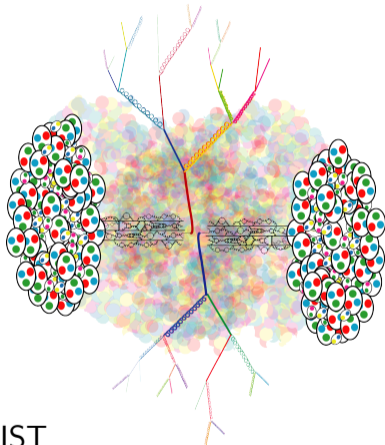


Transformers for Quenched Jet Tagging



João A. Gonçalves, LIP/IST

November 1, 2022

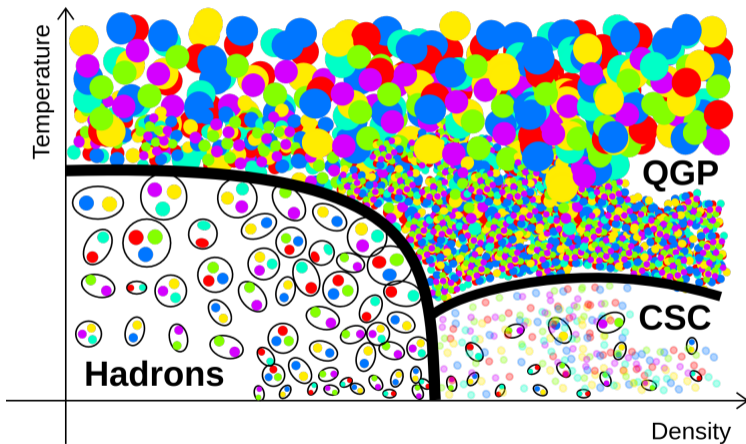


Overview

1. Quark Gluon Plasma, how to make it and how to study it
2. Stating the Problem
3. Transformers
4. Conclusions and Future Work

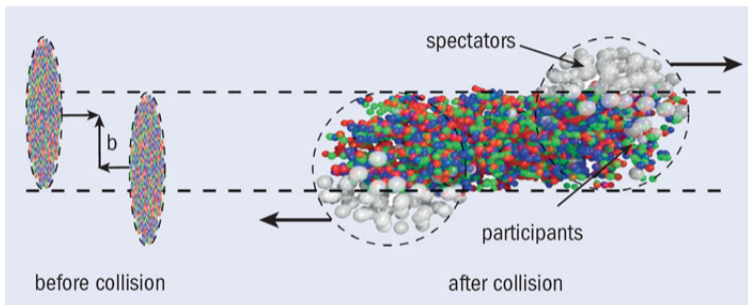
Quark Gluon Plasma, how to make it and how to study it

