

# Towards a Sustainable Use of GPUs in Graphics Research

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## MOTIVATION

### Graphics Processing Units (GPUs)

are at the core of Computer Graphics research. These chips are critical for rendering images, processing geometric data, and training machine learning models. Yet, the production and disposal of GPUs emits CO<sub>2</sub> and results in toxic e-waste [1].

## METHOD

We surveyed **888 papers** presented at SIGGRAPH (premier conference for computer graphics research), from 2018 to 2024, and systematically gathered GPU models cited in the text.

We then contextualize the hardware reported in papers with publicly available **data of consumers' hardware** [2, 3].

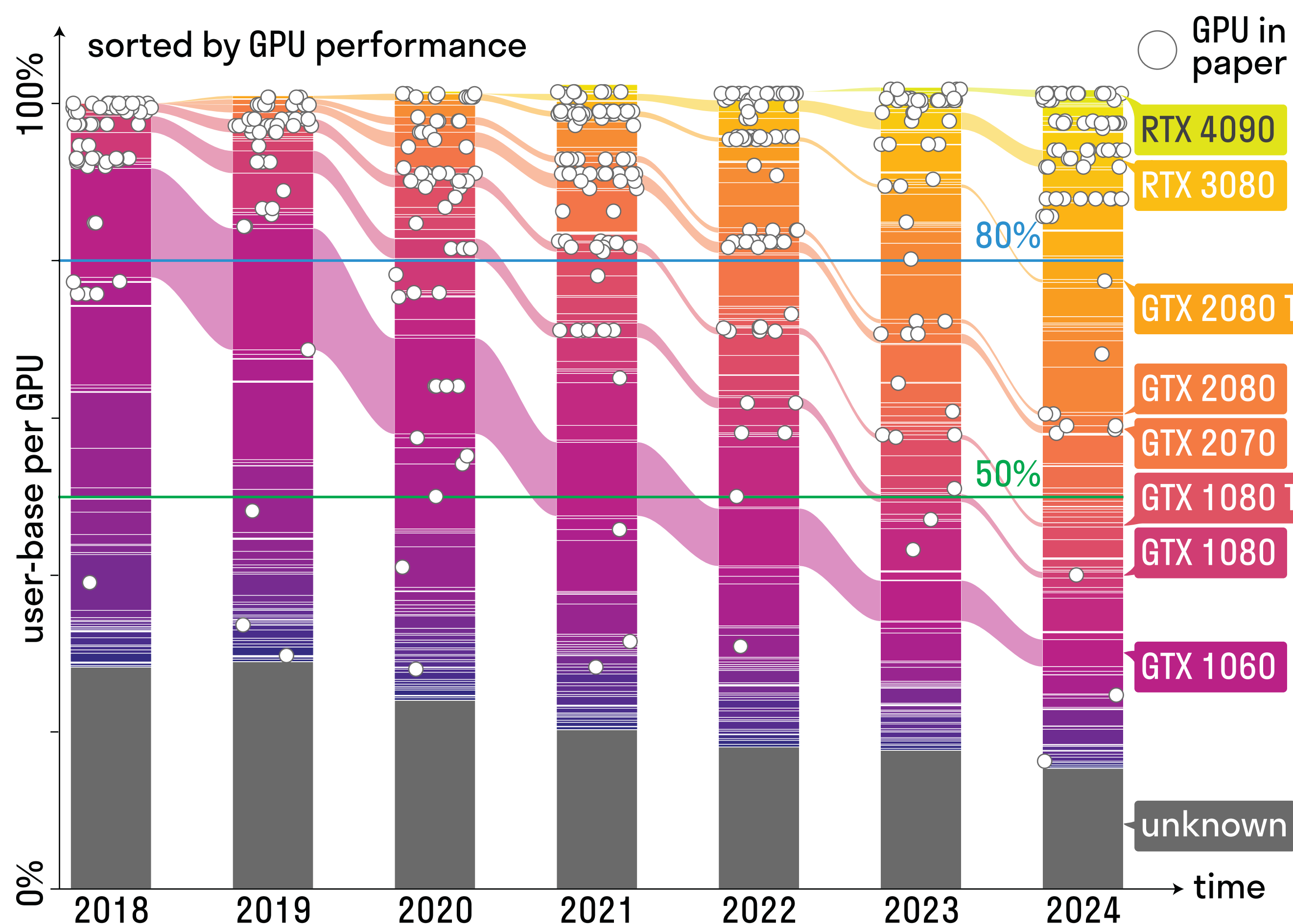
What **material substrate** does Computer Graphics research depend on and what are the **consequences** of that dependency?

