

## Learning the Physics of Jet Evolution with a Recurrent Neural Network Part I (15')

*Tuesday, December 12, 2017 10:20 AM (15 minutes)*

Many early applications of Machine Learning in jet physics are classifiers that use Convolutional Neural Networks trained on jet images. We will present a work-in-progress custom probabilistic model, tailored to learning the physics of jet production in an unsupervised way. Our model is built on a Recurrent Neural Network suited to modeling the approximate sequential splitting of a tree, which can be explicitly defined through a clustering algorithm. The model also contains fully-connected sub-networks modeling physical quantities like the QCD splitting functions.

We train our network on Pythia jets as a proof-of-principle, but our framework importantly admits training on LHC data, including the potential to be jet-algorithm independent. Given the general structure, our model can be used as a generative model for jets, though we do not anticipate that to be its primary use. Instead, we will investigate the extraction of splitting functions in various environments and their sensitivity to global jet structure using unsupervised machine learning. Further possible physics applications will be explored.

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