.0.8
[decodercarbon INFO @ 12:09:46] Available RAM : 31.435 GB
[decodercarbon INFO @ 12:09:46] CPU count: 22 thread(s) in 22 physical CPU(s)
[decodercarbon INFO @ 12:09:46] CPU model: Intel(R) Core(TM) Ultra 9 185H
[decodercarbon INFO @ 12:09:46] GPU count: None
[decodercarbon INFO @ 12:09:46] GPU model: None
[decodercarbon INFO @ 12:09:48] Energy consumed for RAM : 0.000006 kWh. RAM Power :
20.0 W
[decodercarbon INFO @ 12:09:48] Delta energy consumed for CPU with constant :
0.000012 kWh, power : 42.5 W
[decodercarbon INFO @ 12:09:48] Energy consumed for All CPU : 0.000012 kWh
[decodercarbon INFO @ 12:09:48] 0.000018 kWh of electricity and 0.000000 L of water
were used since the beginning.
[decodercarbon INFO @ 12:09:49] Energy consumed for RAM : 0.000011 kWh. RAM Power :
20.0 W
[decodercarbon INFO @ 12:09:49] Delta energy consumed for CPU with constant :
0.000012 kWh, power : 42.5 W
[decodercarbon INFO @ 12:09:49] Energy consumed for All CPU : 0.000024 kWh
[decodercarbon INFO @ 12:09:49] 0.000035 kWh of electricity and 0.000000 L of water
were used since the beginning.
[decodercarbon INFO @ 12:09:50] Energy consumed for RAM : 0.000017 kWh. RAM Power :
20.0 W
[decodercarbon INFO @ 12:09:50] Delta energy consumed for CPU with constant :
0.000012 kWh, power : 42.5 W
[decodercarbon INFO @ 12:09:50] Energy consumed for All CPU : 0.000036 kWh
[decodercarbon INFO @ 12:09:50] 0.000053 kWh of electricity and 0.000000 L of water
were used since the beginning.
[decodercarbon INFO @ 12:09:51] Energy consumed for RAM : 0.000022 kWh. RAM Power :
20.0 W
[decodercarbon INFO @ 12:09:51] Delta energy consumed for CPU with constant :
0.000012 kWh, power : 42.5 W
[decodercarbon INFO @ 12:09:51] Energy consumed for All CPU : 0.000048 kWh
[decodercarbon INFO @ 12:09:51] 0.000070 kWh of electricity and 0.000000 L of water
were used since the beginning.
[decodercarbon INFO @ 12:09:52] Energy consumed for RAM : 0.000028 kWh. RAM Power :
20.0 W

```



[codecarbon INFO @ 12:09:52] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:52] Energy consumed for All CPU : 0.000060 kWh

[codecarbon INFO @ 12:09:52] 0.000088 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:09:53] Energy consumed for RAM : 0.000034 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:09:53] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:53] Energy consumed for All CPU : 0.000072 kWh

[codecarbon INFO @ 12:09:53] 0.000106 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:09:54] Energy consumed for RAM : 0.000039 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:09:54] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:54] Energy consumed for All CPU : 0.000084 kWh

[codecarbon INFO @ 12:09:54] 0.000123 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:09:55] Energy consumed for RAM : 0.000045 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:09:55] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:55] Energy consumed for All CPU : 0.000096 kWh

[codecarbon INFO @ 12:09:55] 0.000141 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:09:56] Energy consumed for RAM : 0.000050 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:09:56] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:56] Energy consumed for All CPU : 0.000108 kWh

[codecarbon INFO @ 12:09:56] 0.000158 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:09:57] Energy consumed for RAM : 0.000056 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:09:57] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:57] Energy consumed for All CPU : 0.000120 kWh

[codecarbon INFO @ 12:09:57] 0.000175 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:09:58] Energy consumed for RAM : 0.000061 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:09:58] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:58] Energy consumed for All CPU : 0.000131 kWh

[codecarbon INFO @ 12:09:58] 0.000193 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:09:59] Energy consumed for RAM : 0.000067 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:09:59] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:09:59] Energy consumed for All CPU : 0.000143 kWh

[codecarbon INFO @ 12:09:59] 0.000210 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:00] Energy consumed for RAM : 0.000073 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:00] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:00] Energy consumed for All CPU : 0.000156 kWh

[codecarbon INFO @ 12:10:00] 0.000228 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:01] Energy consumed for RAM : 0.000079 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:01] Delta energy consumed for CPU with constant : 0.000013 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:01] Energy consumed for All CPU : 0.000169 kWh

[codecarbon INFO @ 12:10:01] 0.000247 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:02] Energy consumed for RAM : 0.000084 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:02] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:02] Energy consumed for All CPU : 0.000180 kWh

[codecarbon INFO @ 12:10:02] 0.000264 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:03] Energy consumed for RAM : 0.000089 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:03] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:03] Energy consumed for All CPU : 0.000192 kWh

[codecarbon INFO @ 12:10:03] 0.000281 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:04] Energy consumed for RAM : 0.000093 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:04] Delta energy consumed for CPU with constant : 0.000008 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:04] Energy consumed for All CPU : 0.000200 kWh

[codecarbon INFO @ 12:10:04] 0.000293 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon WARNING @ 12:10:04] Multiple instances of codecarbon are allowed to run at the same time.

[codecarbon INFO @ 12:10:04] [setup] RAM Tracking...

[codecarbon INFO @ 12:10:04] [setup] CPU Tracking...

[codecarbon WARNING @ 12:10:06] We saw that you have a Intel(R) Core(TM) Ultra 9 185H but we don't know it. Please contact us.

[codecarbon WARNING @ 12:10:06] No CPU tracking mode found. Falling back on estimation based on TDP for CPU.

Windows OS detected: Please install Intel Power Gadget to measure CPU

[codecarbon INFO @ 12:10:06] CPU Model on constant consumption mode: Intel(R) Core(TM) Ultra 9 185H

[codecarbon WARNING @ 12:10:06] No CPU tracking mode found. Falling back on CPU constant mode.

[codecarbon INFO @ 12:10:06] [setup] GPU Tracking...

[codecarbon INFO @ 12:10:06] No GPU found.

