

Multi-apa/face generalization

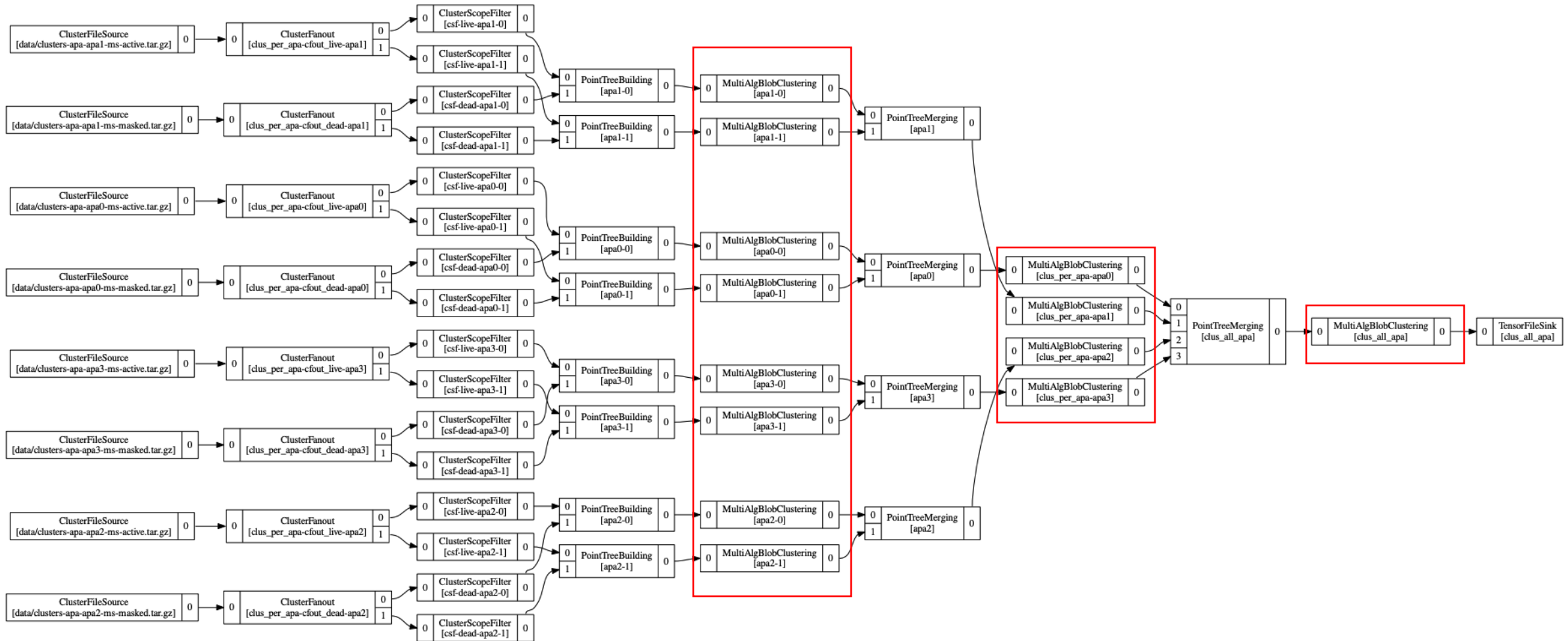
Our ~month-long journey is close to the end

- WirePlaneID (apa/face/plane) included in Facade objects
- DetectorVolume for detector information
- PointCloudTransformation Utilities
- Facade can handle multiple sets of points (e.g., raw and t0_corrected)
- New DynamicPointCloud (standalone PC)
- BEE updates
- A collaborative work from: Brett, Xin, Xuyang, Chao and Haiwang

Test for PDHD

3 Clusterings: per-face; per-apa; all-apa

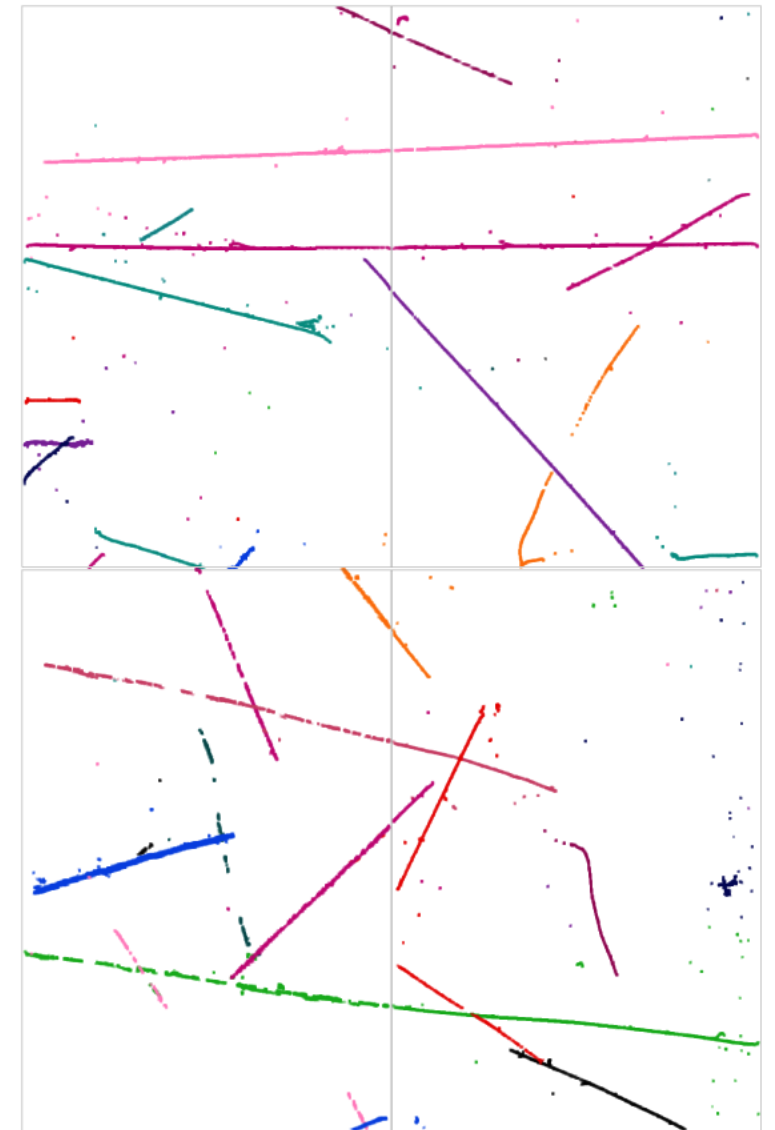
<https://github.com/HaiwangYu/wcp-porting-img/blob/main/pdhd/wct-clustering.jsonnet>



