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Sustainability Study on Video Transcodings

Team 7 - Leonardo Lago, Andrea Malnati, Roberto Negro

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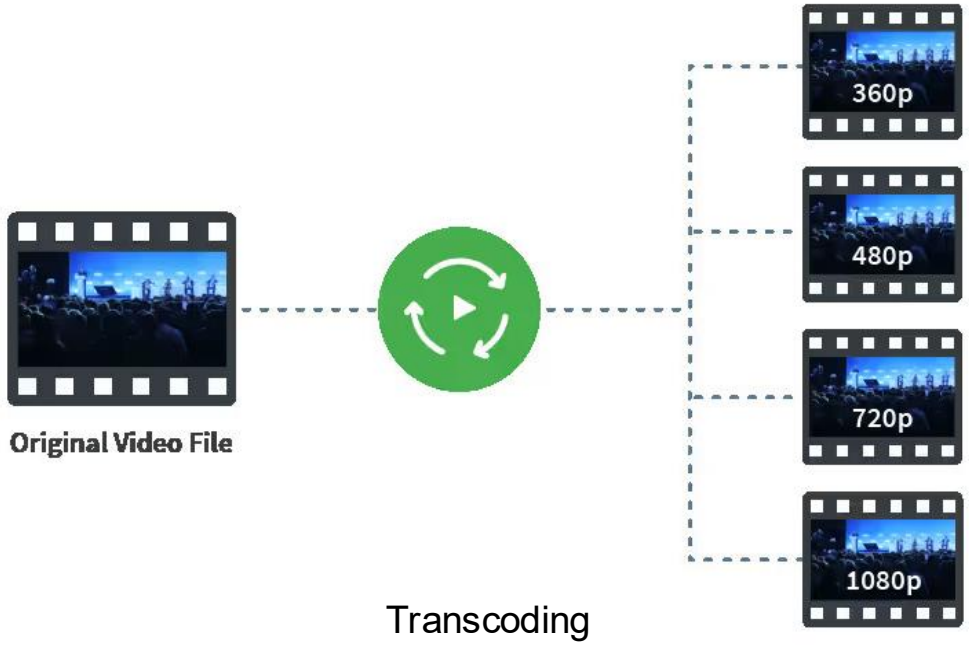
Project Objective

- Estimate carbon emissions of a video processing server located in the Netherlands
- Focus on the transcoding tasks
- Process of decoding and re-encoding a video in many resolutions to enables adaptive streaming
- One of the most energy-intensive tasks in the video processing pipeline

NETINT Quadra Video Server



Transcoding

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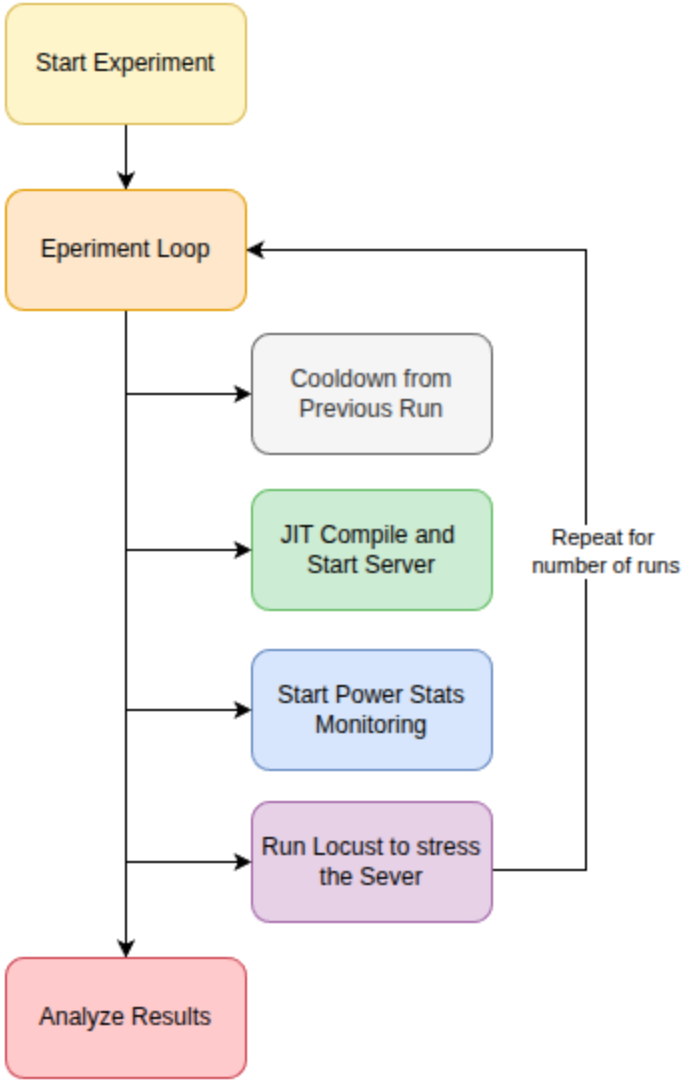
Experiment Design

