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Energy consumption characterization of Subnuclear Physics computing workloads

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Among human activities that contribute to the environmental footprint of our species, computational footprint, i.e. the environmental impact that results from the employment of computing resources, might be one of the most underappreciated ones. While many modern scientific discoveries have been obtained thanks to the availability of more and more performing computers and algorithms, the energy and carbon footprint related to powering and exploiting such technologies is often underacknowledged. Since hardware-related improvements (i.e. Moore's Law and Dennard Scaling) are considered close to reach a *plateau*, this underestimation might lead, in the near future, the computing sector to become unsustainable for the environment and economically unaccessible for researchers.
Investigations in computing sustainability mainly took into account the hardware lifecycle, the focus being curbing the footprint related to resource provisioning and de-commisioning phases. Today, due to the pervasiveness of computing, it is becoming evident that resource exploitation must be taken into account too. Some computing niches, AI as an example, are indeed starting to shed some light on the usage of computing resources in their sector in order to understand how can their research be kept as energy efficient as reasonably possible. Nonetheless, the energy impact of many other scientific applications is typically only vaguely outlined.
With the goal of encouraging a better footprint description of computing activities in physics, in this work we show the footprint of computing workloads belonging to the branch of Subnuclear physics. We focus on the performance-related interplay between workload type, CPUs and energy usage. This data is expected to characterize the resource usage and offer actionable insights for curbing their energy eagerness.

Significance

This work should give a frame of reference for the energy efficiency of benchmark subnuclear physics workloads which, to the best of my knowledge, is not available in literature yet.

References

Experiment context, if any

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