Contribution ID: **9** Type: **not specified**

LSTM model for the automatic LHC collimator alignment

Friday 15 October 2021 14:10 (25 minutes)

A collimation system is installed in the Large Hadron Collider (LHC) to protect its sensitive equipment from unavoidable beam losses. An alignment procedure determines the settings of each collimator, by moving the collimator jaws towards the beam until a characteristic loss pattern, consisting of a sharp rise followed by a slow decay, is observed in downstream beam loss monitors. This indicates that the collimator jaw intercepted the reference beam halo and is thus aligned to the beam. The latest alignment software introduced in 2018 relies on supervised machine learning (ML) to detect such spike patterns in real-time. This enables the automatic alignment of the collimators, with a significant reduction in the alignment time. This paper analyses the first-use performance of this new software focusing on solutions to the identified bottleneck caused by waiting a fixed duration of time when detecting spikes. It is proposed to replace the supervised ML model with a Long-Short Term Memory model able to detect spikes in time windows of varying lengths, waiting for a variable duration of time determined by the spike itself. This will allow for further speeding up the automatic alignment.

Presenter: AZZOPARDI, Gabriella (CERN)

Session Classification: Project Presentations