- Tracking both CPU and GPU
- Evaluated 7 JIT profiles:
  - 30 repetitions
  - Input 3 minutes at 1080p30
  - Output 1080p, 720p, 480p, 360p
  - 3 minutes runs with 90s cooldown
  - 3 request to ensure real-time transcoding



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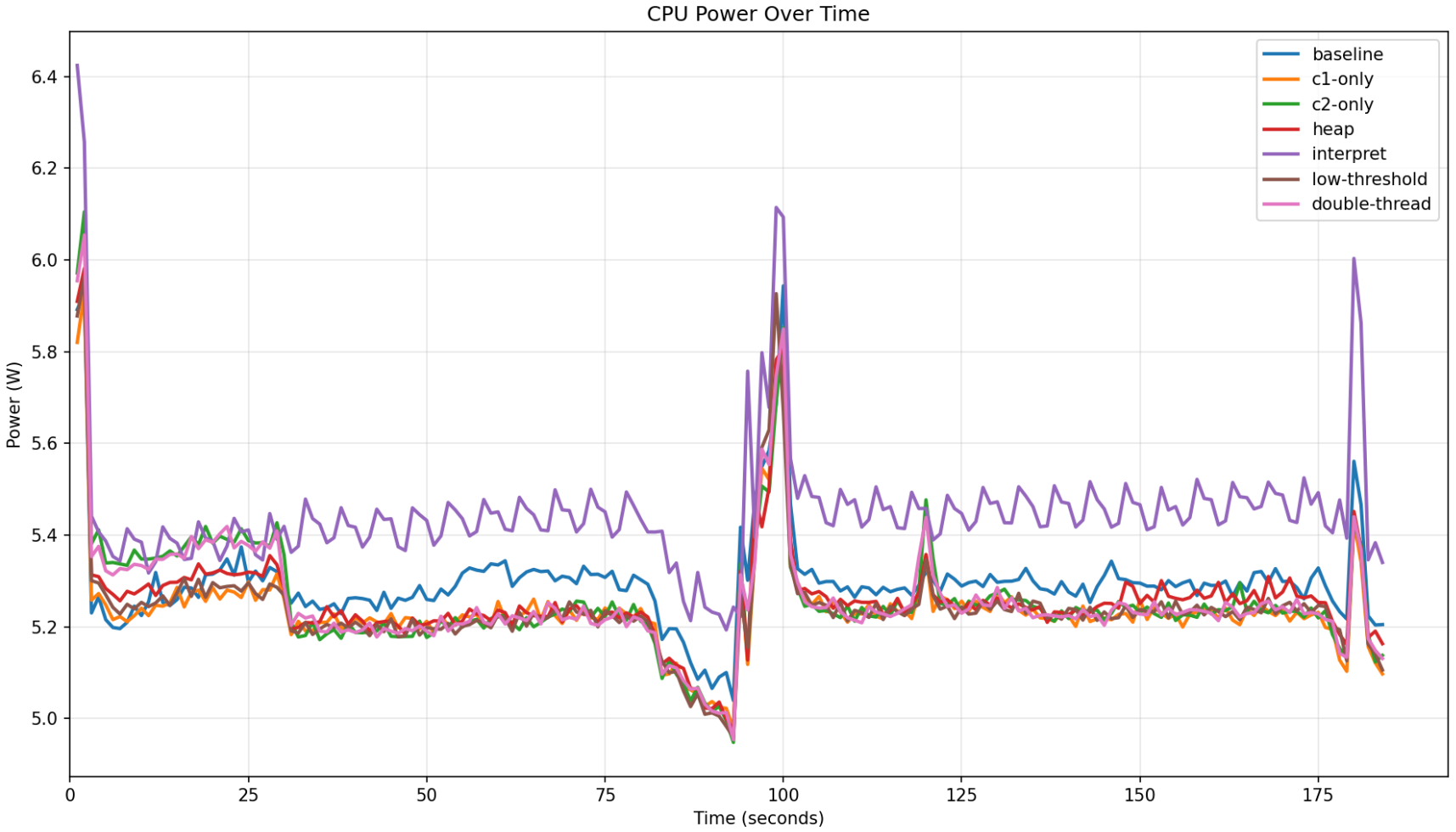
JIT Analysis



