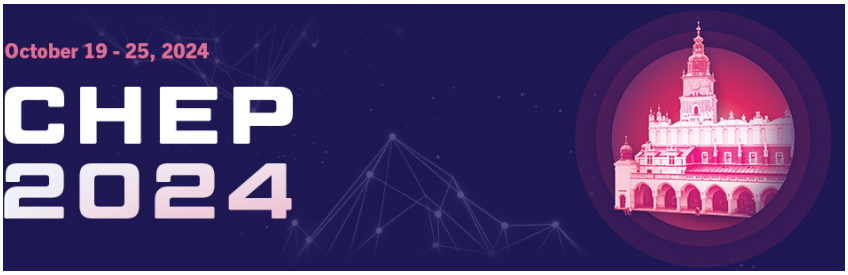

Contribution ID: **46** Type: **Talk**

Graph-based Full Event Interpretation: a graph neural network for event reconstruction in Belle II

Tuesday 22 October 2024 13:30 (18 minutes)

In this work we present the Graph-based Full Event Interpretation (GraFEI), a machine learning model based on graph neural networks to inclusively reconstruct events in the Belle II experiment.
Belle II is well suited to perform measurements of B meson decays involving invisible particles (e.g. neutrinos) in the final state. The kinematical properties of such particles can be deduced from the energy-momentum imbalance obtained after reconstructing the companion B meson produced in the event. This task is performed by reconstructing it either from all the particles in an event but the signal tracks, or using the Full Event Interpretation, an algorithm based on Boosted Decision Trees and limited to specific, hard-coded decay processes. A recent example involving the use of the aforementioned techniques is the search for the $B^+ \to K^+\nu\bar{\nu}$ decay, that provided an evidence for this process at about 3 standard deviations.
The GraFEI model is trained to predict the structure of the decay chain by exploiting the information from the detected final state particles only, without making use of any prior assumptions about the underlying event. By retaining only signal-like decay topologies, the model considerably reduces the amount of background while keeping a relatively high signal efficiency. The performances of the model when applied to the search for $B^+ \to K^+\nu\bar{\nu}$ are presented. The implementation of the model in the Belle II Analysis Software Framework is discussed.

Primary authors: SANTOS, Corentin (University of Strasbourg); DUJANY, Giulio (IPHC - CNRS); Dr CERASOLI, Jacopo (Université de Strasbourg, CNRS, IPHC, UMR 7178, 67037 Strasbourg, France); ABUMUSABH, Merna

Presenter: SANTOS, Corentin (University of Strasbourg)

Session Classification: Parallel (Track 5)

Track Classification: Track 5 - Simulation and analysis tools