[codecarbon INFO @ 12:10:06] The below tracking methods have been set up:

RAM Tracking Method: RAM power estimation model

CPU Tracking Method: global constant

GPU Tracking Method: Unspecified

[codecarbon INFO @ 12:10:06] >>> Tracker's metadata:

[codecarbon INFO @ 12:10:06] Platform system: Windows-11-10.0.26200-SP0

[codecarbon INFO @ 12:10:06] Python version: 3.12.6

[codecarbon INFO @ 12:10:06] CodeCarbon version: 3.0.8

[codecarbon INFO @ 12:10:06] Available RAM : 31.435 GB

[codecarbon INFO @ 12:10:06] CPU count: 22 thread(s) in 22 physical CPU(s)

[codecarbon INFO @ 12:10:06] CPU model: Intel(R) Core(TM) Ultra 9 185H

[codecarbon INFO @ 12:10:06] GPU count: None

[codecarbon INFO @ 12:10:06] GPU model: None

[codecarbon INFO @ 12:10:07] Energy consumed for RAM : 0.000006 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:07] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:07] Energy consumed for All CPU : 0.000012 kWh

[codecarbon INFO @ 12:10:07] 0.000018 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:08] Energy consumed for RAM : 0.000011 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:08] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:08] Energy consumed for All CPU : 0.000024 kWh

[codecarbon INFO @ 12:10:08] 0.000035 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:09] Energy consumed for RAM : 0.000017 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:09] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:09] Energy consumed for All CPU : 0.000036 kWh

[codecarbon INFO @ 12:10:09] 0.000053 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:10] Energy consumed for RAM : 0.000022 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:10] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:10] Energy consumed for All CPU : 0.000048 kWh

[codecarbon INFO @ 12:10:10] 0.000070 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:11] Energy consumed for RAM : 0.000028 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:11] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:11] Energy consumed for All CPU : 0.000060 kWh

[codecarbon INFO @ 12:10:11] 0.000087 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:12] Energy consumed for RAM : 0.000033 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:12] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:12] Energy consumed for All CPU : 0.000072 kWh

[codecarbon INFO @ 12:10:12] 0.000105 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:13] Energy consumed for RAM : 0.000039 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:13] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:13] Energy consumed for All CPU : 0.000083 kWh

[codecarbon INFO @ 12:10:13] 0.000122 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:15] Energy consumed for RAM : 0.000044 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:15] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:15] Energy consumed for All CPU : 0.000095 kWh

[codecarbon INFO @ 12:10:15] 0.000140 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:15] Energy consumed for RAM : 0.000047 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:15] Delta energy consumed for CPU with constant : 0.000007 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:15] Energy consumed for All CPU : 0.000102 kWh

[codecarbon INFO @ 12:10:15] 0.000149 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon WARNING @ 12:10:15] Multiple instances of codecarbon are allowed to run at the same time.

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[codecarbon INFO @ 12:10:15] [setup] RAM Tracking..
[codecarbon INFO @ 12:10:15] [setup] CPU Tracking..
[codecarbon WARNING @ 12:10:17] We saw that you have a Intel(R) Core(TM) Ultra 9
185H but we don't know it. Please contact us.
[codecarbon WARNING @ 12:10:17] No CPU tracking mode found. Falling back on
estimation based on TDP for CPU.
  Windows OS detected: Please install Intel Power Gadget to measure CPU

[codecarbon INFO @ 12:10:17] CPU Model on constant consumption mode: Intel(R)
Core(TM) Ultra 9 185H
[codecarbon WARNING @ 12:10:17] No CPU tracking mode found. Falling back on CPU
constant mode.
[codecarbon INFO @ 12:10:17] [setup] GPU Tracking..
[codecarbon INFO @ 12:10:17] No GPU found.
[codecarbon INFO @ 12:10:17] The below tracking methods have been set up:
      RAM Tracking Method: RAM power estimation model
      CPU Tracking Method: global constant
      GPU Tracking Method: Unspecified

[codecarbon INFO @ 12:10:17] >>> Tracker's metadata:
[codecarbon INFO @ 12:10:17]   Platform system: Windows-11-10.0.26200-SP0
[codecarbon INFO @ 12:10:17]   Python version: 3.12.6
[codecarbon INFO @ 12:10:17]   CodeCarbon version: 3.0.8
[codecarbon INFO @ 12:10:17]   Available RAM : 31.435 GB
[codecarbon INFO @ 12:10:17]   CPU count: 22 thread(s) in 22 physical CPU(s)
[codecarbon INFO @ 12:10:17]   CPU model: Intel(R) Core(TM) Ultra 9 185H
[codecarbon INFO @ 12:10:17]   GPU count: None
[codecarbon INFO @ 12:10:17]   GPU model: None
[codecarbon INFO @ 12:10:19] Energy consumed for RAM : 0.000006 kWh. RAM Power :
20.0 W
[codecarbon INFO @ 12:10:19] Delta energy consumed for CPU with constant :
0.000012 kWh, power : 42.5 W
[codecarbon INFO @ 12:10:19] Energy consumed for All CPU : 0.000012 kWh
[codecarbon INFO @ 12:10:19] 0.000018 kWh of electricity and 0.000000 L of water
were used since the beginning.
[codecarbon INFO @ 12:10:20] Energy consumed for RAM : 0.000011 kWh. RAM Power :
20.0 W

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[codecarbon INFO @ 12:10:20] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:20] Energy consumed for All CPU : 0.000024 kWh

[codecarbon INFO @ 12:10:20] 0.000036 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:10:21] Energy consumed for RAM : 0.000017 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:10:21] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:21] Energy consumed for All CPU : 0.000036 kWh

[codecarbon INFO @ 12:10:21] 0.000053 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:10:22] Energy consumed for RAM : 0.000022 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:10:22] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:22] Energy consumed for All CPU : 0.000048 kWh

[codecarbon INFO @ 12:10:22] 0.000071 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:10:23] Energy consumed for RAM : 0.000028 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:10:23] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:23] Energy consumed for All CPU : 0.000060 kWh

