

# Hard Probes 2018: International Conference on Hard & Electromagnetic Probes of High-Energy Nuclear Collisions

Contribution ID: 314

Type: 2a) Jets and high-pT hadrons (TALK)

## Automated discovery of jet substructure analyses

*Tuesday, 2 October 2018 15:40 (20 minutes)*

Jet substructure analysis has the promise to reveal the details of the QCD shower beyond existing jet cross section and coincidence measurements in hadron collider QCD and heavy-ion. Traditional jet substructure variables have been constructed using expert knowledge, and are largely transplanted, unmodified, from the high-energy physics to heavy-ion, thus inhibiting its performance as a QCD shower and fragmentation model discriminant. A novel neural network architecture is described that is capable to bootstrap the entire chain of statistical analysis on its own, and further allows the extraction of closed-form algebraic expressions from the learned result — allowing the automatically constructed jet substructure analysis to be subsequently understood and reproduced by humans. The type of jet substructure variables and analyses is discussed, when the neural network constructs is tasked to distinguish jets undergoing energy loss in different medium temperatures, demonstrated using both JEWEL and the Linearized Boltzmann Transport Monte Carlo, and at the presence of a realistic heavy-ion underlying event. The resulting analyses is shown to reliably distinguish different initial temperatures, a performance beyond existing, manually designed analyses.

### Summary

**Primary author:** LAI, Yue Shi (University of California Berkeley (US))

**Presenter:** LAI, Yue Shi (University of California Berkeley (US))

**Session Classification:** Parallel 2