BEE for PDHD:

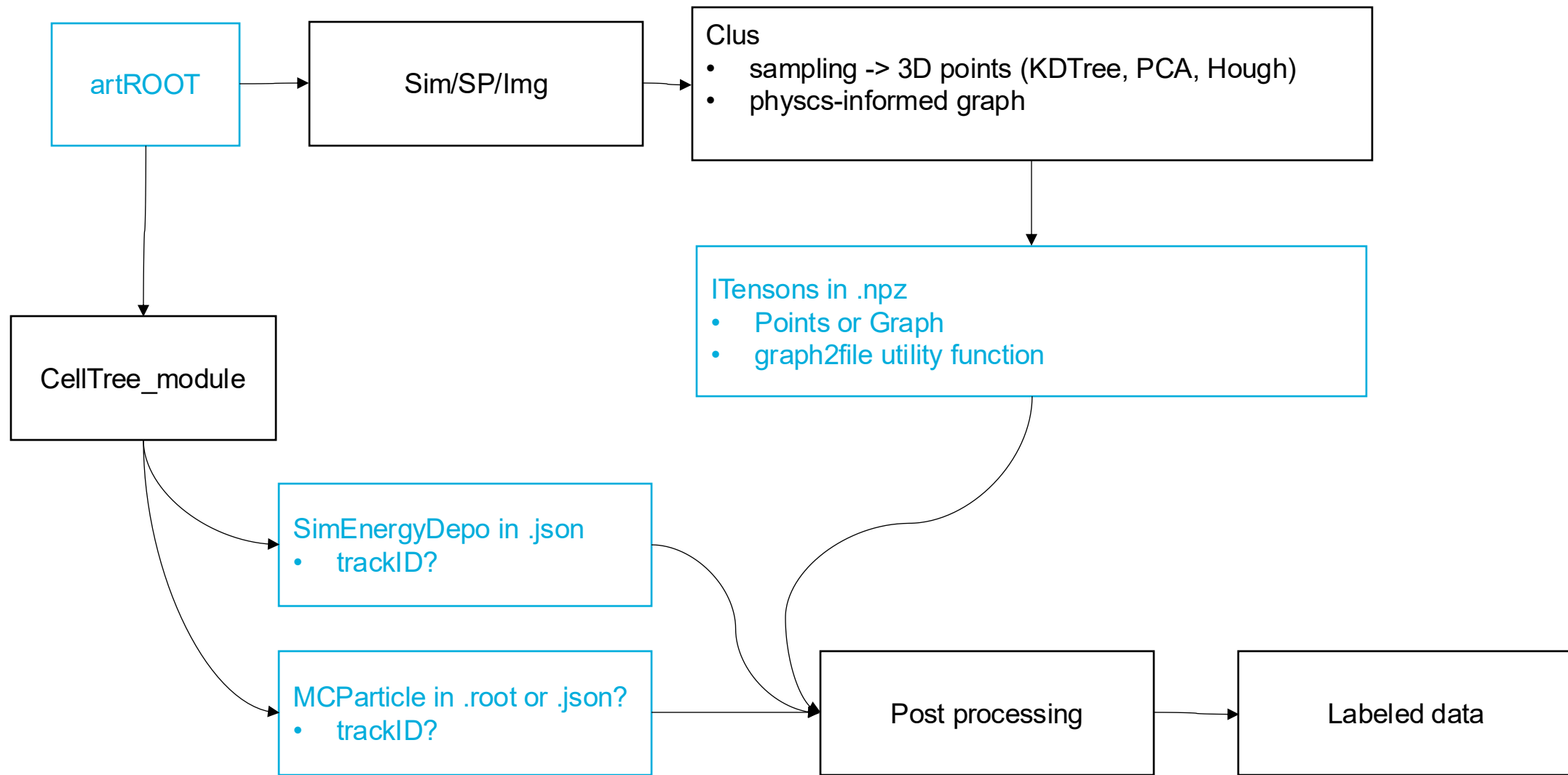
<https://github.com/HaiwangYu/wcp-porting-img/blob/main/pdhd/clus.jsonnet>