Quark Gluon Plasma



Quark Gluon Plasma, how to make it and how to study it

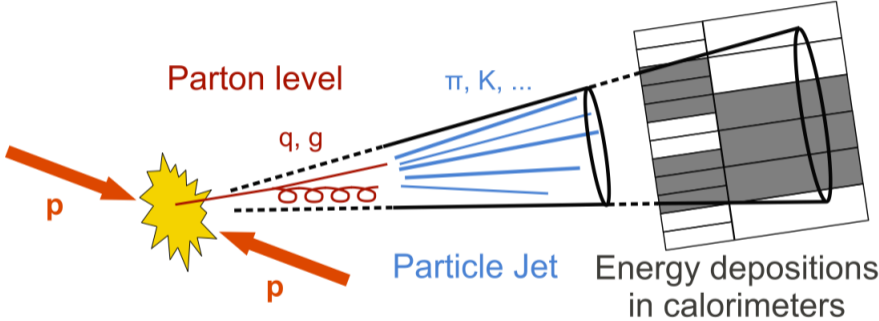
How to make it



source

Quark Gluon Plasma, how to make it and how to study it

How to study it: Jets



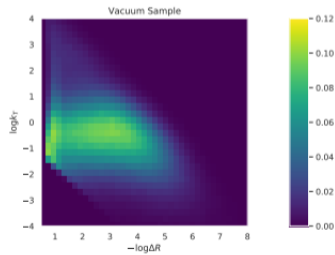
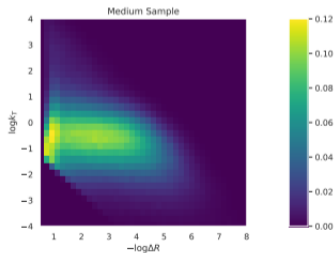
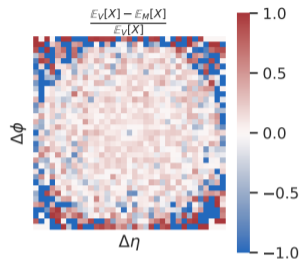
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Quark Gluon Plasma, how to make it and how to study it

How to study it - Jet Representations

High-level variables:

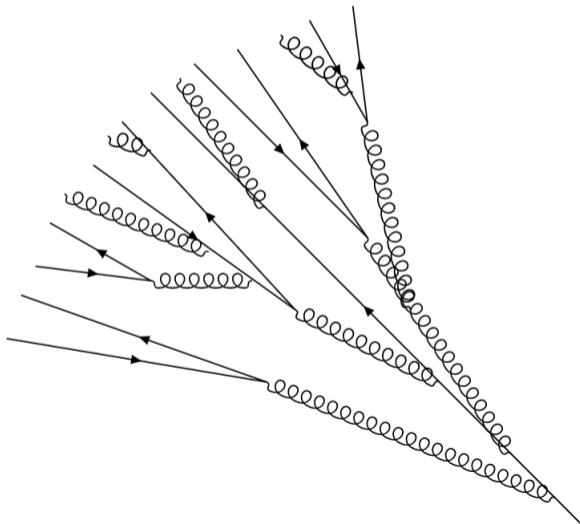
- Dijet and jet-boson asymmetries
- Energy flow polynomials
- Any other high level variable



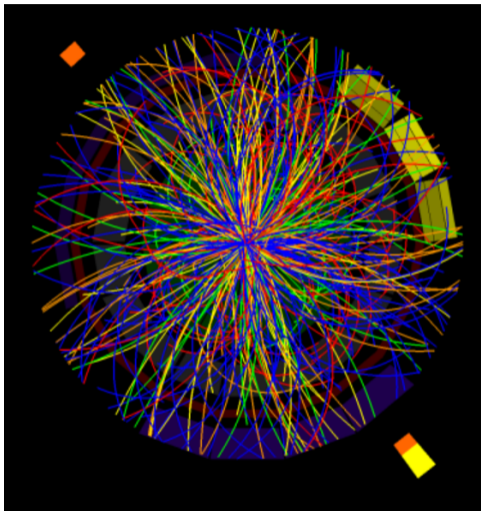
L. Apolinário, N. Castro, M. Romão, J. Milhano, R. Pedro, arXiv:2106.08869
L. Oliveira, M. Kagan, L. Mackey, B. Nachman, A. Schwartzman, arXiv:1511.05190

