# Model independent measurement discussion points

## Stable and unstable

- Are pions usually treated as stable or unstable?
- What are the advantages and disadvantages of treating b-hadrons as "stable" or "unstable" in a measurement?
  - Do b-hadrons ever interact with the detector?
- What are the advantages and disadvantages of treating tau leptons as "stable" or "unstable" in a measurement?

## Well defined?

- Which of these are
  - physically distinguishable in principle
  - Experimentally distinguishable in practice
- 1. Electrons from a Z decay vs electrons from a virtual photon
- 2. Photons from QED FSR vs Photons from the hard matrix element
- 3. Photons from QED FSR vs Photons from pion decay
- 4. Muons from a tau vs muons from the hard matrix element
- 5. Jets from a top decay vs jets from gluon exchange
- 6. Neutrinos from a W decay vs neutrinos from charm decay
- 7. Neutrinos from a W decay vs a Dark Matter particle
- 8. Jets from a gluon vs jets from a quark

#### Questions:

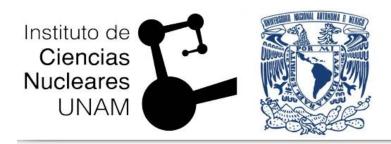
- In which ways does the electroweak part of the Standard Model differ from its QCD part?
- 2 What role does the input parameter scheme play?
- 3 What role does the renormalisation scheme play?
- 4 How are higher-order corrections defined?
- What characterises IR safety in the EW sector? What are its consequences?
- 6 What are the consequences of the fact that the EW sector of the Standard Model is a broken symmetry? How does it impact NLO calculations?

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- 1. What is the energy density estimated for central heavy ion collisions at the LHC energies? Can we still describe partons as a collection of distinct individual hadrons?
  - 2. What are some signatures which indicate the formation of QGP in heavy ion collisions?
  - 3. The nuclear modification factor is significantly below unity at high pT in central AA collisions. How do we understand this effect?

## MPI and HI-like effects



## Can we infer $N_{\rm mpi}$ (target variable) from a given a set of input variables? $\to$ Regression problem

We use a multivariate regression technique based on Boosted Decision Trees (BDT) with gradient boosting training, which is implemented in TMVA (arXiv:physics/0703039)

We use the existing data on  $p_T$  spectra as a function of multiplicity [OK for MPI studies in minimum-bias pp collisions]

Olnput variables: Event-by-event average p<sub>T</sub> of charged particles / Multiplicity

For systematic uncertainties other set of input variables was considered: Charged particle multiplicity in the pseudorapidity region covered by VZERO detector / Transverse spherocity