[codecarbon INFO @ 12:10:23] 0.000088 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:10:24] Energy consumed for RAM : 0.000033 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:10:24] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:24] Energy consumed for All CPU : 0.000072 kWh

[codecarbon INFO @ 12:10:24] 0.000105 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:10:25] Energy consumed for RAM : 0.000039 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:10:25] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:25] Energy consumed for All CPU : 0.000084 kWh

[codecarbon INFO @ 12:10:25] 0.000123 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:26] Energy consumed for RAM : 0.000045 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:26] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:26] Energy consumed for All CPU : 0.000096 kWh

[codecarbon INFO @ 12:10:26] 0.000140 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:27] Energy consumed for RAM : 0.000050 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:27] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:27] Energy consumed for All CPU : 0.000108 kWh

[codecarbon INFO @ 12:10:27] 0.000158 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:28] Energy consumed for RAM : 0.000055 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:28] Delta energy consumed for CPU with constant : 0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:28] Energy consumed for All CPU : 0.000118 kWh

[codecarbon INFO @ 12:10:28] 0.000174 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon WARNING @ 12:10:28] Multiple instances of codecarbon are allowed to run at the same time.

[codecarbon INFO @ 12:10:28] [setup] RAM Tracking..

[codecarbon INFO @ 12:10:28] [setup] CPU Tracking..

[codecarbon WARNING @ 12:10:29] We saw that you have a Intel(R) Core(TM) Ultra 9 185H but we don't know it. Please contact us.

[codecarbon WARNING @ 12:10:29] No CPU tracking mode found. Falling back on estimation based on TDP for CPU.

Windows OS detected: Please install Intel Power Gadget to measure CPU

[codecarbon INFO @ 12:10:29] CPU Model on constant consumption mode: Intel(R) Core(TM) Ultra 9 185H

[codecarbon WARNING @ 12:10:29] No CPU tracking mode found. Falling back on CPU constant mode.



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[codecarbon INFO @ 12:10:29] [setup] GPU Tracking..
[codecarbon INFO @ 12:10:29] No GPU found.
[codecarbon INFO @ 12:10:29] The below tracking methods have been set up:
    RAM Tracking Method: RAM power estimation model
    CPU Tracking Method: global constant
    GPU Tracking Method: Unspecified

[codecarbon INFO @ 12:10:29] >>> Tracker's metadata:
[codecarbon INFO @ 12:10:29]   Platform system: Windows-11-10.0.26200-SPO
[codecarbon INFO @ 12:10:29]   Python version: 3.12.6
[codecarbon INFO @ 12:10:29]   CodeCarbon version: 3.0.8
[codecarbon INFO @ 12:10:29]   Available RAM : 31.435 GB
[codecarbon INFO @ 12:10:29]   CPU count: 22 thread(s) in 22 physical CPU(s)
[codecarbon INFO @ 12:10:29]   CPU model: Intel(R) Core(TM) Ultra 9 185H
[codecarbon INFO @ 12:10:29]   GPU count: None
[codecarbon INFO @ 12:10:29]   GPU model: None
[codecarbon INFO @ 12:10:31] Energy consumed for RAM : 0.000006 kWh. RAM Power :
20.0 W
[codecarbon INFO @ 12:10:31] Delta energy consumed for CPU with constant :
0.000013 kWh, power : 42.5 W
[codecarbon INFO @ 12:10:31] Energy consumed for All CPU : 0.000013 kWh
[codecarbon INFO @ 12:10:31] 0.000019 kWh of electricity and 0.000000 L of water
were used since the beginning.
[codecarbon INFO @ 12:10:32] Energy consumed for RAM : 0.000011 kWh. RAM Power :
20.0 W
[codecarbon INFO @ 12:10:32] Delta energy consumed for CPU with constant :
0.000011 kWh, power : 42.5 W
[codecarbon INFO @ 12:10:32] Energy consumed for All CPU : 0.000025 kWh
[codecarbon INFO @ 12:10:32] 0.000036 kWh of electricity and 0.000000 L of water
were used since the beginning.
[codecarbon INFO @ 12:10:33] Energy consumed for RAM : 0.000017 kWh. RAM Power :
20.0 W
[codecarbon INFO @ 12:10:33] Delta energy consumed for CPU with constant :
0.000012 kWh, power : 42.5 W
[codecarbon INFO @ 12:10:33] Energy consumed for All CPU : 0.000037 kWh

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[codecarbon INFO @ 12:10:33] 0.000053 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:34] Energy consumed for RAM : 0.000022 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:34] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:34] Energy consumed for All CPU : 0.000049 kWh

[codecarbon INFO @ 12:10:34] 0.000071 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:35] Energy consumed for RAM : 0.000028 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:35] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:35] Energy consumed for All CPU : 0.000061 kWh

[codecarbon INFO @ 12:10:35] 0.000088 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:36] Energy consumed for RAM : 0.000033 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:36] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:36] Energy consumed for All CPU : 0.000073 kWh

[codecarbon INFO @ 12:10:36] 0.000106 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:37] Energy consumed for RAM : 0.000039 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:37] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:37] Energy consumed for All CPU : 0.000085 kWh

[codecarbon INFO @ 12:10:37] 0.000124 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:38] Energy consumed for RAM : 0.000044 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:38] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:38] Energy consumed for All CPU : 0.000097 kWh

[codecarbon INFO @ 12:10:38] 0.000141 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:39] Energy consumed for RAM : 0.000050 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:39] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:39] Energy consumed for All CPU : 0.000109 kWh

[codecarbon INFO @ 12:10:39] 0.000158 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:40] Energy consumed for RAM : 0.000055 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:40] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:40] Energy consumed for All CPU : 0.000120 kWh

[codecarbon INFO @ 12:10:40] 0.000175 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:41] Energy consumed for RAM : 0.000061 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:42] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:42] Energy consumed for All CPU : 0.000133 kWh

