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DESY Summer Student Programm
Hamburg, DESY, 02. September 2011
Analysis Chain

Simulation
Digitalization
Reconstruction
Analysis

- MC Generation
- Reconstruction
- Digitalization
- Simulation
- Data
HepMC Format

Graph structure of physics event
HepMC format: vertex and particle structure
Particles: kinematic information, ID, …
Each particle belongs at least to one vertex
Workflow of HepMCAnalysis

1. generator
2. event in HepMC format
3. HepMCAnalysis
4. root file

- example programs and steering files
- class library with physics analyses
- scripts for comparison + web display
Results for different generators: W histograms

- Hardly differences between Pythia6 and Pythia8
- Higher differences between Herwig++ and Pythia
- Herwig++ does not decrease for first bin → will be checked
Pythia6
Herwig++
Pythia8
Results for different generators: charged stable particles

- peculiar behaviour of Pythia 8
- Pythia 6 and Herwig++ very similar
Results for Different PDFs: W histograms

- LO
- NLO
- NNLO
- LOmod (LO*)
Marc Sangel

DESY Summer Student Programe
2. September 2011

LO
NLO
NNLO
LOmod (LO*)
Results for different PDFs: Charged particles

- Again big differences for charged particle histograms

- Charged particles histograms
  - LO
  - NLO
  - NNLO
  - LOmod (LO*)

- Number of charged particles in the event

- Transversal momentum of charged stable particles

- Eta of charged stable particles
Efficiency calculation
## Results of efficiencies for different PDFs

<table>
<thead>
<tr>
<th>PDF</th>
<th>Efficiency</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSTW2008lo90cl</td>
<td>0.12762</td>
<td>0.00119961</td>
</tr>
<tr>
<td>CTEQ66 (NLO)</td>
<td>0.13482</td>
<td>0.00123692</td>
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<tr>
<td>HERAPDF15NNLOEIG</td>
<td>0.13427</td>
<td>0.00123409</td>
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<tr>
<td>MRST2007lomod</td>
<td>0.13617</td>
<td>0.00124383</td>
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</table>

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<tr>
<th>PDF</th>
<th>Efficiency</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSTW2008lo90cl</td>
<td>0.08508</td>
<td>0.0008</td>
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<tr>
<td>CTEQ66 (NLO)</td>
<td>0.08988</td>
<td>0.000825</td>
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<tr>
<td>HERAPDF15NNLOEIG</td>
<td>0.089513</td>
<td>0.000823</td>
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<tr>
<td>MRST2007lomod</td>
<td>0.09078</td>
<td>0.000829</td>
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</tbody>
</table>

ATLAS: Efficiency: 0.0975, Error: 0.0019; (arXive:1108.4101v1)
Class Library

<table>
<thead>
<tr>
<th>Second level</th>
<th>Third level</th>
<th>Fourth level</th>
<th>Fifth level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Init()</td>
<td>Process(HepMC::GenEvent* event)</td>
<td>Finalize()</td>
<td></td>
</tr>
<tr>
<td></td>
<td>JetFinder(), ParticleID(), MissingEt(), FinalStateParticle() etc.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DiJetAnalysis  TopAnalysis  ...  UserAnalysis

common interface
algorithms for reconstruction of physical analysis objects
Generators