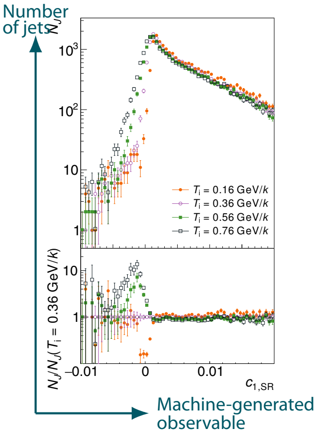
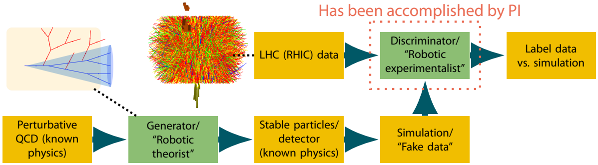
Activities

- Discovery of new observables by neural network (arXiv:1810.00835)
- Discovery of theoretical models via automated analysis
  - A generator that mimicks the quark/gluon passing the plasma, and learns data-driven from experiment how to parton-shower and hadronize
  - A discriminator looks at both the output of the generator, and real measurement data, and decide if this was simulated or is the reality/reference





- “Experimentalist” network learning measurement for model Jewel
- Neural network reduced to 13 terms
- Change plasma temperature by ≈50% ⇒ Selected jets changes by

Activities

Current experiment/theory limitations:

- Little development of original measurement techniques for heavy-ion. Many measurements recycles HEP methods, e.g. softdrop, that are developed for different purpose
- Theory papers only compare a model against selected, “favorite” results (overfitting)
- There is little model that explains most of results, e.g. models are embedded into data to mimic the soft, thermal background

A few of the project deliverables:

- A “convolutional tree” that showers via a DGLAP-like, trainiable kernel, with extension to dipole showers
- Factorized shower–hadronization model trained on LEP and ALICE data (like human QCD global analysis):
  - A neural pp/hadronic shower tuned to LEP + LHC data
  - A neural ALICE PbPb GAN (hard process + thermal, underlying event)

Project goals:

- “Interpretable” insights into how machine-learned showers work, compared to human constructed ones
- Experimental insights into how machine analyzes data for e.g. parton–plasma interaction and factorization breaking