- Many clustering_funcs extended to multi-apa/face
- Using (fake)T0-corrected points
- Filtering all points outside FV



<https://www.phy.bnl.gov/twister/bee/set/6f9a9a6f-1a87-465c-b427-56374ab2a534/event/0/>

DL-Clustering data preparation



Workflow

Reco dump:

- `grouping2file` (available in master, 0.30.2)
 - with apa/face/plane sorted out, adding 2D charge is straightforward

Truth dump:

- Moon's implementation using ParticleInventoryService
- https://github.com/wjdanswjddl/larreco/tree/add_outputs
- [Minor bug fix](#)

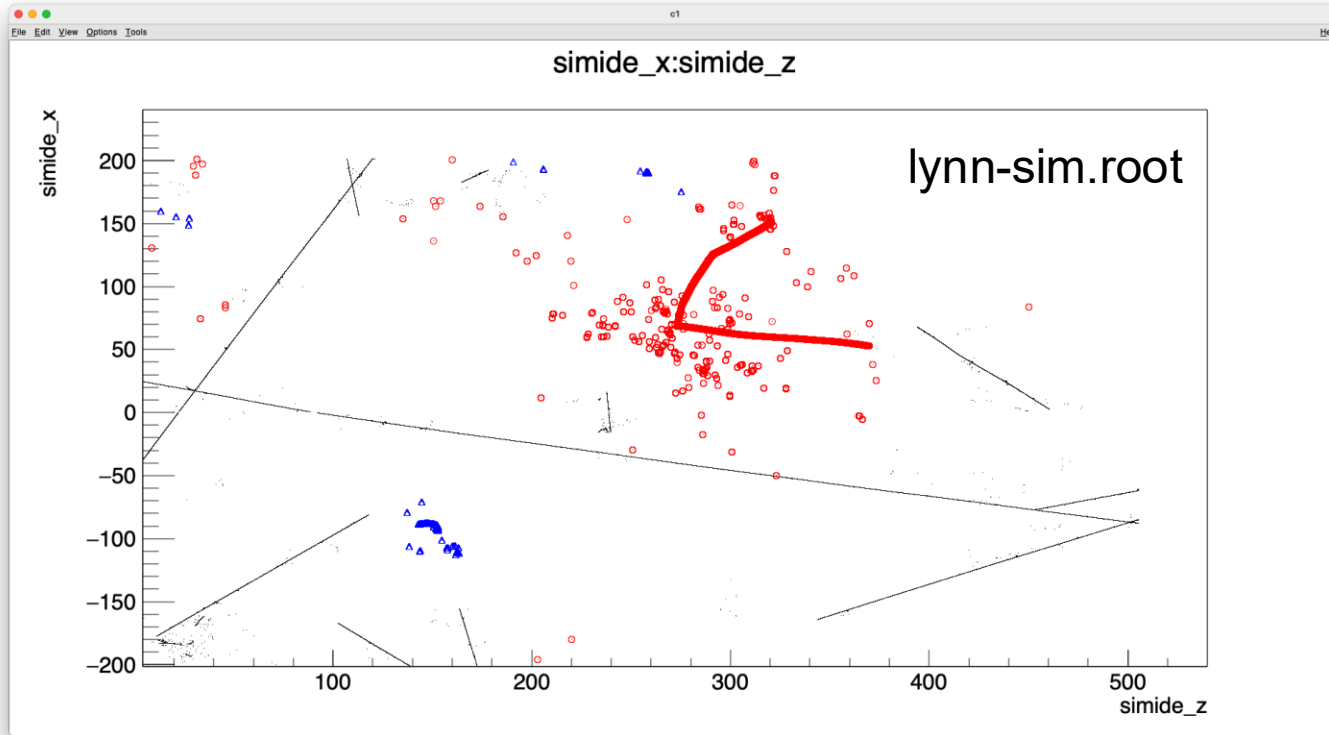
Post processing:

