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The automated Bandwidth Division for the LHCb first-level trigger

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The first level of the trigger system of the LHCb experiment (HLT1) reconstructs and selects events in real-time at the LHC bunch crossing rate in software using GPUs. It must carefully balance a broad physics programme that extends from kaon physics up to the electroweak scale. An automated procedure to determine selection criteria is adopted that maximises the physics output of the entirety of this programme while satisfying constraints from the higher-level components of the trigger system, which cap the output rate of HLT1 to around 1MHz. In this talk, the method by which this optimisation is achieved will be described in detail, which uses a variant of the ADAM algorithm popular in machine learning tools, customised in order to solve discrete minimisation problems. The impact of this optimisation on the first data taken by the LHCb experiment in its nominal Run 3 configuration will also be shown.

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