NA3: Quark-Gluon Plasma characterization with jets

Guilherme Milhano, Marco van Leeuwen

NA3 goals and plans

o Theory-experiment collaboration on probing the QGP with jets

o Main goal: survey/benchmark of *observables*:
  - o Large number of potential jet shape/structure observables
  - o Identify observables that are sensitive to specific aspects of parton energy loss

o One parton energy loss model as main reference

o Provide public tools for the above

Activities, results in past period

o Previous period: [series of online lectures](#) to review jet observables and physics inputs

o Previous period: reference model selected: JEWEL (milestone)
  o Well-documented; clear physics picture in model
  o Clear connection to analytical calculations
  o Made available in a [Docker container](#) for portability/ease of use

o Survey of observables almost complete
  o Paper draft in advanced stage; submission in upcoming months

o Next steps:
  o Meeting(s) to discuss results
  o Extensions of survey under discussion: e.g. more powerful machine learning tools, other jet quenching models, thermal background

Surveying jet observables

Surveying jet observables:

- Map correlations to find independent sets
  - Linear correlations: Principle Component Analysis
  - Non-linear: Deep-learning Autoencoder
- 3 main categories of observables
  - Angularities
  - Dynamical grooming measures
  - Jet charge (not sensitive to quenching)
- 5-7 principle components cover most quantities
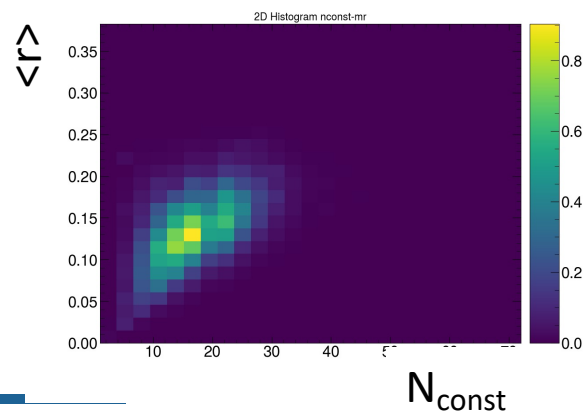
Linear correlations between variables: PCA

Variables Absolute Correlation Clustering for PbPb

2D Histogram nconst-mr
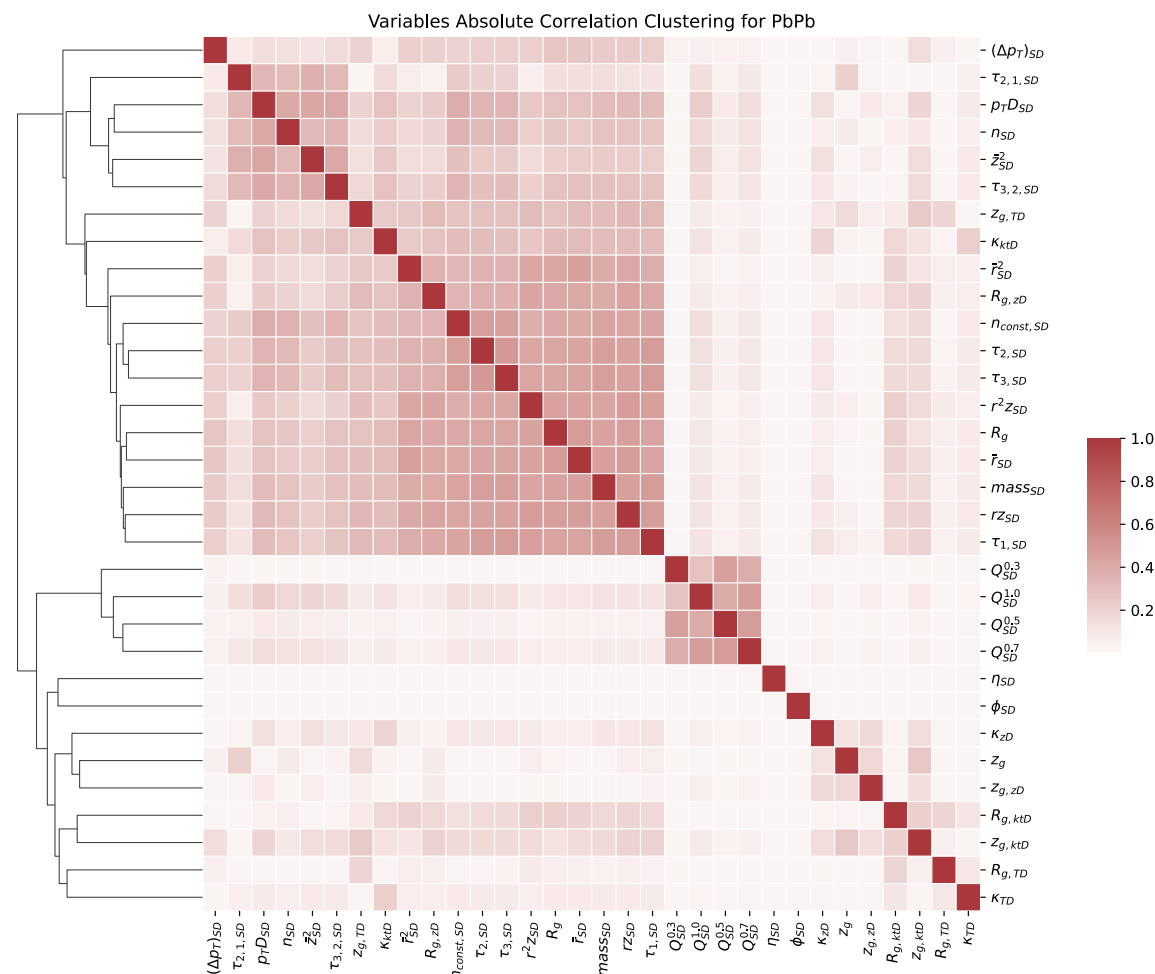
Sensitivity to jet quenching

Sensitivity to jet quenching

- 4-5 promising variables identified
- Large overlap in sensitivity
- Reach full sensitivity with 1-2 variables

Distributions with $rz_{SD} < 0.03$ cut
pp Rejection Efficiency: 0.78