Contribution ID: **11** Type: **not specified**

Deep Neural Networks for whole, multi-jet event classification and generation (15'+5')

Tuesday, December 12, 2017 3:20 PM (20 minutes)

Several studies have had success applying deep convolutional neural nets (CNNs) to a subset of the calorimeter for individual jet classification / tagging. We explore approaches that use the entire calorimeter, combined with track information, for directly conducting multi-jet physics analyses, without the need for any jet reconstruction. We use an existing RPV-Susy analysis as a case study and compare statistical performance of our approaches with selections on high-level physics variables from the current physics analyses, and shallow classifiers trained on those variables. We also discuss work in progress, and possible directions, using GraphCNNs on this data and GAN approaches for generating new events of this type.

Networks are applied on GPU and multi-node CPU architectures (including Knights Landing (KNL) Xeon Phi nodes) on the Cori supercomputer at NERSC, so we also provide time-to-solution performance of CPU (scaling to multiple KNL nodes) and GPU implementations.

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Session Classification: Experimental/Practical aspects of learning with jets