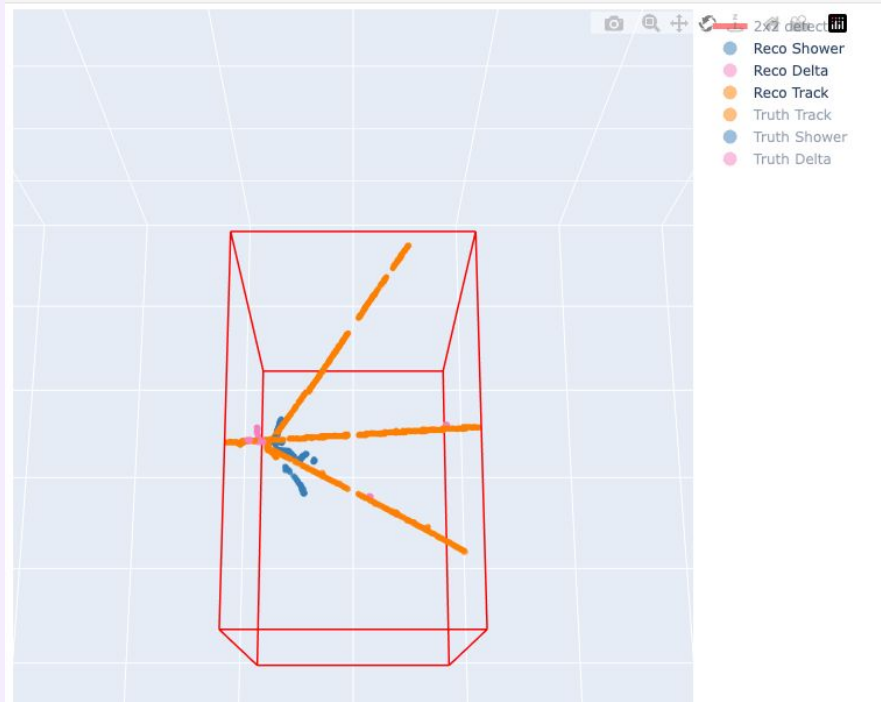


Track Matching Across Detectors: Reco SPINE 2x2 Matching

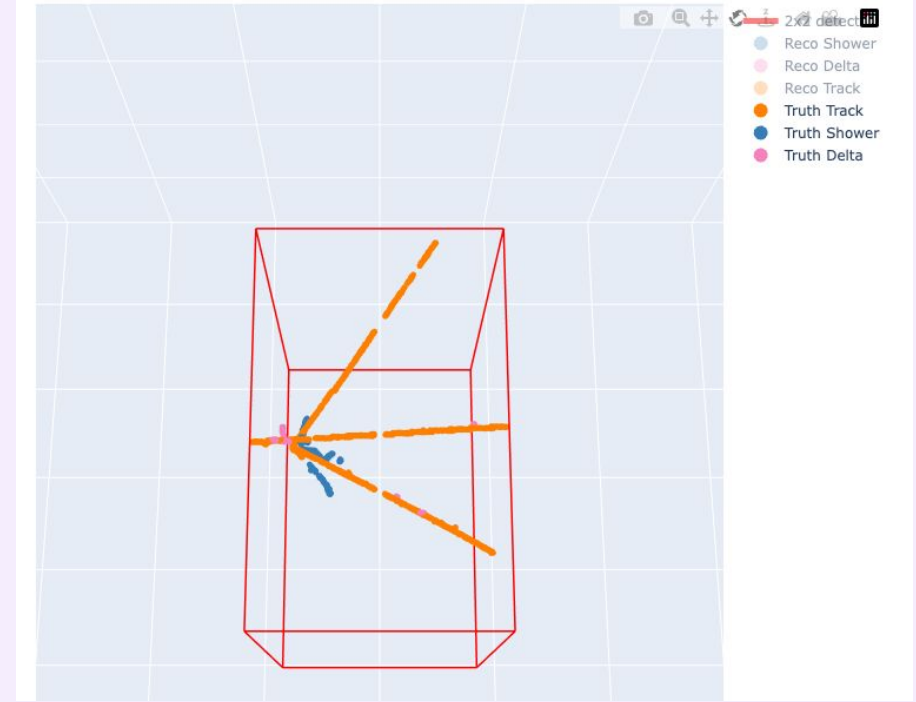
Jessie Micallef (they/them)
jessie.micallef@tufts.edu