Quark Gluon Plasma, how to make it and how to study it

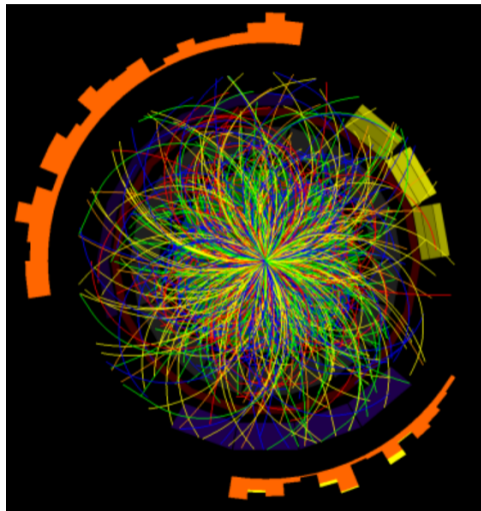
How to study it - Jet Representations



Stating the Problem

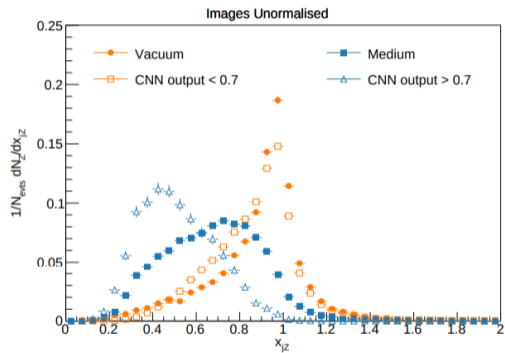
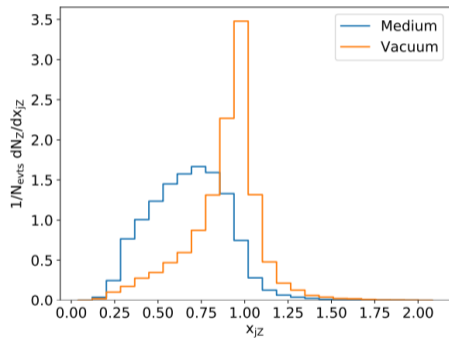


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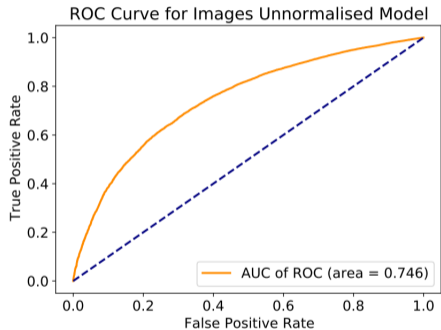
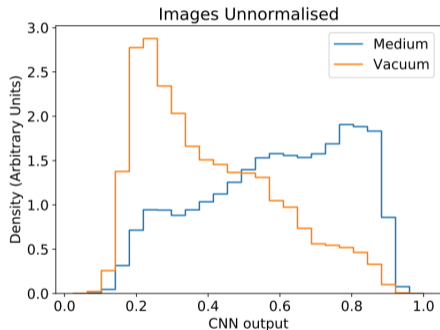
source

