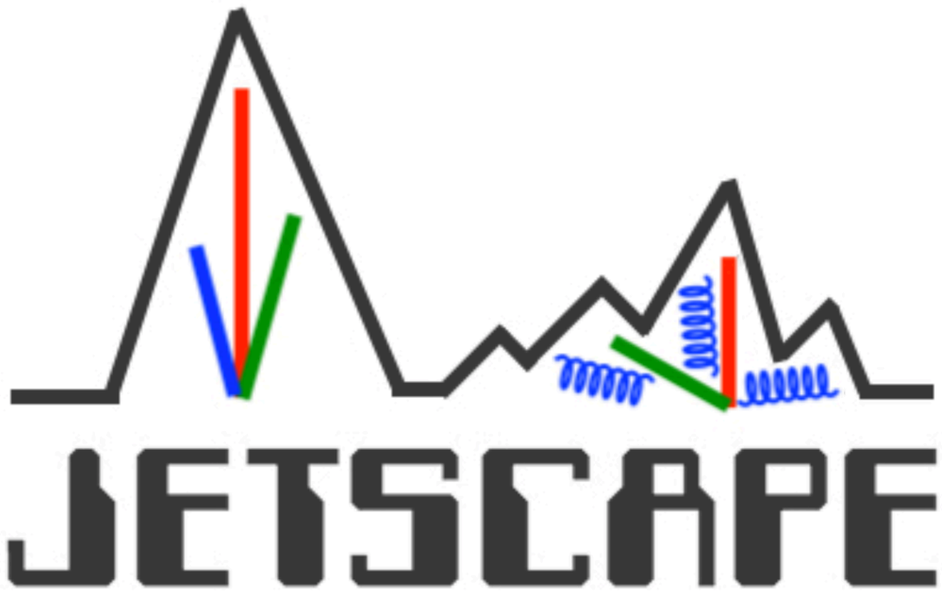
Analysis (PHYS)



Texas A&M University, January 10th 2019

Get Analysis Codes

% git clone https://github.com/JETSCAPE/WinterSchool2019.git

- Materials are in “phys_session”

JETSCAPE
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Analysis for one pTHat bin

Analysis for one pTHat bin

- **What to do here**

  - Use analysis-spectra.cc and analyze data from events with $\hat{p}_{\mathrm{T}}^{\mathrm{min}} = 110\,\mathrm{GeV},\ \hat{p}_{\mathrm{T}}^{\mathrm{max}} = 120\,\mathrm{GeV}$
  - Reconstruct Jets by anti-kt with FASTJET (fjcore)
  - Get results for 5 observables

    Jet Spectra, Hadron Spectra

    Jet Shape, Jet Fragmentation Function, Jet Mass

- **Work flow**

  - Edit JETSCAPE/CMakeLists.txt
  - cmake ..
  - Edit analysis-spectra.cc
  - make
  - ./analysis-spectra

Edit JETSCAPE/CMakeLists.txt

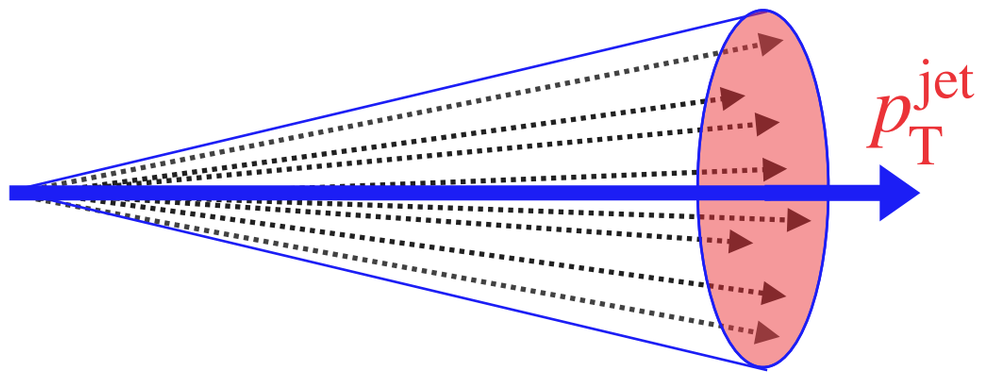
- Add analysis-spectra.cc in Executables

```
366
367 if (${ROOT_FOUND})
368 add_executable(analysis-spectra ./examples/analysis-spectra.cc)
369 target_link_libraries(analysis-spectra JetScape )
370 endif()
371
```

