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When Jet Quenching meets Machine Learning

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It's believed that the properties of quark-gluon-plasma (QGP) can be studied through measurements of the jet quenching phenomenon. More specifically, observation of jet substructure variables may reveal the microscopic properties of the QGP.

Recently the modification of groomed jet observables was studied in heavy-ion collisions [1]. In addition, the Lund radiation plane was introduced to investigate parton shower modifications in the QGP [2].

In this poster I am going to show how machine learning techniques can help evaluate how quenched a jet is. The first approach is to use a convolution neural network (CNN) which is a technique heavily used in computer vision. The second approach uses a technique based on long and short-term memory (LSTM). The LSTM model is an artificial recursive neural network and is capable of processing sequential data. This design makes it well-suited for making predictions on jets considering that the way of calculating substructure variables implies sequential information of how branchings occur.

Simulations are made with monte-carlo event generators such as PYTHIA8 and JEWEL which simulates jet showering in vacuum and in medium respectively. Classifiers are trained in order to evaluate how quenched a jet is. In addition, experience from the perspective of hardware will also be shared.

Reference:
[1] Measurement of the splitting function in pp and PbPb collisionsat√sNN =5.02TeV
[2] Novel tools and observables for jet physics in heavy-ion collisions

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