Contribution ID: **38** Type: **Oral**

HEP.TrkX: Novel deep learning methods for track reconstruction

Thursday, March 22, 2018 12:00 PM (25 minutes)

For the past year, the HEP.TrkX project has been investigating machine learning solutions to LHC particle track reconstruction problems. A variety of models were studied that drew inspiration from computer vision applications and operated on an image-like representation of tracking detector data. While these approaches have shown some promise, image-based methods face challenges in scaling up to realistic HL-LHC data due to high dimensionality and sparsity. In contrast, models that can operate on the spacepoint representation of track measurements ("hits") can exploit the structure of the data to solve tasks efficiently.
In this presentation we will show two sets of new deep learning models for reconstructing tracks using space-point data arranged as sequences or connected graphs. In the first set of models, recurrent neural networks (RNNs) are used to extrapolate, build, and evaluate track candidates similar to Kalman Filter algorithms. Such models can express their own uncertainty when trained with an appropriate likelihood loss function. The second set of models use graph neural networks for the tasks of hit classification and segment classification. These models read a graph of connected hits and compute features on the nodes and edges. They adaptively learn which hit connections are important and which are spurious. The models are scaleable with simple architecture and relatively few parameters. Results for all models will be presented on ACTS generic detector simulated data.

Primary authors: CALAFIURA, Paolo (Lawrence Berkeley National Lab. (US)); Dr FARRELL, Steven Andrew (Lawrence Berkeley National Lab (US))

Presenter: Dr FARRELL, Steven Andrew (Lawrence Berkeley National Lab (US))

Session Classification: Session5

Track Classification: 3: Machine learning approaches