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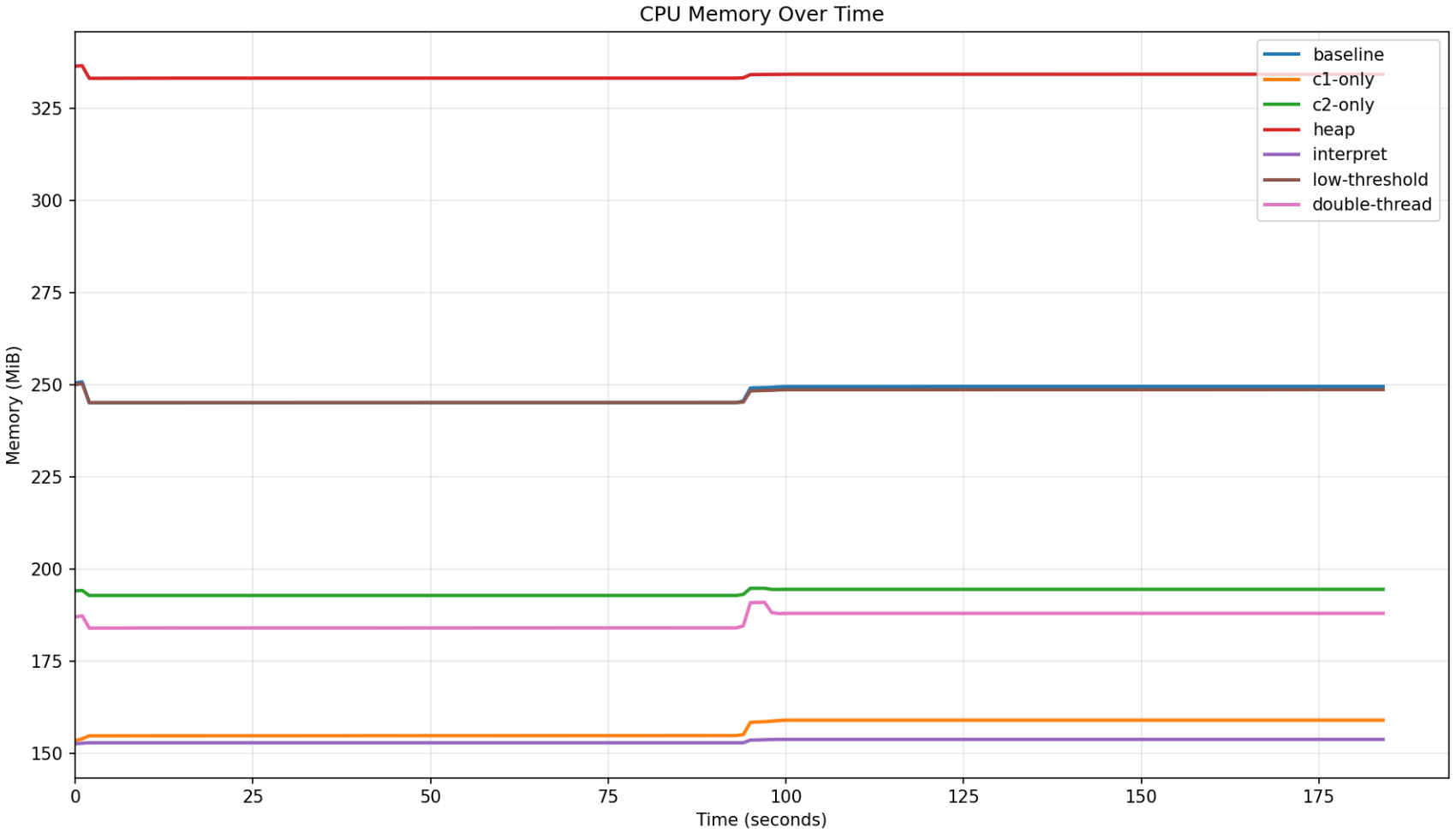
JIT Analysis



