Deep Learning at CERN openlab: for High Energy Physics and Beyond

Theoretical and algorithmic advances, availability of data, and computing power are driving AI. Specifically, in the Deep Learning (DL) domain, these advances have opened the door to exceptional perspectives for application in the most diverse fields of science, business and society at large, and notably in High Energy Physics (HEP).

The HEP community has a long tradition of using Machine Learning methods to solve tasks mostly related to efficient selection of interesting events against the overwhelming background produced at colliders. Today, many HEP experiments are working on integrating Deep Learning into their workflows for different applications: from data quality assurance, to real-time selection of interesting collision events, simulation and data analysis. For example, Generative Models are being developed as fast alternatives to Monte Carlo based simulation. Anomaly detection algorithms are being explored to improve data quality monitoring, design searches for rare new-physics processes or analyse, and correct, faults in complicated systems, such as detectors control systems.

Training of such models has been made tractable thanks to algorithmic improvement and the advent of dedicated hardware, well adapted to tackle the highly-parallelizable task of training neural networks. High performance storage and Computing (HPC) technologies are often required by these kind of projects, together with the availability of HPC multi-architecture frameworks (ranging from large multi-core systems to hardware accelerators like GPUs and FPGAs).

Thanks to its unique role as a catalyst for collaborations between our community, leading ICT companies and other research organisations, CERN openlab is involved in a large set of Deep Learning and AI projects within the HEP community and beyond. This talk will present an overview of these activities.

Summary

Presenter(s) : Dr VALLECORSA, Sofia (CERN)