Observables

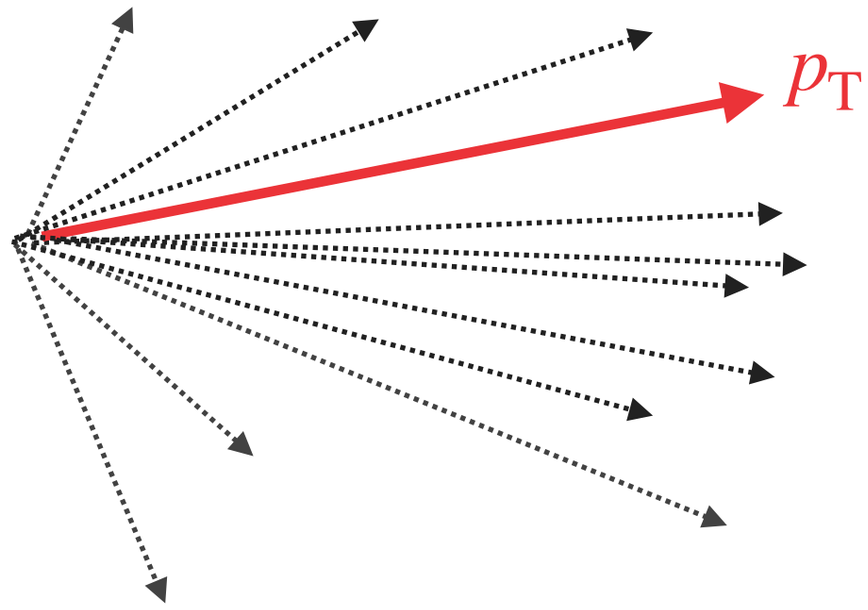
- **Jet Spectra**

$$\frac{1}{N_{\text{event}}} \frac{dN^{\text{jet}}}{dp_{\text{T}}^{\text{jet}} d\eta^{\text{jet}}}$$



