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Bayesian Approach for Combined Particle Identification in ALICE Experiment at LHC

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One of the main features of the ALICE detector at LHC is the capability to identify particles in a very broad momentum range from 0.1 GeV/c up to 10 GeV/c. This can be achieved only by combining, within a common setup, several detecting systems that are efficient in some narrower and complementary momentum sub-ranges. The situation is further complicated by the amount of data to be processed (about 10^7 events with about 10^4 tracks in each). Thus, the particle identification (PID) procedure should satisfy the following requirements:
1) It should be as much as possible automatic.
2) It should be able to combine PID signals of different nature (e.g. dE/dx and TOF measurements).
3) When several detectors contribute to the PID, the procedure must profit from this situation by providing an
improved PID.
4) When only some detectors identify a particle, the signals from the other detectors must not affect the combined PID.
5) It should take into account the fact that the PID depends, due to different track selection, on the kind of analysis.
In this report we will demonstrate how combining the single detector PID signals in the Bayesian way satisfies these requirements. We will also discuss how one can obtain the needed probability distribution functions and a priory probability from the experimental data. The approach has been implemented within the
ALICE offline framework, and the algorithm efficiency and PID contamination have been estimated using the ALICE simulation.

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