Contribution ID: **121** Type: **Oral**

The Neural Network First-Level Hardware Track Trigger of the Belle II Experiment

Wednesday, 13 March 2024 16:50 (20 minutes)

We describe the principles and performance of the first-level (”L1”) hardware track trigger of Belle II, based on neural networks. The networks use as input the results from the standard \belleii trigger, which provides “2D” track candidates in the plane transverse to the electron-positron beams. The networks then provide estimates for the origin of the 2D track candidates in direction of the colliding beams (z-vertex), as well as their polar emission angles theta. Given the z-vertices of the neural tracks allows identifying events coming from the collision region (z ˜ 0), and suppressing the overwhelming background from outside by a suitable cut d. Requiring |z| < d for at least one neural track in an event with two or more 2D candidates will set an L1 trigger. The networks also enable a minimum bias trigger, requiring a single 2D track candidate validated by a neural track with a momentum larger than 0.7 GeV in addition to the |z| condition. The momentum of the neural track is derived with the help of the polar angle theta.

Significance

The Level 1 Neural Network Track Trigger is the first of its kind operating in a high energy physics experiment. It provides even a minimum bias single track trigger, also the first of its kind in an electron-positron experiment.

References

Talk given by collaborator on last year’s ACAT conference, giving the status of the hardware development. A publication for NIMA is in preparation.

Experiment context, if any

The neural trigger is operating at the Belle II experiment at KEK, Japan

Primary author: KIESLING, Christian (Max Planck Institut für Physik (DE))

Co-authors: LENZ, Alex (TUM (Inf)); KNOLL, Alois (TUM (Inf)); MEGGENDORFER, Felix (Max Planck Institut für Physik (DE)); BECKER, Jürgen (KIT (ITIV)); UNGER, Kai (KIT (ITIV); BÄHR, Steffen (KIT (ITIV)); JÜLG, Tobias (TUM (Inf))

Presenter: KIESLING, Christian (Max Planck Institut für Physik (DE))

Session Classification: Track 2: Data Analysis - Algorithms and Tools

Track Classification: Track 2: Data Analysis - Algorithms and Tools