- truth -> time shift -> kd.radius() -> label reco

Data from Avinay – still checking it

- SigProc output
- SimEnergyDepo

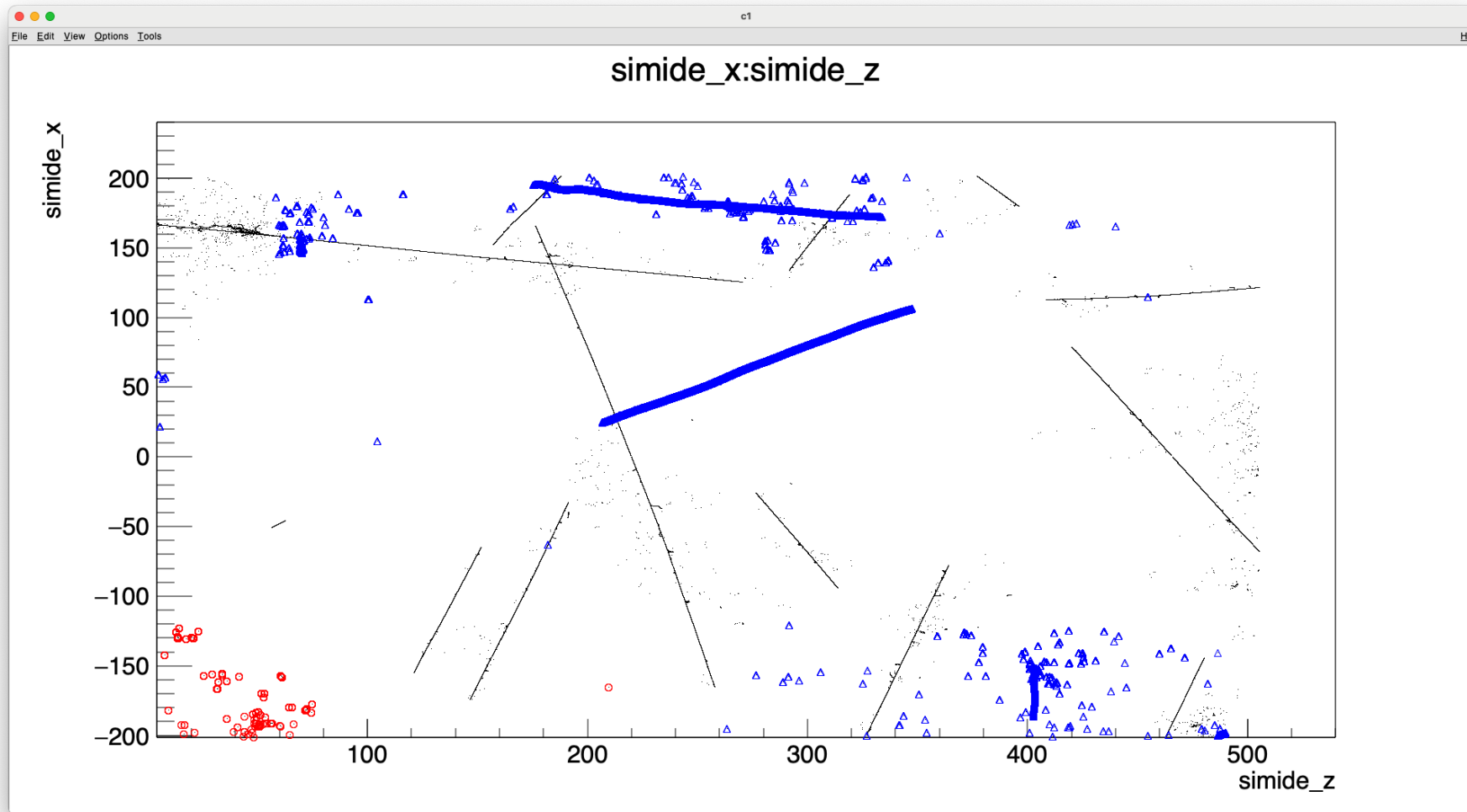
Using Moon's truth tagging



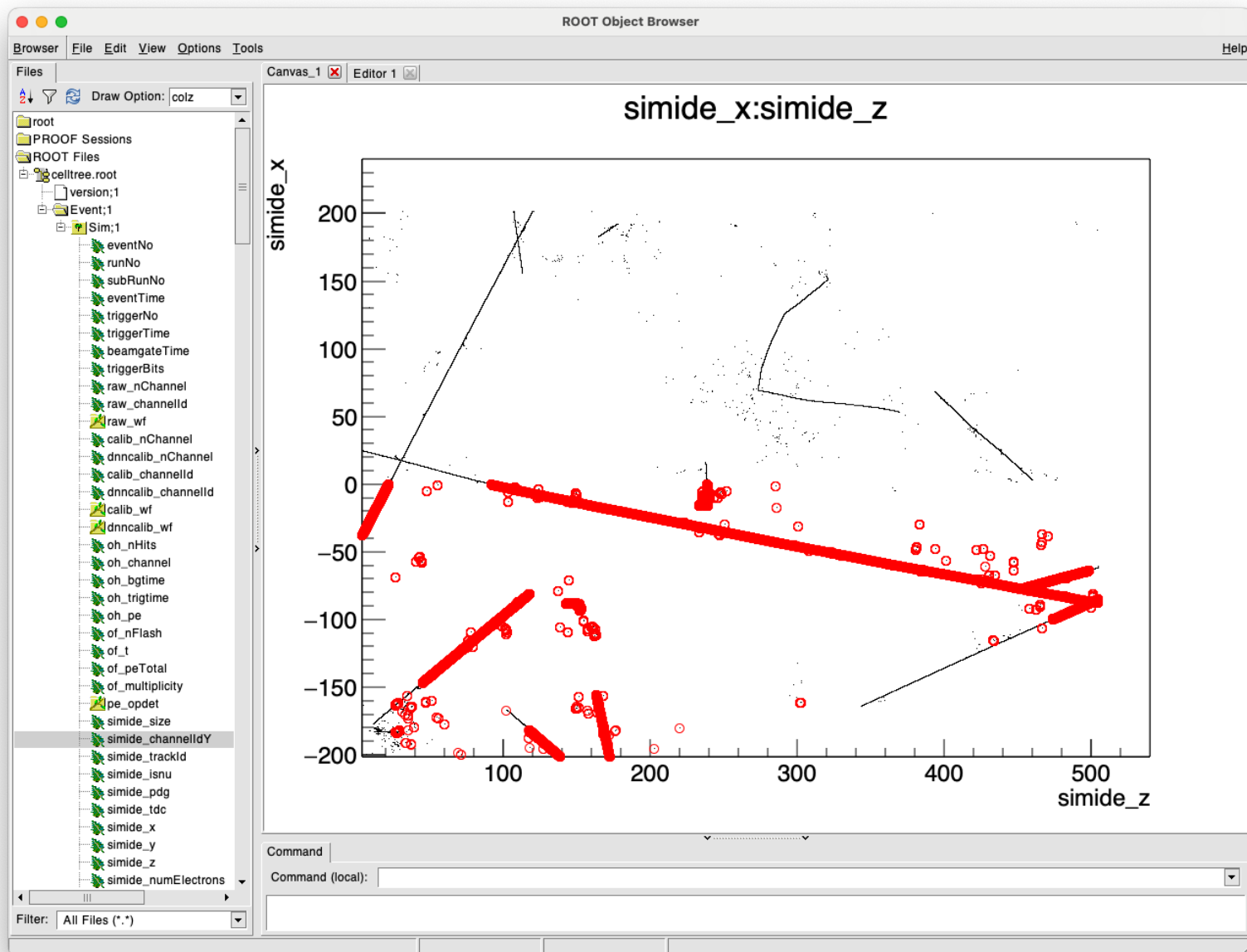
red: `is_nu==1`
blue: `is_nu==0`
other: not found from
`ParticleInventoryService::TrackIdToMCTruth_P`

