Jet Reconstruction Task Force Intro

ePIC Jet/HF Meeting
February 2nd, 2022
Derek Anderson (ISU)

Contents:

1) Intro to Jet Reconstruction Task Force

2) Ideas about Jet Reconstruction in EICRecon

3) General Discussion

Next Simulation Campaign and Related Task Forces

- **Next simulation campaign**:
  - **Target date**: End of March. tbd
  - **Goal**: Improved software stack for the reconstruction, including benchmarks.

- **Task forces** to reach our goal:
  - **Calorimeter Clustering**
  - **Jet Reconstruction**
  - **PID**
  - **Tracking**
  - **EICrecon** for urgent fixes to the reconstruction software stack
  - **Modular Reconstruction** for substantial improvements of the reconstruction software stack
  - **Simulation Production**

> **Important note: Task forces != subgroups**
> - Task forces solve specific issues.
> - Subgroups based around interest in a general area, e.g., reconstruction, will form later.

- Each task force will be responsible for leading the effort for a particular topic with the following goals:
  - The development is accessible to the whole collaboration in our main repository.
  - We can evaluate the reconstruction quality using a set of well-defined plots that we can easily reproduce.
  - Kickoff meeting with task force leaders on January 27.

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Task Force Intro | General

Reconstruction Task Forces

Calorimeter Clustering	**Chao Peng** cpeng@anl.gov	**Dmitry Kalinkin** dmitry.kalinkin@gmail.com
Jet Reconstruction	**Derek Anderson** dmawxc@iastate.edu	
PID	**Christopher Dilks** dilks@jlab.org	
Tracking	**Shujie Li** shujieli@lbl.gov	
EICrecon	**Dmitry Romanov** romanov@jlab.org	
Modular Reconstruction	**David Lawrence** davidl@jlab.org	**Sylvester Joosten** sjoosten@anl.gov
Simulation Production	**Wouter Deconinck** wouter.deconinck@umanitoba.ca	

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Task Force Intro | Jet Reconstruction

Task Force Lead: Derek Anderson (ISU)
- dmawxc@iastate.edu
- derek.murphy.anderson@protonmail.com
- Mattermost

Meetings: planning on weekly meetings
- Poll for initial time:
  › https://www.when2meet.com/?185 88885-DkOuM
- Poll is also to help determine available workforce

Task Force Charge: incorporate jet reconstruction into EICRecon
⇒ 2 main thrusts:
1) Developing a **"jet factory"** for EICRecon (+ any additional code)
2) Determining **key jet benchmarks** and implementing them

Key Tasks:
- Developing EICRecon jet factory
- Writing example macros/standalone code to work with jet output
- Developing jet benchmark code

Jet Reco in EICRecon | the jet factory

User specifies following at runtime:
- Input collection (e.g. tracks)
- Kinematic cuts on constituents
- Jet parameters

Jet_Factory.cc

For each member in input_collection, do
    if member is in kinematic_cuts, then
        add member to constituent_list

Create fastjet objects & do clustering
Write fastjet output to PODIO collection

User then interacts with jet PODIO collection

Jet Reco in EICRecon | jet parameters

Possible jet parameters to specify:
- Input collection
- Jet algorithm
  - › Generalized kT parameters?
  - › Inclusive/exclusive options?
- Recombination scheme
- Rjet
- Jet eta/pT ranges
- Area definition
  - › Max ghost eta
  - › Num. repeat

Jet Reco in EICRecon | PODIO jet strawman

Members

uint64_t	nCst	// no. of constituents
float	aJet	// jet area
edm4eic::Vector4f	pJet	// jet 4-momentum

Vector Members

edm4eic::Vector4f	pCst	// constituent 4-momentum

General Discussion

Some questions to discuss:
- What do we need/want in our jets?
- What benchmarks should we consider?
  - Inclusive spectra (e.g. jet pT)?
  - More specific observables?
- How do we accommodate multiple jet definitions?
  - Multiple collections?
  - Multifactories?
- How do we incorporate backgrounds?
- In addition to the jet factory, what additional infrastructure do we need?
  - An example "jet reader" macro?
  - A standalone way of reconstructing jets?

Thank you!