T 42: Experimental methods II

Time: Tuesday 17:00–18:15   Location: L-4.001

T 42.1   Tue 17:00   L-4.001

Quark gluon tagging in dijet searches using only calorimeter-based event information with the ATLAS experiment — •Lisa Marie Baltes — Kirchhoff-Institute for Physics, University Heidelberg

The analysis of dijet events can give us important information about new possible models beyond the Standard Model such as dark matter. In some models the massive mediator can be observed as an excess in the invariant mass spectrum of the decay product. However, dijet searches at masses below 1 TeV are statistically limited by the bandwidth and storage limitations of the detector. The trigger-object-level analysis (TLA) allows the search for low-mass resonances down to an invariant mass of 450 GeV by recording and analysing only a part of the full event information. In our signal model, the massive mediator decays into two quarks, while the QCD background is dominated by gluon-gluon and quark-gluon final states. Therefore, tagging the flavour of the two final state jets can suppress the background compared to the signal. TLA only uses information about the online reconstructed jets and some jet structure variables based on calorimeter information and therefore no tracking information is available. In this talk, the results from different neural networks are discussed, including ROC curves and background rejection efficiencies.

T 42.2   Tue 17:15   L-4.001

Charm jet identification and discriminator calibration with the CMS experiment — •Spandan Mondal[1], Xavier Coubez[1,2], Luca Mastrolorenzo[1], Andrzej Novak[1], Andrey Pozdnyakov[1], and Alexander Schmidt[1] — [1]Physikalisches Institut III A, RWTH Aachen University — [2]Brown University

Identification of charm-quark-initiated jets at the LHC is especially challenging. Over the past few years, usage of advanced deep learning based algorithms has enabled several CMS analyses to efficiently discriminate charm jets simultaneously from bottom and light jets. The charm probability scores yielded by such charm tagging algorithms can play a powerful role when used as inputs to a machine learning based signal-background discriminating algorithm. However, as jet identification algorithms are trained strictly on simulated jets, a direct usage of charm tagger output values requires calibrating the entire output probability distributions using real jets reconstructed from CMS data. This talk focuses on charm jet identification algorithms in CMS as well as the calibration of their output discriminator values using flavour-enriched selections of jets in data.

T 42.3   Tue 17:30   L-4.001

b-tagging efficiency calibration for Variable-R track jets — •Janik von Ahnen for the ATLAS-Collaboration — DESY, Hamburg, Germany

Many analyses rely on b-tagging algorithms to identify jets containing b-hadrons which are often a distinct feature of interesting processes at the LHC. The b-tagging algorithms are trained using simulation and are calibrated with data-to-simulation scale factors to account for differences coming from mismodeling in the simulation. The method of calculating the data-to-simulation scale factors for anti-k_t Variable-R track jets and the data set collected by ATLAS at $\sqrt{s}$=13 TeV in the years 2015, 2016, 2017 and 2018 ($\mathcal{L}_{int}$ =140 fb^{-1}) is presented. A sample enriched in di-leptonic $t\bar{t}$ and a likelihood-based fitting method are used to extract the b-tagging efficiency in data. In the fit, control regions constructed with variables, which are not related to b-tagging, are implemented to allow for the simultaneous fit of b-tagging efficiency and flavour composition.

T 42.4   Tue 17:45   L-4.001

Multijet Background Estimation with the *Rebalance and Smear* Method — Arthur Linss[1], Xuanhong Lou[1], •Jonas Neundorf[1], Krisztian Peters[1], Matthias Saimpert[2], and Christian Sander[1] — [1]DESY — [2]CERN

In analyses without leptons in the final state, the *multijet* background can become relevant. For this talk, the implementation of the data-driven *Rebalance and Smear* method for multijet background estimation was modified in order to make it usable for different analyses. It is then applied to searches for new physics in the $t\bar{t} + E_T^{\mathrm{miss}}$ channel. The data-driven estimate is shown to agree with the expectation from Monte Carlo simulations and, combined with the Monte Carlo expecations of other background processes, the data yield in the validation regions.

T 42.5   Tue 18:00   L-4.001

Estimation of the multi-jet background using the Rebalance and Smear technique for a dark matter search in ATLAS — •Arthur Linss and Christian Sander for the ATLAS-Collaboration — DESY, Hamburg, Germany

This talk presents an overview of the methodology, advantages and challenges of the Rebalance and Smear (RnS) technique. RnS can be used for the estimation of the multi-jet background for searches for new physics in final states with jets and missing transverse energy. In RnS, unbiased pseudo-data is produced by rebalancing selected events in transverse momentum. After that, to account for jet mismeasurements, a jet smearing is performed. Currently, this method is used or is in the process of implementation for two dark matter searches: 2 jets (VBF) + MET and ttbar + MET, while the focus of this talk is on the former.