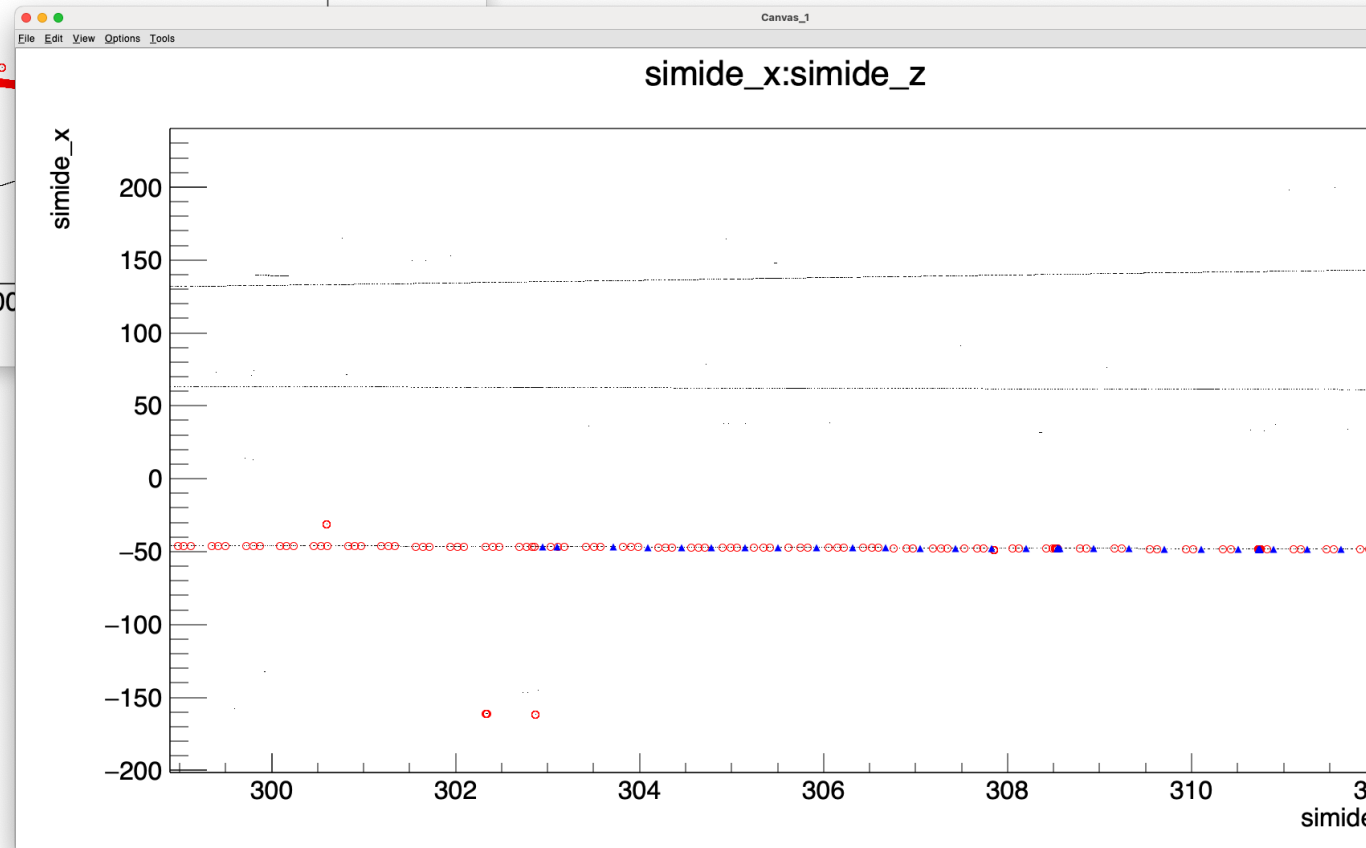
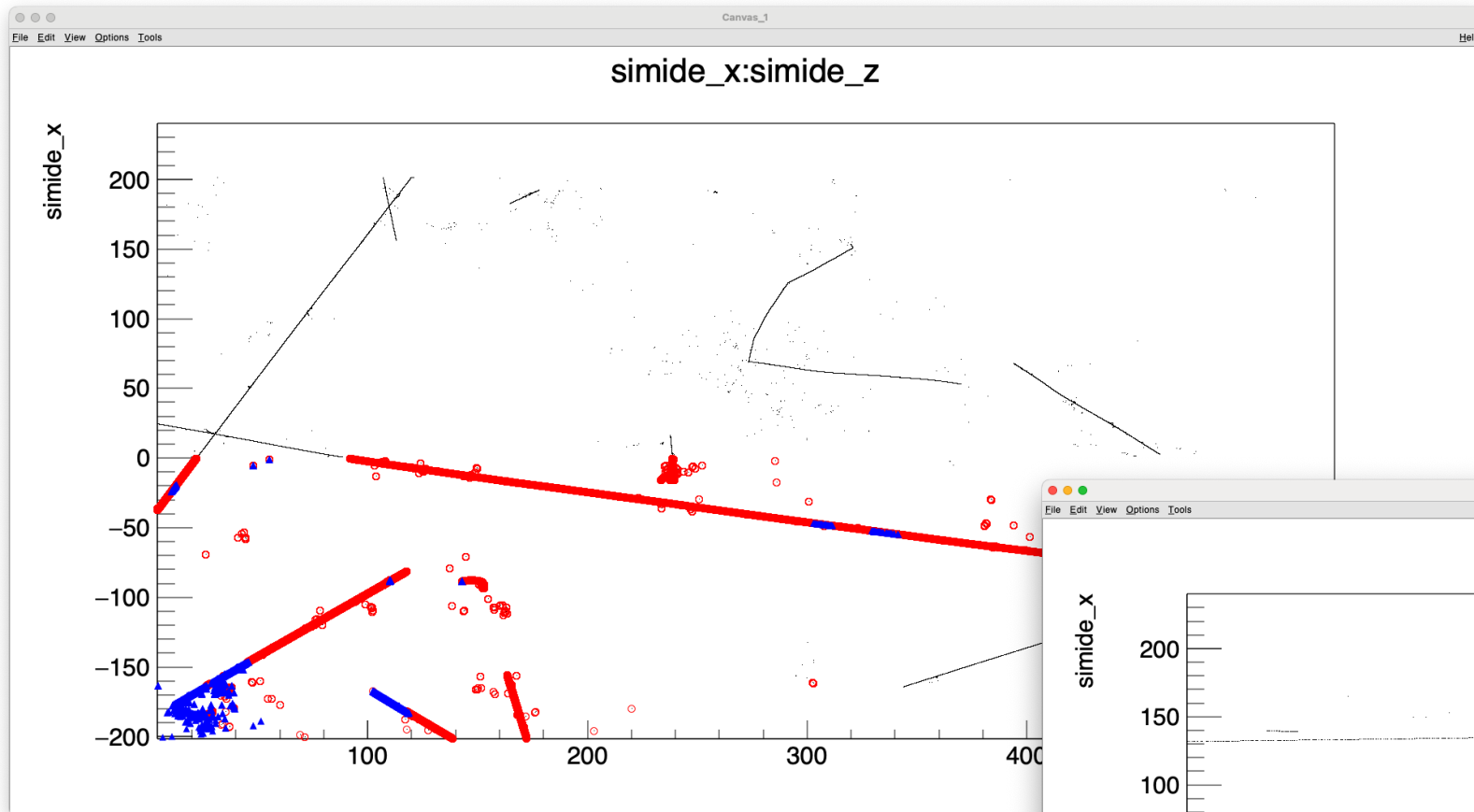
Another example