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Carbon footprint estimation

$$perf = \frac{Power}{N\ streams}$$

$$E_{VPU} = E_{GPU} \cdot \frac{perf_{VPU}}{perf_{GPU}}$$

Product	Performance (W/Stream)	Power proportion
NETINT T1U	0.625	25%
NVIDIA T4	6.73	270%
NVIDIA 4060 Mobile	2.491	100%

$$E_{VPU} = 6217.159 \cdot 0.251 = 1560.507\ J \quad \text{in 3 minutes}$$

$$E_{VPU} = 93630.42\ J \quad \text{in 3 hours}$$

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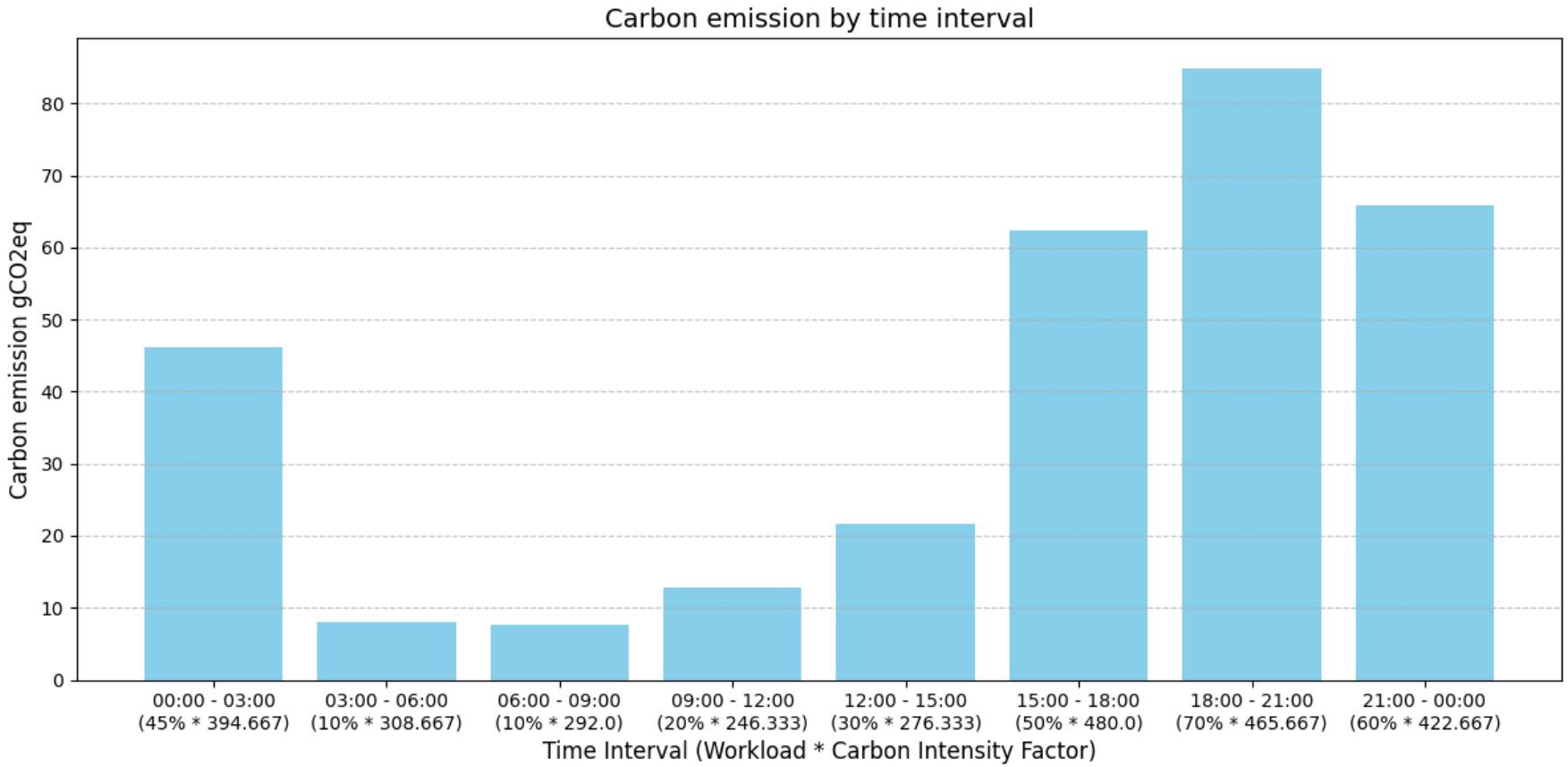
Results and Considerations