Stating the Problem



L. Apolinário, N. Castro, M. Romão, J. Milhano, R. Pedro, arXiv:2106.08869

Stating the Problem

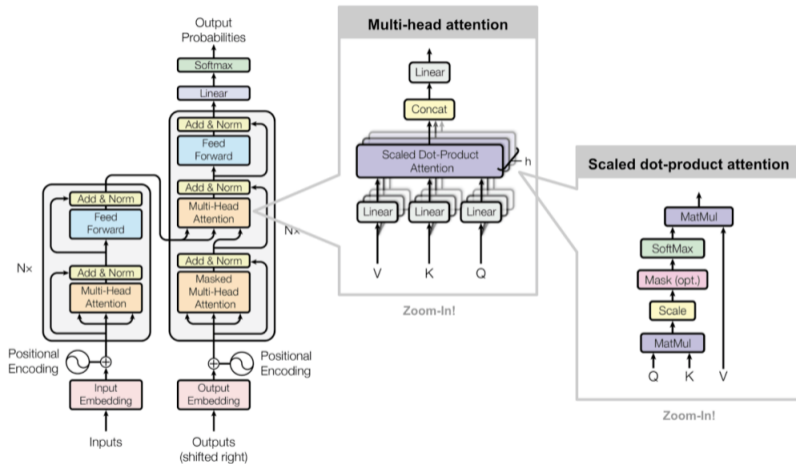


L. Apolinário, N. Castro, M. Romão, J. Milhano, R. Pedro, arXiv:2106.08869

Transformer

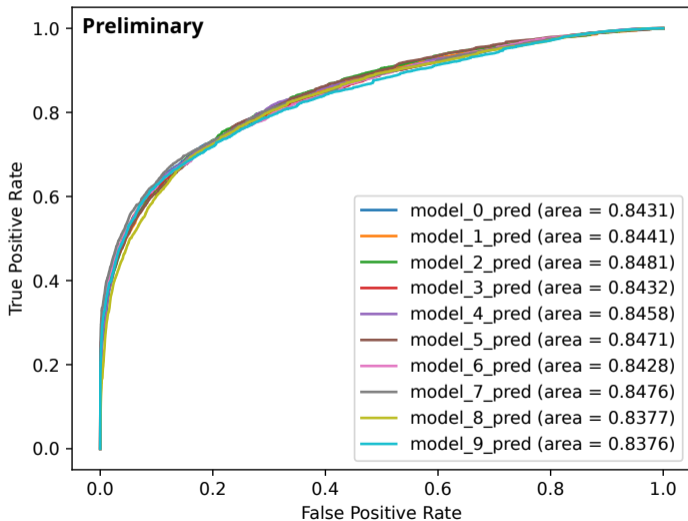


Transformers

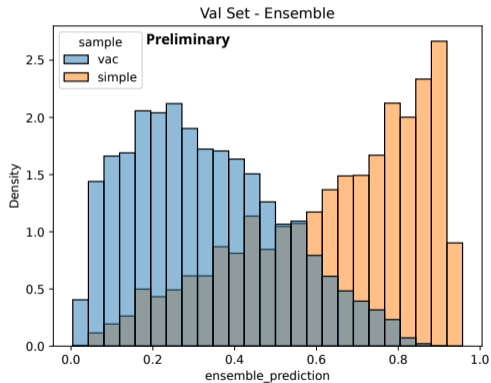
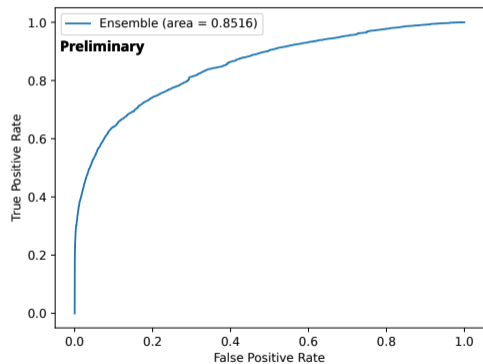


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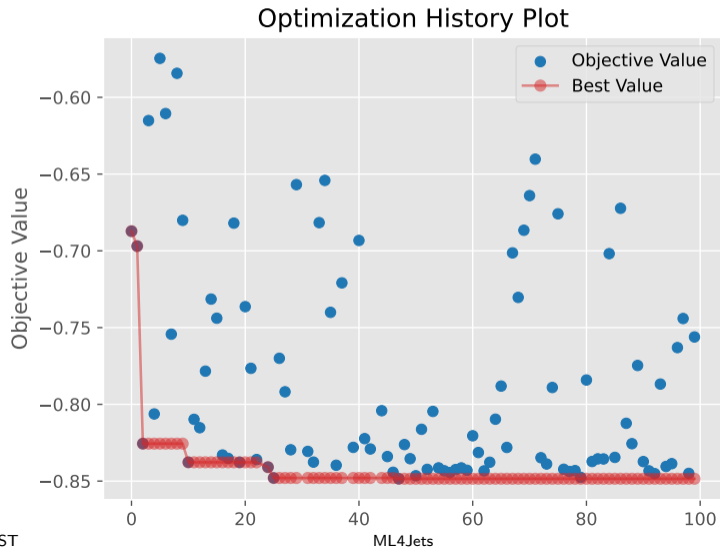
Transformers