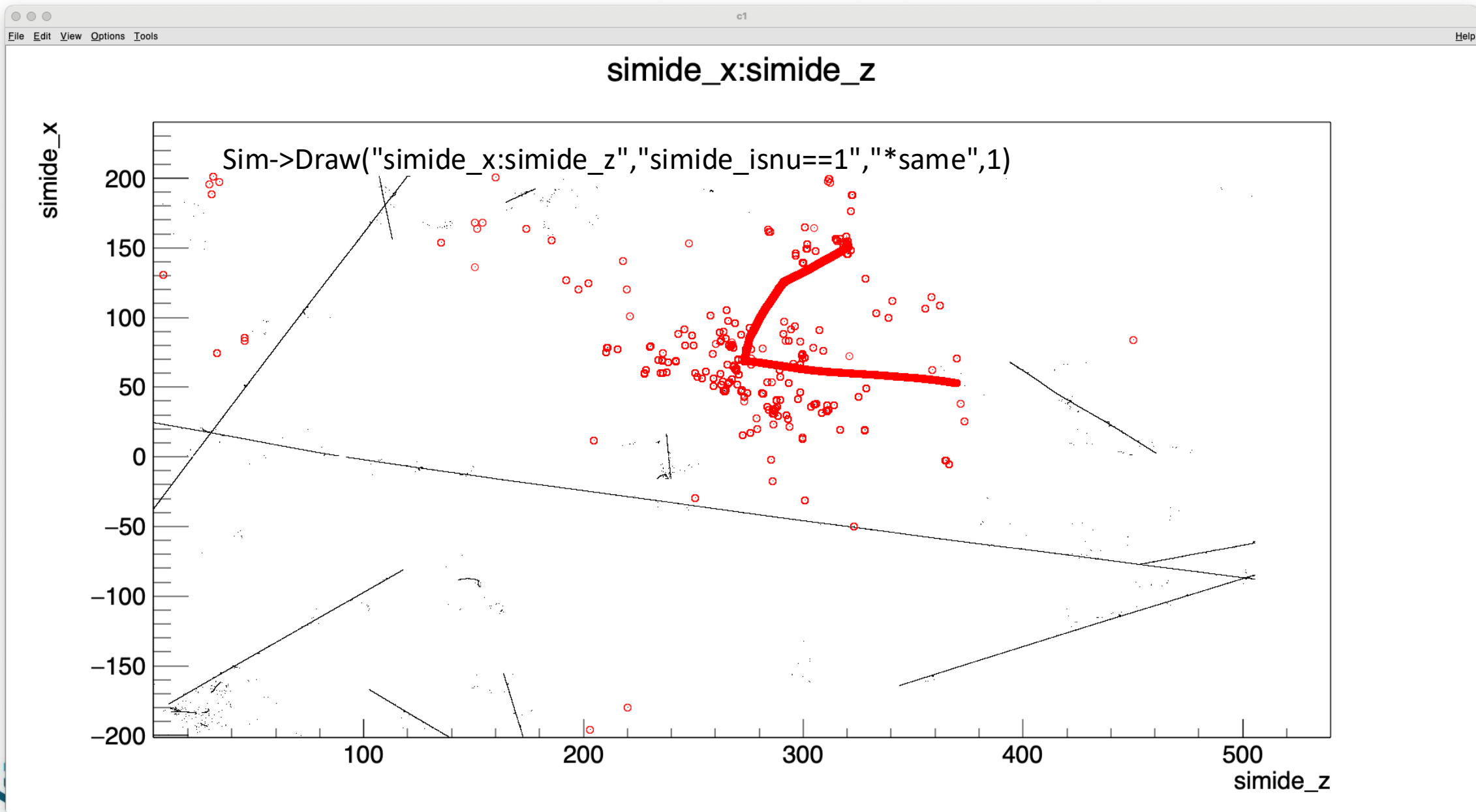
/exp/sbnd/app/users/yuhw/dl-clustering/avinay-mar-05.root