[codecarbon INFO @ 12:10:42] 0.000193 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:43] Energy consumed for RAM : 0.000066 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:43] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:43] Energy consumed for All CPU : 0.000145 kWh

[codecarbon INFO @ 12:10:43] 0.000211 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:44] Energy consumed for RAM : 0.000072 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:44] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:44] Energy consumed for All CPU : 0.000157 kWh

[codecarbon INFO @ 12:10:44] 0.000228 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:45] Energy consumed for RAM : 0.000077 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:45] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:45] Energy consumed for All CPU : 0.000169 kWh

[codecarbon INFO @ 12:10:45] 0.000246 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:10:46] Energy consumed for RAM : 0.000082 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:10:46] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:46] Energy consumed for All CPU : 0.000180 kWh

[codecarbon INFO @ 12:10:46] 0.000263 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:10:47] Energy consumed for RAM : 0.000088 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:10:47] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:47] Energy consumed for All CPU : 0.000192 kWh

[codecarbon INFO @ 12:10:47] 0.000280 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:10:48] Energy consumed for RAM : 0.000093 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:10:48] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:48] Energy consumed for All CPU : 0.000204 kWh

[codecarbon INFO @ 12:10:48] 0.000297 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:10:49] Energy consumed for RAM : 0.000098 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:10:49] Delta energy consumed for CPU with constant :  
0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:49] Energy consumed for All CPU : 0.000216 kWh

[codecarbon INFO @ 12:10:49] 0.000314 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:10:50] Energy consumed for RAM : 0.000104 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:10:50] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:50] Energy consumed for All CPU : 0.000228 kWh

[codecarbon INFO @ 12:10:50] 0.000332 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:51] Energy consumed for RAM : 0.000109 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:51] Delta energy consumed for CPU with constant : 0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:51] Energy consumed for All CPU : 0.000239 kWh

[codecarbon INFO @ 12:10:51] 0.000348 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:52] Energy consumed for RAM : 0.000115 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:52] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:52] Energy consumed for All CPU : 0.000251 kWh

[codecarbon INFO @ 12:10:52] 0.000366 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:53] Energy consumed for RAM : 0.000120 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:53] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:53] Energy consumed for All CPU : 0.000263 kWh

[codecarbon INFO @ 12:10:53] 0.000383 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:54] Energy consumed for RAM : 0.000126 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:54] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:54] Energy consumed for All CPU : 0.000275 kWh

[codecarbon INFO @ 12:10:54] 0.000401 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:55] Energy consumed for RAM : 0.000131 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:55] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:55] Energy consumed for All CPU : 0.000288 kWh

[codecarbon INFO @ 12:10:55] 0.000419 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:56] Energy consumed for RAM : 0.000137 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:56] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:56] Energy consumed for All CPU : 0.000300 kWh

[codecarbon INFO @ 12:10:56] 0.000436 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:57] Energy consumed for RAM : 0.000142 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:57] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:57] Energy consumed for All CPU : 0.000312 kWh

[codecarbon INFO @ 12:10:57] 0.000454 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:58] Energy consumed for RAM : 0.000148 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:58] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:58] Energy consumed for All CPU : 0.000324 kWh

[codecarbon INFO @ 12:10:58] 0.000472 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:10:59] Energy consumed for RAM : 0.000153 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:10:59] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:10:59] Energy consumed for All CPU : 0.000336 kWh

[codecarbon INFO @ 12:10:59] 0.000489 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:00] Energy consumed for RAM : 0.000159 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:00] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:00] Energy consumed for All CPU : 0.000348 kWh

[codecarbon INFO @ 12:11:00] 0.000507 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:01] Energy consumed for RAM : 0.000164 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:01] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:01] Energy consumed for All CPU : 0.000360 kWh

[codecarbon INFO @ 12:11:01] 0.000524 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:02] Energy consumed for RAM : 0.000170 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:02] Delta energy consumed for CPU with constant : 0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:02] Energy consumed for All CPU : 0.000372 kWh

[codecarbon INFO @ 12:11:02] 0.000541 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:03] Energy consumed for RAM : 0.000175 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:03] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:03] Energy consumed for All CPU : 0.000383 kWh

[codecarbon INFO @ 12:11:03] 0.000558 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:04] Energy consumed for RAM : 0.000180 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:04] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:04] Energy consumed for All CPU : 0.000395 kWh

