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Drones: Making faster and smarter decisions with software triggers

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Data collection rates in high energy physics (HEP), particularly those at the Large Hadron Collider (LHC) are a continuing challenge and require large amounts of computing power to handle. For example, at LHCb an event rate of 1 MHz is processed in a software-based trigger. The purpose of this trigger is to reduce the output data rate to manageable levels, which amounts to a reduction from 60 GB per second to an output data rate of 0.6 GB per second. Machine learning (ML) is becoming an evermore important tool in the data reduction, be it with the identification of interesting event topologies, or the distinction between individual particle species. For the case of LHCb data-taking, over 600 unique signatures are searched for in parallel in real time, each with its own set of requirements. However, only a handful at present make use of machine learning, despite the large ecosystem. Often the reason for this is the relative difficulty in the application of a preferred ML classifier to the C++/Python combination of event selection frameworks. One way to overcome this is to use an approximate network known as a drone that can learn the features of your preferred form and can be executed in an easily parallelisable way. We present the uses and advantages of such an approach.

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