backups







Outline 1

- **Clustering validation + tool development – Ewerton, Hanyu**
 - goal:
 - develop a useful tool to evaluate img/clus results
 - look for cluster failures and tune/improve the clus parameters/alg.
 - clustering code not crashing **in all cases**
 - save out SimEnergyDepo
 - group depos based on time
 - match Cluster points with depo points
 - metric calculation
- **QL-Matching – Lynn, Haiwang**
 - goal:
 - adopt the many-to-many uboone ql-matching alg. to
 - determine cluster t0 (tag in-beam cluster)
 - improve clustering
 - Implement data objects to provide charge/light information
 - Bring in the semi-analytical photon library
 - Initial implementation of matching alg.
 - ...

Outline 2

- **DL-Clustering – Moon, Avinay, Haiwang**

- goal:
 - improve neutrino clustering especially π^0 related
 - prioritize efficiency more
- Data preparation
 - NC π^0 + cosmic sample with current clustering alg.
 - <https://github.com/HaiwangYu/sbnd-dl-clustering/blob/main/README.md#clustering-input-data>
 - Save out reco. info
 - Save out truth info
- Algorithm development
 - information to use
 - network architecture
 - ...

save out reco.

- Facade::Grouping -> boost::multi_array<float, 2> -> WireCell::Stream::write() (.npz)
- a Facade::Util function that is called at the end of MABC
 - similar like a BEE dumper

meta data: run, subRun, eventNum

blob:

[blob_idx], q, qp0 (uq), dqp0 (duq) ..., wind_min_dp0 (wind_u_min) ...,
ncorners, corner0_x, corner0_y, corner0_z, ... corner11_z [max 12 corners]

points:

[pt_idx], x, y, z, q, blob_idx, qp0 (uq), dqp0 (duq) ...

point_graph:

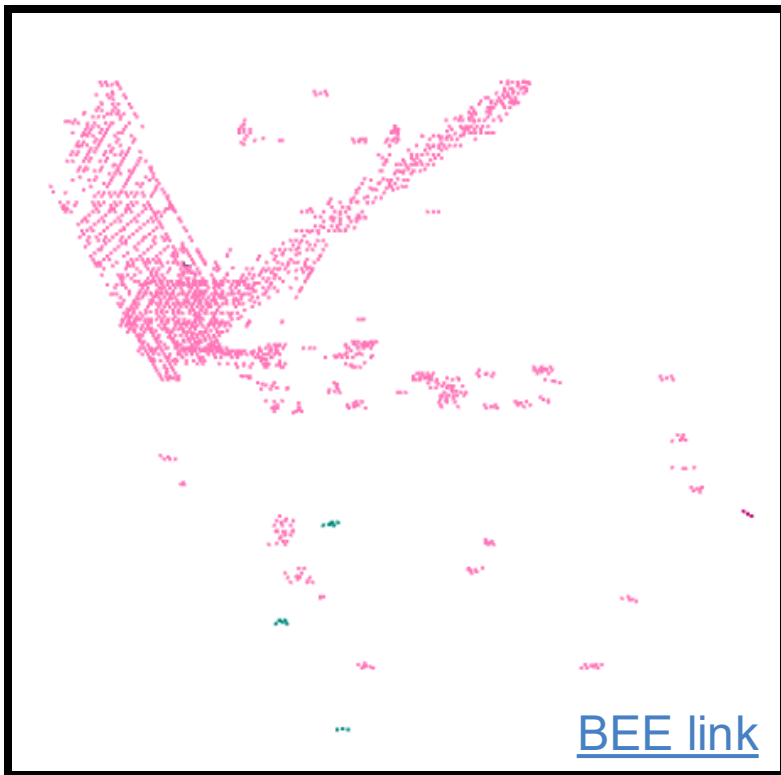
head (pt_idx), tail, weights (pp-dist.)

light?

