Paper Title:
Understanding ML Driven HPC: Applications and Infrastructure

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1 Summary

1.1 Motivation

This paper discusses the possibility and impact of how Learning can be implemented alongside traditional HPC methods. It elaborates on the MLforHPC concept to demonstrate the potential performance improvements that it can provide for HPC simulations.

1.2 Contribution

The paper identifies all the possible ways of integrating ML with HPC, for computational benefits within a system. Furthermore, it provides context on how integrating these concepts together might individually help enhance Learning and HPC technologies.

1.3 Methodology

MLforHPC encapsulates all the aspects of combining ML and computation-based methods. There are many types of MLforHPC such as, MLaroundHPC, MLControl, MLAutoTuning and MLafterHPC, which are all touched on in the research methodologies section. Additionally, MLaroundHPC is emphasized and explained, through descriptive analysis of the three functional drivers for integration, e.g Substitution, Assimilation and Control & Adaptive Execution.

1.4 Conclusion

Enhancements to ML will be a necessity in the near future, as it allows the concept of learning in scientific scenarios. On the other hand, the use of HPCs will provide much faster computations in real-time, improving the performance of any system. Thus, integrating these concepts will definitely have important implications for cyberinfrastructures and the progression of science.

2 Limitations

2.1 First Limitation

Requires implementation of novel methods, or redesigning of past models to increase the effectiveness of the system, or else the integration might turn out to be futile.

2.2 Second Limitation

Must support large-scale simulations, where both ML and HPC executions have to be concurrent, and computations have to be flexible and coherent.

3 Synthesis

The combination of these tools have still not been developed enough to an extent where the masses can utilize them. However, in the case of scientific advances e.g biomolecular science, physics, ML-Driven-HPCs can help enhance the process by making it more efficient.