21st MCnet Meeting

Wednesday, September 9, 2020 - Friday, September 11, 2020

Durham University

Book of Abstracts

Contents

Student Talks / **74**

Calculating the QCD Primary Lund Jet Plane Density

Author: Andrew Lifson[1]

[1] *Lund University*

Corresponding Author: andrew.lifson@thep.lu.se

The primary Lund Jet Plane has for several decades been a powerful tool for jet parton showers, jet substructure, and resummation. In 2018, Dreyer, Salam, and Soyez promoted this tool to a substructure observable used to discriminate boosted electroweak particles from the QCD background. Recently, Salam, Soyez, and I calculated the QCD density of emissions at next-to-leading logarithmic accuracy. This talk will focus on the recent work available at https://arxiv.org/abs/2007.06578, part of which formed my master's thesis in 2018.

Student Talks / **75**

String shoving in jets in PYTHIA8

Authors: Smita Chakraborty[1]; Christian Bierlich[2]; Gosta Gustafson[1]; Leif Lönnblad[2]

[1] *Lund University*

[2] *Lund University (SE)*

Corresponding Authors: leif.lonnblad@thep.lu.se, smita.chakraborty@thep.lu.se, christian.bierlich@thep.lu.se, gosta.gustafson@thep.lu.se

Jet observables in dijet events are excellent probes to study collision dynamics in dense systems. Interacting Lund strings will affect jet observables and suggests a new common mechanism responsible for jet modification in p-A and A-A. In this talk, we present our new implementation of the string shoving mechanism in PYTHIA8 which lets us study the effects on jet observables in p-p and nuclear collisions. We also present preliminary results for di hadron correlation studies and show the effects in hadron-jet correlation studies.

Student Talks / **76**

Colorful event deconstruction

Author: Leif Gellersen[1]

[1] *Lund University*

Corresponding Author: leif.gellersen@thep.lu.se

I review the HYTREES approach, an improved implementation of the Shower/Event deconstruction method by including hard matrix elements with multiple jet emissions. I further discuss how this can be improved by subleading colour corrections in parton shower reconstruction.

Student Talks / **77**

Unit testing in HEP

Author: Marian Heil[1]

[1] *IPPP, Durham*

Corresponding Author: marian.heil@durham.ac.uk

Most software in HEP are developed over many years by multiple authors. It is therefore easy to accidentally introduce bugs. In this talk I will give an overview of the existing tools for unite testing and continues integration, which can help to at least not break working code.

Discussion session / **78**

Rivet3 and HEPMC3

Corresponding Author: a.g.buckley@gmail.com

Discussion session / **79**

Issues and conventions for variation weights

Corresponding Author: chris.g@cern.ch

Discussion session / **80**

Future of MCnet

Corresponding Author: steffen.schumann@phys.uni-goettingen.de

Discussion session / **81**

Feedback from Machine Learning School

Corresponding Authors: malin.sjodahl@thep.lu.se, this.is.stefan.prestel@gmail.com

Student Talks / **82**

Efficient Multi-Jet Merging at High Multiplicities

Author: Christian Preuss[1]

Co-authors: Helen Brooks ; Peter Skands [2]

[1] *Monash University*

[2] *Monash University (AU)*

Corresponding Authors: christian.preuss@monash.edu, peter.skands@cern.ch

I will present an implementation of the CKKW-L multi-jet merging technique to so-called sector showers as implemented in the Vincia antenna shower. The bijective nature of sector showers allows for efficient multi-jet merging at high multiplicities, as any given configuration possesses only a single shower history. After briefly reviewing the idea of sector showers, I will demonstrate that the complexity of constructing histories for these develops only an effective linear scaling with the number of final-state particles. Using the example of weak boson+jets at the LHC, I will demonstrate that the overall event generation time and the memory footprint of the new implementation remain approximately constant when including additional jets. This talk will be based on arxiv.org/abs/2008.09468.

Student Talks / **83**

Global Recoil in Dipole Showers

Author: Emma Simpson Dore[1]

[1] *KIT*

Corresponding Author: emma.dore@kit.edu

I will discuss recent work on the implementation of global recoil methods in the Herwig dipole shower.

Student Talks / **84**

Diffractive Cross-Sections in Herwig

Author: Patrick Kirchgaesser[None]

Corresponding Author: kirchgaesser@googlemail.com

We implement a model for diffractive cross-section in Herwig.
We combine this model with a two-channel eikonal model including enhanced
pomeron contributions and compare the result to cross section measurements
at 7 TeV and 8 TeV. We further discuss an analytical expression which relates
unresolved cross sections (pomeron exchanges) to resolved cross sections (soft, hard, diffractive).