Time	Workload
00:00 - 03:00	45%
03:00 - 06:00	10%
06:00 - 09:00	10%
09:00 - 12:00	20%
12:00 - 15:00	30%
15:00 - 18:00	50%
18:00 - 21:00	70%
21:00 - 00:00	60%



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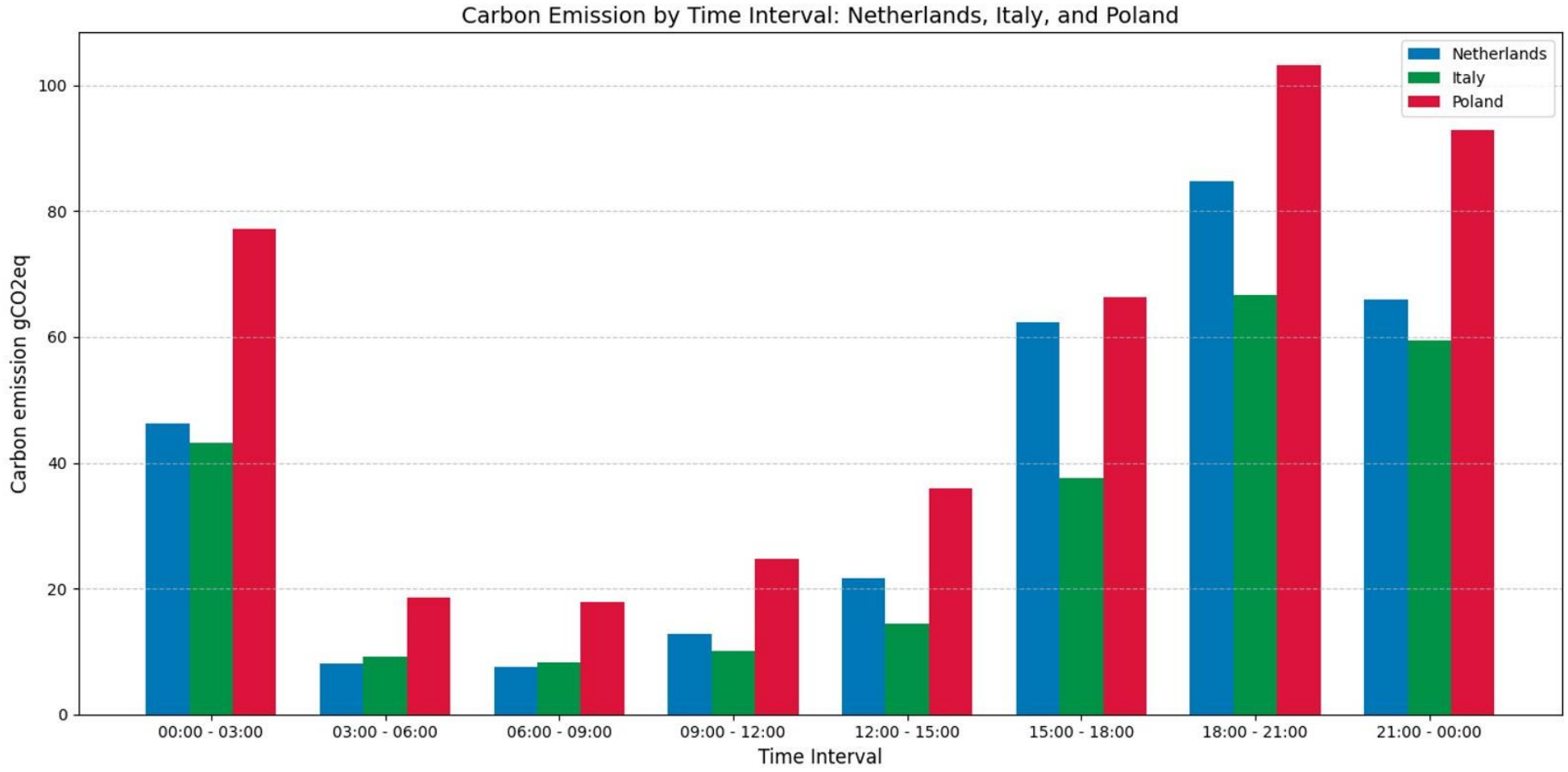
Results and Considerations