## RESULTS

We find that GPUs used in research papers (white dots in graph) are consistently **higher-end GPUs**.

87% of GPUs reported in research papers (above **blue line**) are available to less than 20% of the consumer-level user base at publication time. These high-end GPUs tend to become more wide-spread after a few years (see curved lines).

We visualize GPUs as **colored** segments in this graph. The vertical size of a segment represents the proportion of the user base using that device, while its vertical placement indicates its performance compared to other devices (higher means more powerful).



## RECOMMENDATIONS

AUTHORS

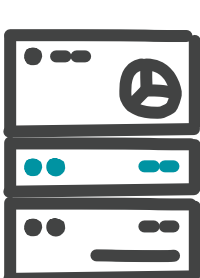
Report hardware used in papers.



Consider mid-to-low-end hardware as further opportunities to optimize algorithms.

INSTITUTIONS

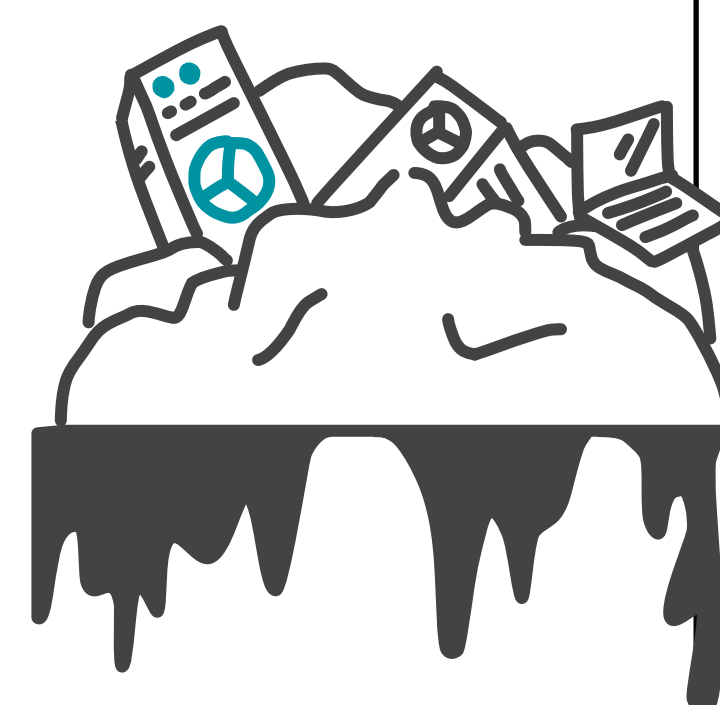
Develop performance metrics that incentivize using low-end hardware.



Develop supra-local testing infrastructures with a range of heterogeneous, multi-generational hardware.

## OPEN DISCUSSION

By developing and disseminating methods optimized to work on new hardware, are we actively encouraging **premature hardware obsolescence** among end-users?



By necessitating compute clusters to run our algorithms (the 2nd most-cited GPU is a data center GPU), are we consolidating the **dependency** of individual users **on privatized "cloud" services**?

## REFERENCES

- [1] CRAWFORD, KATE. The Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence. Yale University Press, 2021.
- [2] STEAM. Steam Hardware Survey. <https://store.steampowered.com/hwsurvey>
- [3] BLENDER. Blender Open Data. <https://opendata.blender.org>