[codecarbon INFO @ 12:11:04] 0.000576 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:05] Energy consumed for RAM : 0.000186 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:05] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:05] Energy consumed for All CPU : 0.000407 kWh

[codecarbon INFO @ 12:11:05] 0.000593 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:06] Energy consumed for RAM : 0.000191 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:06] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:06] Energy consumed for All CPU : 0.000419 kWh

[codecarbon INFO @ 12:11:06] 0.000610 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:11:07] Energy consumed for RAM : 0.000196 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:11:07] Delta energy consumed for CPU with constant :  
0.000011 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:07] Energy consumed for All CPU : 0.000430 kWh

[codecarbon INFO @ 12:11:07] 0.000626 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:11:08] Energy consumed for RAM : 0.000202 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:11:08] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:08] Energy consumed for All CPU : 0.000442 kWh

[codecarbon INFO @ 12:11:08] 0.000643 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:11:09] Energy consumed for RAM : 0.000207 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:11:09] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:09] Energy consumed for All CPU : 0.000454 kWh

[codecarbon INFO @ 12:11:09] 0.000661 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:11:10] Energy consumed for RAM : 0.000212 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:11:10] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:10] Energy consumed for All CPU : 0.000466 kWh

[codecarbon INFO @ 12:11:10] 0.000678 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:11:11] Energy consumed for RAM : 0.000218 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:11:11] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W



[codecarbon INFO @ 12:11:11] Energy consumed for All CPU : 0.000477 kWh

[codecarbon INFO @ 12:11:11] 0.000695 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:12] Energy consumed for RAM : 0.000223 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:12] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:12] Energy consumed for All CPU : 0.000489 kWh

[codecarbon INFO @ 12:11:12] 0.000712 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:13] Energy consumed for RAM : 0.000229 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:13] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:13] Energy consumed for All CPU : 0.000501 kWh

[codecarbon INFO @ 12:11:13] 0.000730 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:14] Energy consumed for RAM : 0.000234 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:14] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:14] Energy consumed for All CPU : 0.000513 kWh

[codecarbon INFO @ 12:11:14] 0.000747 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:15] Energy consumed for RAM : 0.000239 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:15] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:15] Energy consumed for All CPU : 0.000524 kWh

[codecarbon INFO @ 12:11:15] 0.000764 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:16] Energy consumed for RAM : 0.000245 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:16] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:16] Energy consumed for All CPU : 0.000536 kWh

[codecarbon INFO @ 12:11:16] 0.000781 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:17] Energy consumed for RAM : 0.000250 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:17] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:17] Energy consumed for All CPU : 0.000548 kWh

[codecarbon INFO @ 12:11:17] 0.000798 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:18] Energy consumed for RAM : 0.000256 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:18] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:18] Energy consumed for All CPU : 0.000560 kWh

[codecarbon INFO @ 12:11:18] 0.000816 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:19] Energy consumed for RAM : 0.000261 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:19] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:19] Energy consumed for All CPU : 0.000572 kWh

[codecarbon INFO @ 12:11:19] 0.000833 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:20] Energy consumed for RAM : 0.000267 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:20] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:20] Energy consumed for All CPU : 0.000584 kWh

[codecarbon INFO @ 12:11:20] 0.000851 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:21] Energy consumed for RAM : 0.000273 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:21] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:21] Energy consumed for All CPU : 0.000596 kWh

[codecarbon INFO @ 12:11:21] 0.000868 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:22] Energy consumed for RAM : 0.000278 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:22] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:22] Energy consumed for All CPU : 0.000608 kWh

[codecarbon INFO @ 12:11:22] 0.000886 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:23] Energy consumed for RAM : 0.000284 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:23] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:23] Energy consumed for All CPU : 0.000619 kWh

[codecarbon INFO @ 12:11:23] 0.000903 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:24] Energy consumed for RAM : 0.000289 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:24] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:24] Energy consumed for All CPU : 0.000631 kWh

[codecarbon INFO @ 12:11:24] 0.000921 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:25] Energy consumed for RAM : 0.000295 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:25] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:25] Energy consumed for All CPU : 0.000643 kWh

[codecarbon INFO @ 12:11:25] 0.000938 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:25] Energy consumed for RAM : 0.000295 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:25] Delta energy consumed for CPU with constant : 0.000000 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:25] Energy consumed for All CPU : 0.000644 kWh

[codecarbon INFO @ 12:11:25] 0.000939 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon WARNING @ 12:11:25] Multiple instances of codecarbon are allowed to run at the same time.