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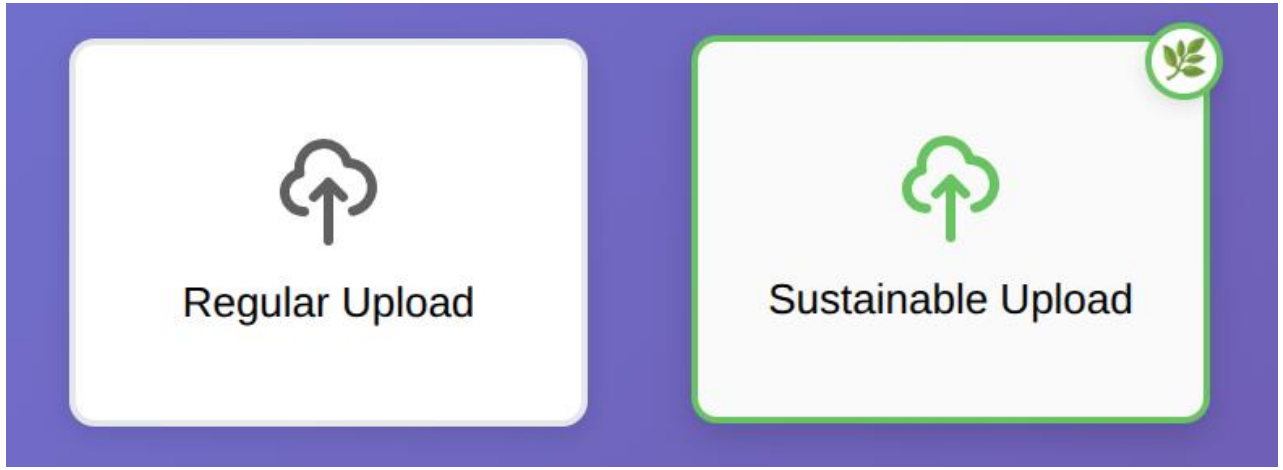
Reflections and Conclusions

- Transcoding process already highly optimized
- Carbon footprint changes every hour with clean energy availability.
- Our proposal: allow users to choose a sustainable upload, shifting transcoding to cleaner energy windows.



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Thank you for your attention

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