Transformers



Transformers



Conclusions and Future Work

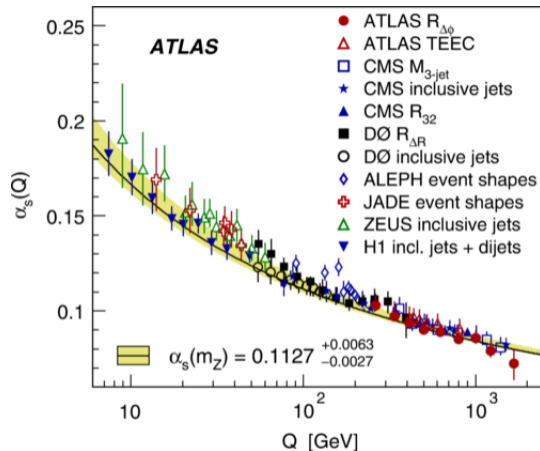
Conclusions and Future Work

- Transformer architectures are promising tools for quenched vs unquenched jet discrimination.
- Our preliminary results show new state of the art discrimination.
- This is still ongoing work.
- We want to check the impact of this discrimination on high-level variables.
- For the future we would like to reproduce this study with a new background subtraction methodology being developed concurrently with this work.
- We are also investigating the impact of MC weights in the analysis.

Thank you for your attention.

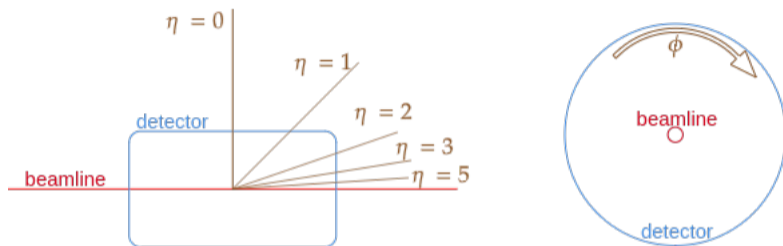
Backup

The running of the coupling constant



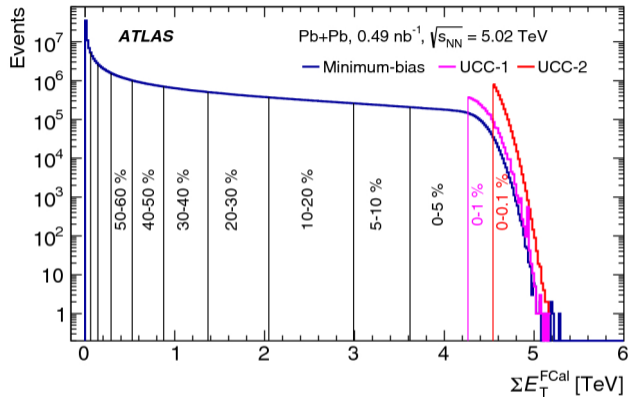
Measurements of the running of the coupling constant from multiple experiments throughout the years. Image taken from here.

Cylindrical Detector Coordinates



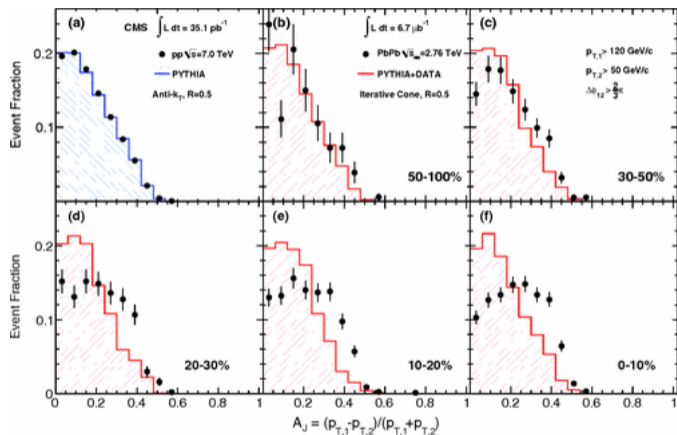
Phase space variables in a cylindrical detector. To the left we have the pseudorapidity, represented in a plane containing the beamline as a horizontal line; to the right, we have the azimuthal angle in the transverse plane of a detector, where the beamline corresponds to a point in the centre of the circle.

Centrality



The sum of the transverse energy deposited in the ATLAS FCal, and centrality bins considered. The plot considers three different triggers, but we only present it to introduce the concept of centrality and so, we refrain from further explaining the considered triggers. Plot taken from reference.

Dijet Asymmetry (measurement)



\hat{p}_T lower bond