Student Talks / **85**

Using measurements to constrain new physics with CONTUR

Author: Louie Dartmoor Corpe[1]

Co-authors: Jonathan Butterworth [2]; Joanna Huang [3]; Andy Buckley [4]

[1] *UCL (GB)*

[2] *UCL*

[3] *University of London (GB)*

[4] *University of Glasgow (GB)*

Corresponding Authors: joanna.huang@cern.ch, l.corpe@ucl.ac.uk, j.butterworth@cern.ch, a.g.buckley@gmail.com

A huge amount of effort and person-power goes into searching for evidence of beyond-the-SM (BSM) theories at the LHC. A search may take a large team over a year to produce, and even then may only focus on the model's most spectacular signature. But many BSM theories would probably already have been ruled out, because they would have caused measurable distortions to well-understood spectra of "standard" processes. If one could quickly check how a signal would have manifested itself in the myriad of LHC measurements to date, a huge amount of person-power could be liberated to focus instead on the remaining models which are not already ruled out. CONTUR is a tool which uses Herwig to generate events all 2->2 processes for a given BSM model, and runs the events through the bank of >150 LHC measurements which are preserved in Rivet+HEPdata, to very quickly gauge which parts of a model's parameter space is already ruled out. In this talk, I will give an overview of this powerful new approach. I will then highlight the results from a recent CONTUR paper (https://arxiv.org/abs/2006.07172), where we use this method to tackle a whole class of "Vector-like Quark" models, and show complementary results to the direct search program.

Student Talks / **86**

Interfacing Pythia with URQMD, a hadronic rescattering MC

Author: Christian Bierlich[1]

[1] *Lund University (SE)*

Corresponding Author: christian.bierlich@thep.lu.se

In Monte Carlo generators for pp physics, the possibility of hadronic rescatterings after hadronization is often neglected, but in heavy ion collisions such effects are ubiquitous. I will present a recent exploratory study, where the Pythia heavy ion model Angantyr was interfaced with the URQMD MC for hadronic rescatterings, which revealed large effects for jet observables, often attributed to "jet quenching" effects from a Quark-Gluon Plasma, as well as for flow.
The study points to the necessity of including hadronic rescattering effects when modeling soft observables in heavy ion collisions, but possibly also in high-multiplicity pp.

Student Talks / **87**

Sherpa generator studies for HWW analyses.

Author: Amandeep Kaur[1]

[1] *Panjab University (IN)*

Corresponding Author: a.kaur@cern.ch

In H⟶WW, several event generators are used to optimize the analysis and estimate the expected yields of signal and backgrounds, as well as their associated systematic uncertainties.We are interested in Sherpa MC event generator for Higgs+jets simulation and WW+jets simulation because of its capability to produce higher jet multiplicities at NLO accuracy. This will help us to understand if with these samples the theoretical uncertainties associated with the migration among jet bins can be reduced as this is one of the major uncertainties in H⟶WW analyses , where events are categorized in jet multiplicity bins.

Student Talks / **88**

Uncertainty on jet vetoes in W+W- Vector Boson Scattering

Author: Mattia Lizzo[1]

[1] *Universita e INFN, Firenze (IT)*

Corresponding Author: mattia.lizzo@cern.ch

Introduction about myself and the project - I will start a short-term MCnet studentship in October, in Durham

Student Talks / 89

B-Physics processes with SHERPA

Author: Ozlem Ozcelik[1]

[1] *Bogazici University (TR)*

Corresponding Author: ozlem.ozcelik@cern.ch

Please welcome me to this amazing community! In this talk, I will give a brief description about this brand new project for improving and developing the B-Physics processes using SHERPA event generation.

Student Talks / 90

Measurement of differential cross-sections in four lepton events in 13 TeV pp collisions with the ATLAS detector

Author: Joanna Huang[1]

[1] *University of London (GB)*

Corresponding Author: joanna.huang@cern.ch

I will present the unfolded measurements of four-lepton differential and integrated fiducial cross-sections, corresponding to events with two same-flavour, opposite-charge electron or muon pairs. The final-state has contributions from a number of interesting Standard Model processes that dominate in different four-lepton invariant mass regions, including single boson production, Higgs boson production and on-shell production, with a complex mix of interference terms, and possible contributions from beyond-the-Standard Model physics. The differential cross-sections include the four-lepton invariant mass inclusively, in slices of other kinematic variables, and in different lepton flavour categories. Also measured are di-lepton invariant masses, transverse momenta, and angular correlation variables, in four regions of four-lepton invariant mass, each dominated by different processes.