```

[codecarbon INFO @ 12:11:25] [setup] RAM Tracking..
[codecarbon INFO @ 12:11:25] [setup] CPU Tracking..
[codecarbon WARNING @ 12:11:27] We saw that you have a Intel(R) Core(TM) Ultra 9
185H but we don't know it. Please contact us.
[codecarbon WARNING @ 12:11:27] No CPU tracking mode found. Falling back on
estimation based on TDP for CPU.
  Windows OS detected: Please install Intel Power Gadget to measure CPU

[codecarbon INFO @ 12:11:27] CPU Model on constant consumption mode: Intel(R)
Core(TM) Ultra 9 185H
[codecarbon WARNING @ 12:11:27] No CPU tracking mode found. Falling back on CPU
constant mode.
[codecarbon INFO @ 12:11:27] [setup] GPU Tracking..
[codecarbon INFO @ 12:11:27] No GPU found.
[codecarbon INFO @ 12:11:27] The below tracking methods have been set up:
    RAM Tracking Method: RAM power estimation model
    CPU Tracking Method: global constant
    GPU Tracking Method: Unspecified

[codecarbon INFO @ 12:11:27] >>> Tracker's metadata:
[codecarbon INFO @ 12:11:27]   Platform system: Windows-11-10.0.26200-SP0
[codecarbon INFO @ 12:11:27]   Python version: 3.12.6
[codecarbon INFO @ 12:11:27]   CodeCarbon version: 3.0.8
[codecarbon INFO @ 12:11:27]   Available RAM : 31.435 GB
[codecarbon INFO @ 12:11:27]   CPU count: 22 thread(s) in 22 physical CPU(s)
[codecarbon INFO @ 12:11:27]   CPU model: Intel(R) Core(TM) Ultra 9 185H
[codecarbon INFO @ 12:11:27]   GPU count: None
[codecarbon INFO @ 12:11:27]   GPU model: None
[codecarbon INFO @ 12:11:29] Energy consumed for RAM : 0.000006 kWh. RAM Power :
20.0 W
[codecarbon INFO @ 12:11:29] Delta energy consumed for CPU with constant :
0.000012 kWh, power : 42.5 W
[codecarbon INFO @ 12:11:29] Energy consumed for All CPU : 0.000012 kWh
[codecarbon INFO @ 12:11:29] 0.000018 kWh of electricity and 0.000000 L of water
were used since the beginning.
[codecarbon INFO @ 12:11:30] Energy consumed for RAM : 0.000011 kWh. RAM Power :
20.0 W

```

[codecarbon INFO @ 12:11:30] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:30] Energy consumed for All CPU : 0.000024 kWh

[codecarbon INFO @ 12:11:30] 0.000036 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:11:31] Energy consumed for RAM : 0.000017 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:11:31] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:31] Energy consumed for All CPU : 0.000036 kWh

[codecarbon INFO @ 12:11:31] 0.000053 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:11:32] Energy consumed for RAM : 0.000022 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:11:32] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:32] Energy consumed for All CPU : 0.000048 kWh

[codecarbon INFO @ 12:11:32] 0.000070 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:11:33] Energy consumed for RAM : 0.000028 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:11:33] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:33] Energy consumed for All CPU : 0.000060 kWh

[codecarbon INFO @ 12:11:33] 0.000088 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:11:34] Energy consumed for RAM : 0.000033 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:11:34] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:34] Energy consumed for All CPU : 0.000072 kWh

[codecarbon INFO @ 12:11:34] 0.000105 kWh of electricity and 0.000000 L of water  
were used since the beginning.

[codecarbon INFO @ 12:11:35] Energy consumed for RAM : 0.000039 kWh. RAM Power :  
20.0 W

[codecarbon INFO @ 12:11:35] Delta energy consumed for CPU with constant :  
0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:35] Energy consumed for All CPU : 0.000084 kWh

[codecarbon INFO @ 12:11:35] 0.000122 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:36] Energy consumed for RAM : 0.000044 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:36] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:36] Energy consumed for All CPU : 0.000095 kWh

[codecarbon INFO @ 12:11:36] 0.000140 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:37] Energy consumed for RAM : 0.000050 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:37] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:37] Energy consumed for All CPU : 0.000107 kWh

[codecarbon INFO @ 12:11:37] 0.000157 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:38] Energy consumed for RAM : 0.000055 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:38] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:38] Energy consumed for All CPU : 0.000119 kWh

[codecarbon INFO @ 12:11:38] 0.000175 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:39] Energy consumed for RAM : 0.000061 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:39] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:39] Energy consumed for All CPU : 0.000131 kWh

[codecarbon INFO @ 12:11:39] 0.000192 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:40] Energy consumed for RAM : 0.000066 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:40] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:40] Energy consumed for All CPU : 0.000143 kWh

[codecarbon INFO @ 12:11:40] 0.000209 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:41] Energy consumed for RAM : 0.000072 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:41] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:41] Energy consumed for All CPU : 0.000155 kWh

[codecarbon INFO @ 12:11:41] 0.000227 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:42] Energy consumed for RAM : 0.000077 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:42] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:42] Energy consumed for All CPU : 0.000166 kWh

[codecarbon INFO @ 12:11:42] 0.000244 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:43] Energy consumed for RAM : 0.000083 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:43] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:43] Energy consumed for All CPU : 0.000178 kWh

[codecarbon INFO @ 12:11:43] 0.000261 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:44] Energy consumed for RAM : 0.000089 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:44] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:44] Energy consumed for All CPU : 0.000190 kWh

[codecarbon INFO @ 12:11:44] 0.000279 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:45] Energy consumed for RAM : 0.000094 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:45] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:45] Energy consumed for All CPU : 0.000202 kWh

[codecarbon INFO @ 12:11:45] 0.000296 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:46] Energy consumed for RAM : 0.000100 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:46] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:46] Energy consumed for All CPU : 0.000214 kWh

[codecarbon INFO @ 12:11:46] 0.000314 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:47] Energy consumed for RAM : 0.000105 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:47] Delta energy consumed for CPU with constant : 0.000012 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:47] Energy consumed for All CPU : 0.000226 kWh

[codecarbon INFO @ 12:11:47] 0.000331 kWh of electricity and 0.000000 L of water were used since the beginning.

[codecarbon INFO @ 12:11:47] Energy consumed for RAM : 0.000106 kWh. RAM Power : 20.0 W

[codecarbon INFO @ 12:11:47] Delta energy consumed for CPU with constant : 0.000003 kWh, power : 42.5 W

[codecarbon INFO @ 12:11:47] Energy consumed for All CPU : 0.000229 kWh

[codecarbon INFO @ 12:11:47] 0.000335 kWh of electricity and 0.000000 L of water were used since the beginning.

CodeCarbon failed for Most frequent keywords: An error occurred while calling z:org.apache.spark.api.python.PythonRDD.collectAndServe.  
: org.apache.spark.SparkException: Job aborted due to stage failure: Task 10 in stage 62.0 failed 1 times, most recent failure: Lost task 10.0 in stage 62.0 (TID 405) (10.94.57.60 executor driver): org.apache.spark.SparkException: Python worker failed to connect back.

at org.apache.spark.api.python.PythonWorkerFactory.createSimpleWorker(PythonWorkerFactory.scala:203)

at org.apache.spark.api.python.PythonWorkerFactory.create(PythonWorkerFactory.scala:109)

at org.apache.spark.SparkEnv.createPythonWorker(SparkEnv.scala:124)

at

org.apache.spark.api.python.BasePythonRunner.compute(PythonRunner.scala:174)

at org.apache.spark.api.python.PythonRDD.compute(PythonRDD.scala:67)

at org.apache.spark.rdd.RDD.computeOrReadCheckpoint(RDD.scala:367)

at org.apache.spark.rdd.RDD.iterator(RDD.scala:331)

at org.apache.spark.api.python.PairwiseRDD.compute(PythonRDD.scala:130)

at org.apache.spark.rdd.RDD.computeOrReadCheckpoint(RDD.scala:367)

at org.apache.spark.rdd.RDD.iterator(RDD.scala:331)

at org.apache.spark.shuffle.ShuffleWriteProcessor.write(ShuffleWriteProcessor.scala:59)



