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Neural network based pulse shape analysis with the Belle II electromagnetic calorimeter

Thursday 5 November 2020 15:00 (20 minutes)

The Belle II experiment, located at the SuperKEKB e^+e^-- collider in Japan, uses pulse shape analysis techniques to distinguish electromagnetically and hadronically interacting particles within the CsI(Tl) electromagnetic calorimeter. The waveforms from the particle dependent scintillation response within the CsI(Tl) scintillators are analyzed with a multi-template offline fit. This fitting method allows to determine the total deposited energy, the deposited hadron energy and the time of energy deposit. This presentation reports on an alternative method to extract the total deposited energy and the deposited hadron energy from the waveforms using machine learning techniques. For this a neural network is trained on simulated γ- and $\pi^{\pm}$-data and is employed as a multivariate regression tool. I will show the comparison between the performance of the neural network and the performance of the current fitting method. The neural network shows an improvement in its total and hadron energy resolution and high robustness towards waveform fluctuations.

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