- **Hadron Spectra**

$$\frac{1}{N_{\text{event}}} \frac{dN^{\text{hadron}}}{dp_{\text{T}} d\eta}$$

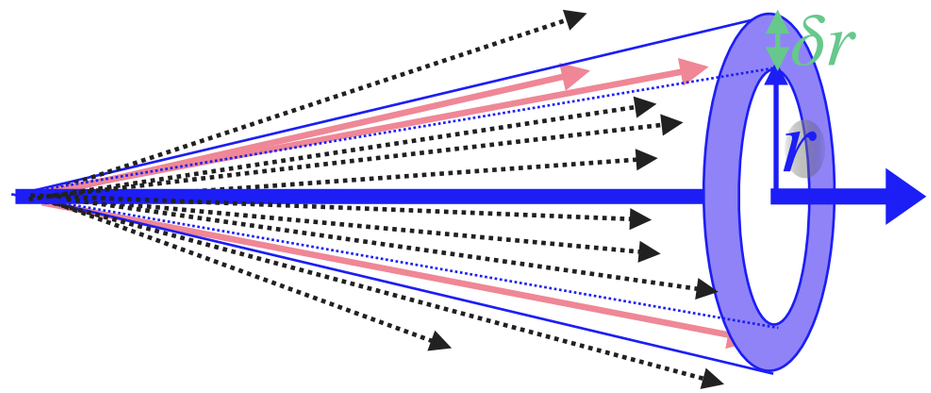


Observables

- **Jet Shape**

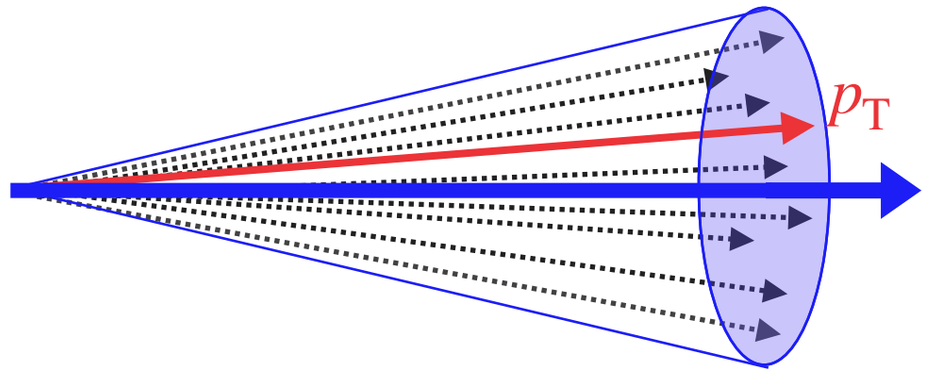
$$\rho(r) = \frac{1}{N_{\text{jet}}} \sum_{\text{jet}} \left[\frac{\frac{1}{\delta r} \sum_{\text{i}\in(r-\delta r/2, r+\delta r/2)} p_{\text{T}}^{i}}{\sum_{\text{i}\in\text{jet}} p_{\text{T}}^{i}} \right]$$

$$\left(\; r = \sqrt{(\eta - \eta^{\text{jet}})^2 + (\phi - \phi^{\text{jet}})^2} \; \right)$$



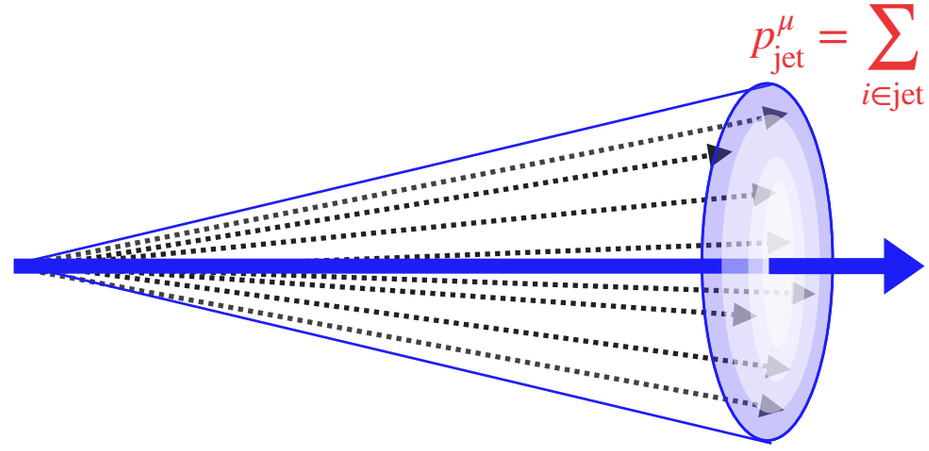
- **Jet Fragmentation Function**

$$D(z) = \frac{1}{N_{\text{jet}}} \frac{dN^{\text{ch}}}{dz} \qquad \left(z = p_{\text{T}}/p_{\text{T}}^{\text{jet}} \right)$$



- **Jet Mass**

$$M = \sqrt{\left(\sum_{i\in\text{jet}} E^{i} \right)^2 - \left| \sum_{i\in\text{jet}} \vec{p}^{\,i} \right|^2}$$



Output

- **Results are saved in SpectraBin110_120.root**

  - Check the results in SpectraBin110_120.root

  - root -l

  - root [0] TBrowser a

  - See inside of SpectraBin110_120.root

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Combine results with different pTHat bins

Combine results with different pTHat bins

- **What to do here**

  - Use analysis-combine.cc and combine data in Root_Files_SpectraPbPb and Root_Files_SpectraPP to get full results

  - Use RatioPPVsPbPb.cc to take a ratio between them and see medium effect

- **Work flow**

  - Edit JETSCAPE/CMakeLists.txt
  - cmake ..
  - Edit analysis-combine.cc
  - make
  - ./analysis-combine

  } for both Root_Files_SpectraPbPb and Root_Files_SpectraPP

  - Edit RatioPPVsPbPb.cc
  - root -l RatioPPVsPbPb.cc

Edit JETSCAPE/CMakeLists.txt

- Add analysis-combine.cc in Executables

```
366 ¬
367 if (${ROOT_FOUND})
368 add_executable(analysis-spectra ./examples/analysis-spectra.cc)
369 target_link_libraries(analysis-spectra JetScape )
370 add_executable(analysis-combine ./examples/analysis-combine.cc)
371 target_link_libraries(analysis-combine JetScape )
372 endif()
373 ¬
```

Outputs

- **CombinedSpectra-PP.root**
- **CombinedSpectra-PbPb.root**