```

    at
org.apache.spark.scheduler.ShuffleMapTask.runTask(ShuffleMapTask.scala:104)
    at
org.apache.spark.scheduler.ShuffleMapTask.runTask(ShuffleMapTask.scala:54)
    at
org.apache.spark.TaskContext.runTaskWithListeners(TaskContext.scala:166)
    at org.apache.spark.scheduler.Task.run(Task.scala:141)
    at
org.apache.spark.executor.Executor$TaskRunner.$anonfun$run$4(Executor.scala:620)
    at org.apache.spark.util.SparkErrorUtils.tryWithSafeFinally(SparkErrorU
ils.scala:64)
    at org.apache.spark.util.SparkErrorUtils.tryWithSafeFinally$(SparkErrorU
tils.scala:61)
    at org.apache.spark.util.Utils$.tryWithSafeFinally(Utils.scala:94)
    at org.apache.spark.executor.Executor$TaskRunner.run(Executor.scala:623)
    at java.base/java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoo
lExecutor.java:1128)
    at java.base/java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPo
olExecutor.java:628)
    at java.base/java.lang.Thread.run(Thread.java:829)
Caused by: java.net.SocketTimeoutException: Accept timed out
    at java.base/java.net.PlainSocketImpl.waitForNewConnection(Native
Method)
    at
java.base/java.net.PlainSocketImpl.socketAccept(PlainSocketImpl.java:163)
    at java.base/java.net.AbstractPlainSocketImpl.accept(AbstractPlainSocket
Impl.java:474)
    at java.base/java.net.ServerSocket.implAccept(ServerSocket.java:565)
    at java.base/java.net.ServerSocket.accept(ServerSocket.java:533)
    at org.apache.spark.api.python.PythonWorkerFactory.createSimpleWorker(Py
thonWorkerFactory.scala:190)
    ... 22 more

```

Driver stacktrace:

```

    at org.apache.spark.scheduler.DAGScheduler.failJobAndIndependentStages(D
AGScheduler.scala:2856)
    at org.apache.spark.scheduler.DAGScheduler.$anonfun$abortStage$2(DAGSche
duler.scala:2792)
    at org.apache.spark.scheduler.DAGScheduler.$anonfun$abortStage$2$adapted
(DAGScheduler.scala:2791)
    at
scala.collection.mutable.ResizableArray.foreach(ResizableArray.scala:62)
    at
scala.collection.mutable.ResizableArray.foreach$(ResizableArray.scala:55)
    at scala.collection.mutable.ArrayBuffer.foreach(ArrayBuffer.scala:49)
    at
org.apache.spark.scheduler.DAGScheduler.abortStage(DAGScheduler.scala:2791)
    at org.apache.spark.scheduler.DAGScheduler.$anonfun$handleTaskSetFailed$

```

```

1(DAGScheduler.scala:1247)
    at org.apache.spark.scheduler.DAGScheduler.$anonfun$handleTaskSetFailed$
1$adapted(DAGScheduler.scala:1247)
    at scala.Option.foreach(Option.scala:407)
    at org.apache.spark.scheduler.DAGScheduler.handleTaskSetFailed(DAGSchedu
ler.scala:1247)
    at org.apache.spark.scheduler.DAGSchedulerEventProcessLoop.doOnReceive(D
AGScheduler.scala:3060)
    at org.apache.spark.scheduler.DAGSchedulerEventProcessLoop.onReceive(DAG
Scheduler.scala:2994)
    at org.apache.spark.scheduler.DAGSchedulerEventProcessLoop.onReceive(DAG
Scheduler.scala:2983)
    at org.apache.spark.util.EventLoop$$anon$1.run(EventLoop.scala:49)
    at
org.apache.spark.scheduler.DAGScheduler.runJob(DAGScheduler.scala:989)
    at org.apache.spark.SparkContext.runJob(SparkContext.scala:2393)
    at org.apache.spark.SparkContext.runJob(SparkContext.scala:2414)
    at org.apache.spark.SparkContext.runJob(SparkContext.scala:2433)
    at org.apache.spark.SparkContext.runJob(SparkContext.scala:2458)
    at org.apache.spark.rdd.RDD.$anonfun$collect$1(RDD.scala:1049)
    at
org.apache.spark.rdd.RDDOperationScope$.withScope(RDDOperationScope.scala:151)
    at
org.apache.spark.rdd.RDDOperationScope$.withScope(RDDOperationScope.scala:112)
    at org.apache.spark.rdd.RDD.withScope(RDD.scala:410)
    at org.apache.spark.rdd.RDD.collect(RDD.scala:1048)
    at
org.apache.spark.api.python.PythonRDD$.collectAndServe(PythonRDD.scala:195)
    at
org.apache.spark.api.python.PythonRDD.collectAndServe(PythonRDD.scala)
    at
java.base/jdk.internal.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
    at java.base/jdk.internal.reflect.NativeMethodAccessorImpl.invoke(Native
MethodAccessorImpl.java:62)
    at java.base/jdk.internal.reflect.DelegatingMethodAccessorImpl.invoke(De
legatingMethodAccessorImpl.java:43)
    at java.base/java.lang.reflect.Method.invoke(Method.java:566)
    at py4j.reflection.MethodInvoker.invoke(MethodInvoker.java:244)
    at py4j.reflection.ReflectionEngine.invoke(ReflectionEngine.java:374)
    at py4j.Gateway.invoke(Gateway.java:282)
    at py4j.commands.AbstractCommand.invokeMethod(AbstractCommand.java:132)
    at py4j.commands.CallCommand.execute(CallCommand.java:79)
    at
py4j.ClientServerConnection.waitForCommands(ClientServerConnection.java:182)
    at py4j.ClientServerConnection.run(ClientServerConnection.java:106)
    at java.base/java.lang.Thread.run(Thread.java:829)
Caused by: org.apache.spark.SparkException: Python worker failed to connect
back.

```