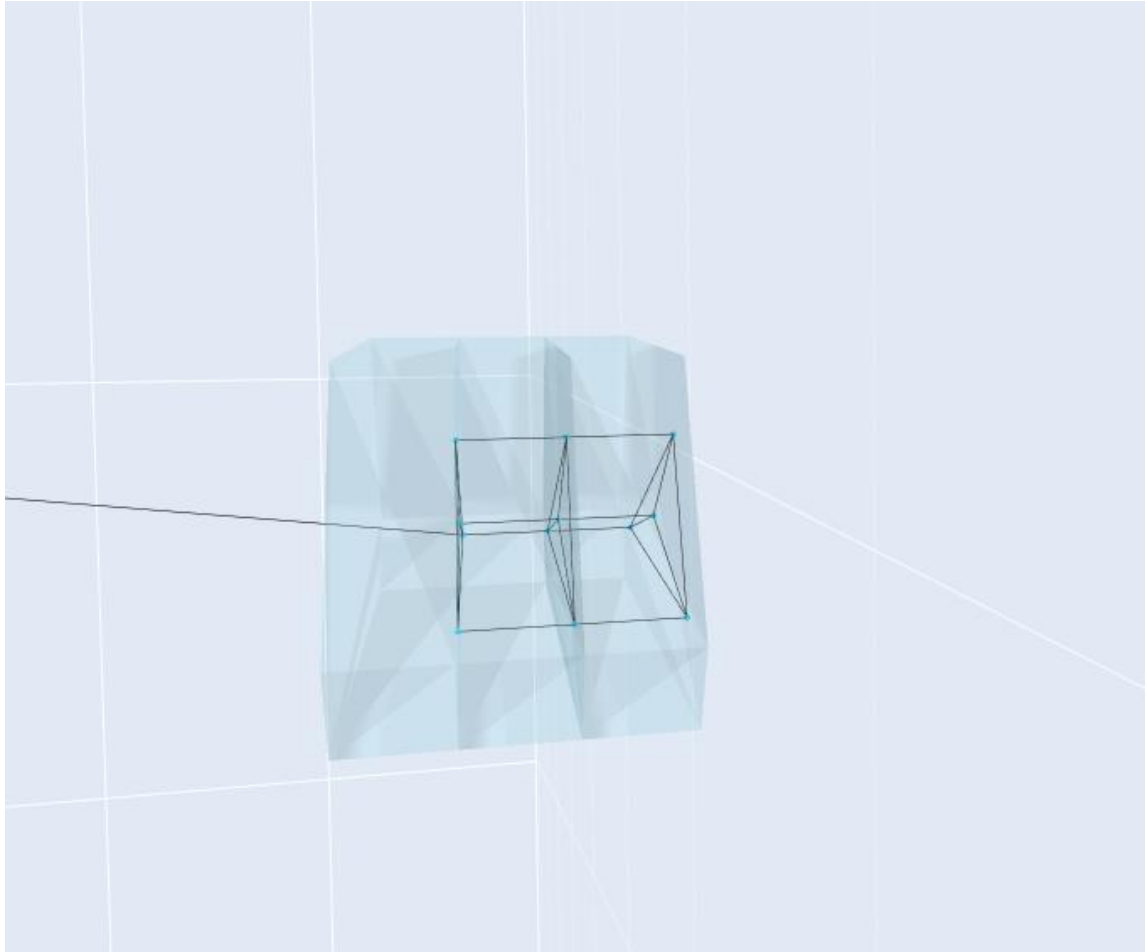
3d points and point-point edges

- torch_geometric.data
- visualization: plotly
- <https://github.com/HaiwangYu/sbnd-dl-clustering/blob/main/explore.py>

A DUNE-FD-VD numu event in one APA



blob + point + edge



Need the bug fix for the `tp.time_offset` not set

Merge three branches?

- master, apply-pointcloud, qlmatching

Save out truth info

https://github.com/LArSoft/larreco/blob/develop/larreco/WireCell/CellTree_module.cc

<https://github.com/LArSoft/lardataobj/blob/develop/lardataobj/Simulation/SimEnergyDeposit.h>

<https://github.com/NuSoftHEP/nusimdata/blob/develop/nusimdata/SimulationBase/MCParticle.h>

Are these trackIDs synchronized?

`SimEnergyDeposit::trackID` or `SimEnergyDeposit::origTrackID`

?

`MCParticle::TrackID()`

From last Thursday:

- Ewerton, Hanyu: can we use `SimEnergyDeposit::Time()` to tag neutrino?
- Chao: can we use `Trajectory()` instead?