```

    at org.apache.spark.api.python.PythonWorkerFactory.createSimpleWorker(Py
thonWorkerFactory.scala:203)
    at org.apache.spark.api.python.PythonWorkerFactory.create(PythonWorkerFa
ctory.scala:109)
    at org.apache.spark.SparkEnv.createPythonWorker(SparkEnv.scala:124)
    at
org.apache.spark.api.python.BasePythonRunner.compute(PythonRunner.scala:174)
    at org.apache.spark.api.python.PythonRDD.compute(PythonRDD.scala:67)
    at org.apache.spark.rdd.RDD.computeOrReadCheckpoint(RDD.scala:367)
    at org.apache.spark.rdd.RDD.iterator(RDD.scala:331)
    at org.apache.spark.api.python.PairwiseRDD.compute(PythonRDD.scala:130)
    at org.apache.spark.rdd.RDD.computeOrReadCheckpoint(RDD.scala:367)
    at org.apache.spark.rdd.RDD.iterator(RDD.scala:331)
    at org.apache.spark.shuffle.ShuffleWriteProcessor.write(ShuffleWriteProc
essor.scala:59)
    at
org.apache.spark.scheduler.ShuffleMapTask.runTask(ShuffleMapTask.scala:104)
    at
org.apache.spark.scheduler.ShuffleMapTask.runTask(ShuffleMapTask.scala:54)
    at
org.apache.spark.TaskContext.runTaskWithListeners(TaskContext.scala:166)
    at org.apache.spark.scheduler.Task.run(Task.scala:141)
    at
org.apache.spark.executor.Executor$TaskRunner.$anonfun$run$4(Executor.scala:620)
    at org.apache.spark.util.SparkErrorUtils.tryWithSafeFinally(SparkErrorUt
ils.scala:64)
    at org.apache.spark.util.SparkErrorUtils.tryWithSafeFinally$(SparkErrorU
tils.scala:61)
    at org.apache.spark.util.Utils$.tryWithSafeFinally(Utils.scala:94)
    at org.apache.spark.executor.Executor$TaskRunner.run(Executor.scala:623)
    at java.base/java.util.concurrent.ThreadPoolExecutor.runWorker(ThreadPoo
lExecutor.java:1128)
    at java.base/java.util.concurrent.ThreadPoolExecutor$Worker.run(ThreadPo
olExecutor.java:628)
    ... 1 more
Caused by: java.net.SocketTimeoutException: Accept timed out
    at java.base/java.net.PlainSocketImpl.waitForNewConnection(Native
Method)
    at
java.base/java.net.PlainSocketImpl.socketAccept(PlainSocketImpl.java:163)
    at java.base/java.net.AbstractPlainSocketImpl.accept(AbstractPlainSocket
Impl.java:474)
    at java.base/java.net.ServerSocket.implAccept(ServerSocket.java:565)
    at java.base/java.net.ServerSocket.accept(ServerSocket.java:533)
    at org.apache.spark.api.python.PythonWorkerFactory.createSimpleWorker(Py
thonWorkerFactory.scala:190)
    ... 22 more

```

PySpark pipeline done → emissions\_spark.csv

```
[4]: # Install seaborn if missing: uncomment next line
# !pip install seaborn

import glob
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

files = glob.glob("emissions_*.csv")
if not files:
    raise FileNotFoundError("No emissions_*.csv files found in the working_
    ↳directory.")

dfs = [pd.read_csv(f) for f in files]
df = pd.concat(dfs, ignore_index=True)

# Ensure numeric columns
df["CO2 (kg)"] = pd.to_numeric(df.get("CO2 (kg)", 0), errors="coerce").fillna(0)
df["Duration (s)"] = pd.to_numeric(df.get("Duration (s)", 0), errors="coerce").
    ↳fillna(0)

agg = df.groupby("Framework", as_index=False).agg({"CO2 (kg)": "sum", "Duration_
    ↳(s)": "sum"})

sns.set(style="whitegrid")
fig, axes = plt.subplots(1, 2, figsize=(12, 5))

sns.barplot(data=agg, x="Framework", y="CO2 (kg)", ax=axes[0], palette="muted")
axes[0].set_title("Total CO2 (kg) per Framework")
axes[0].set_xlabel("")
axes[0].tick_params(axis='x', rotation=30)

sns.barplot(data=agg, x="Framework", y="Duration (s)", ax=axes[1],
    ↳palette="muted")
axes[1].set_title("Total Duration (s) per Framework")
axes[1].set_xlabel("")
axes[1].tick_params(axis='x', rotation=30)

plt.tight_layout()
plt.savefig("emissions_by_framework.png", dpi=150)
plt.show()
```

C:\Users\Gaurav Chugh\AppData\Local\Temp\ipykernel\_21516\2873092671.py:25:  
FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in

v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effect.

```
sns.barplot(data=agg, x="Framework", y="CO2 (kg)", ax=axes[0],  
palette="muted")  
C:\Users\Gaurav Chugh\AppData\Local\Temp\ipykernel_21516\2873092671.py:30:  
FutureWarning:
```

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effect.

```
sns.barplot(data=agg, x="Framework", y="Duration (s)", ax=axes[1],  
palette="muted")
```