Reco SPINE Objects

Reco



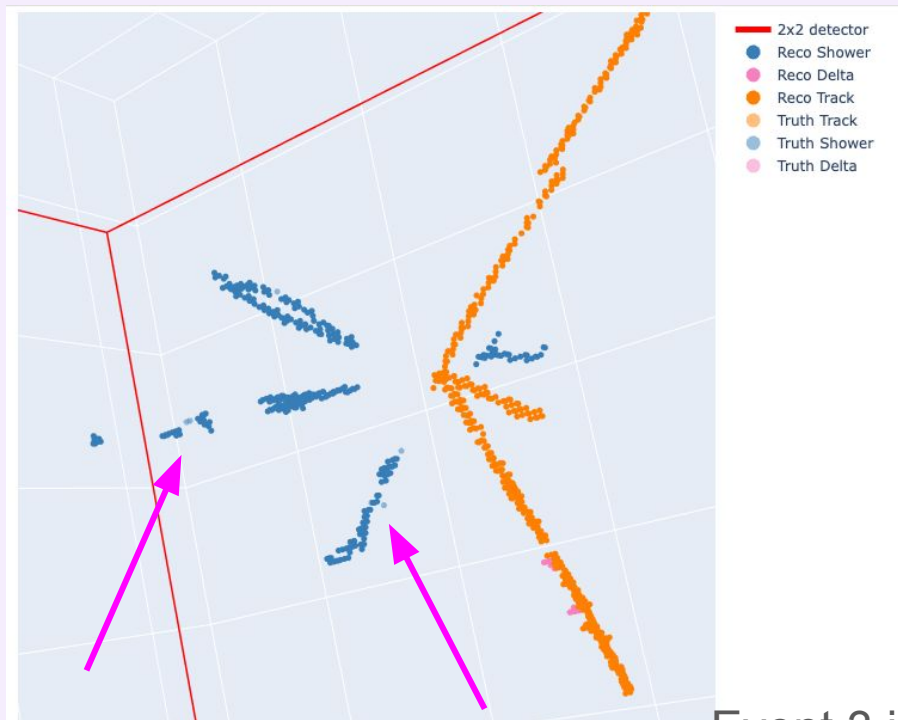
True



Event 3 in file 87

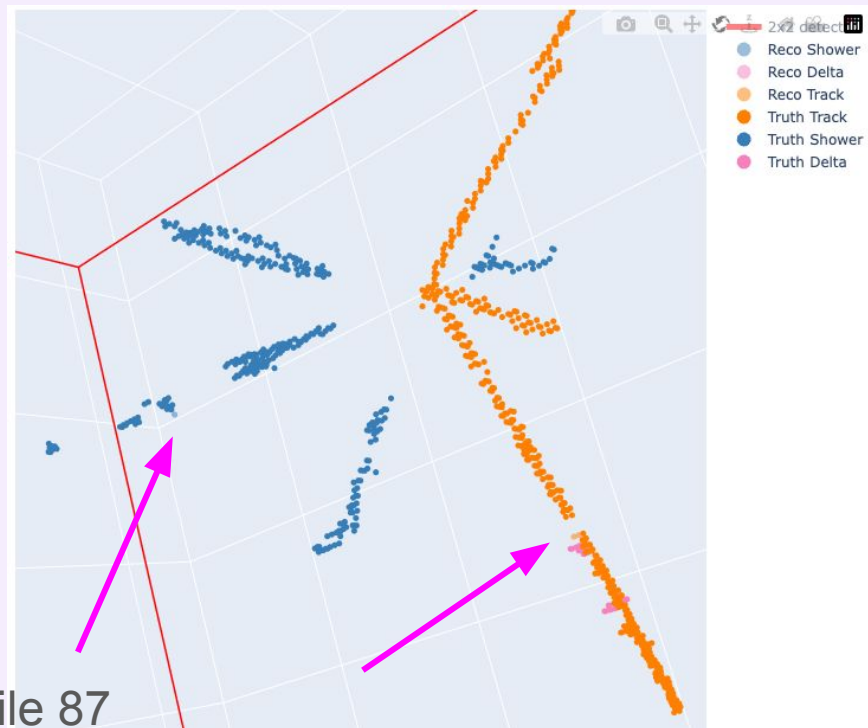
Reco SPINE Objects

Truth lighter → some missed

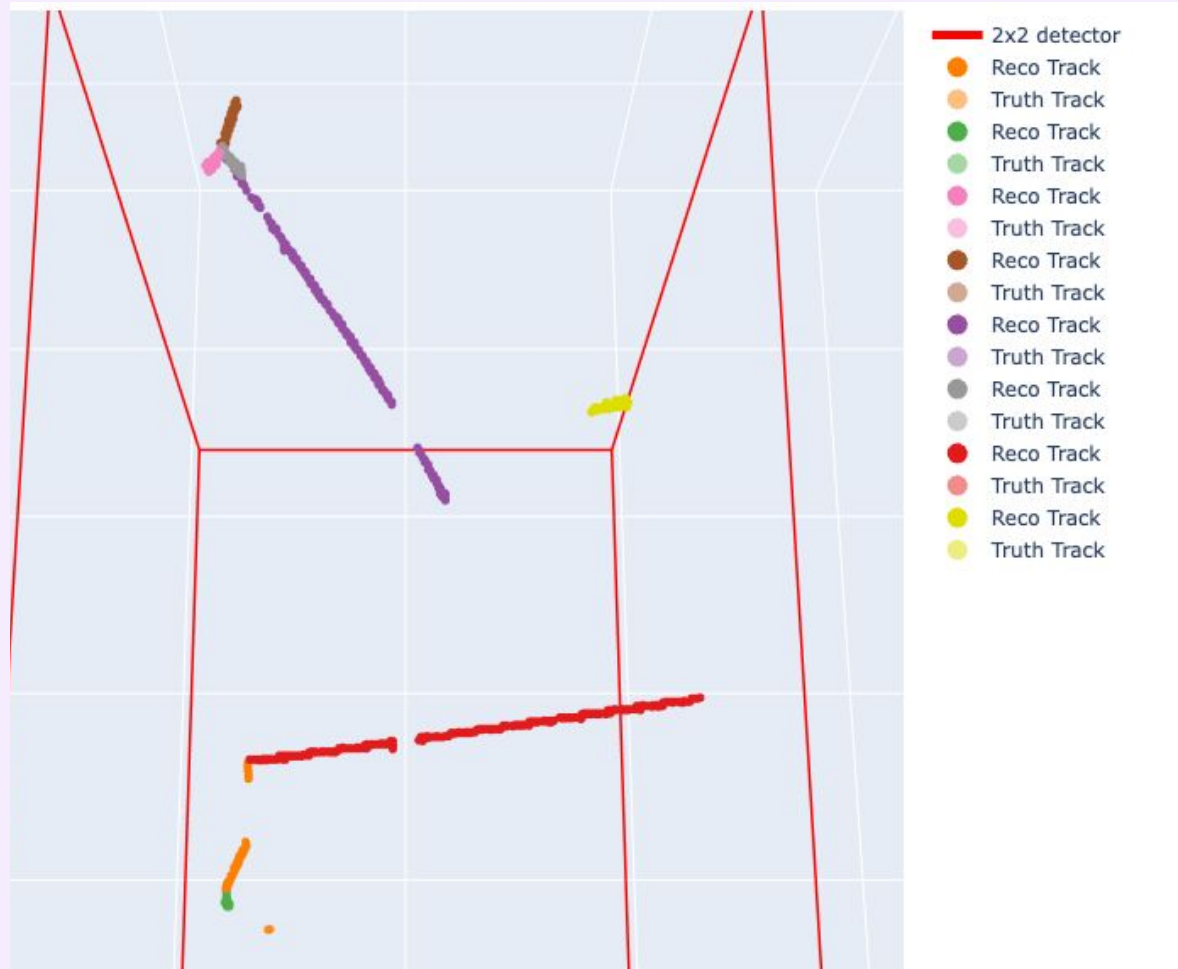


Event 3 in file 87

Reco lighter → some extra



Reco == Track



Event 33 in file 87

Checking Matches in LArCV

Spill 163 {'-13190000500': 0, '1119000049139': 1, '2212190000501': 2}

MINERVA Fragment: 0 Group: 1 Unique ID 1119000049139

MINERVA Fragment: 1 Group: 0 Unique ID -13190000500

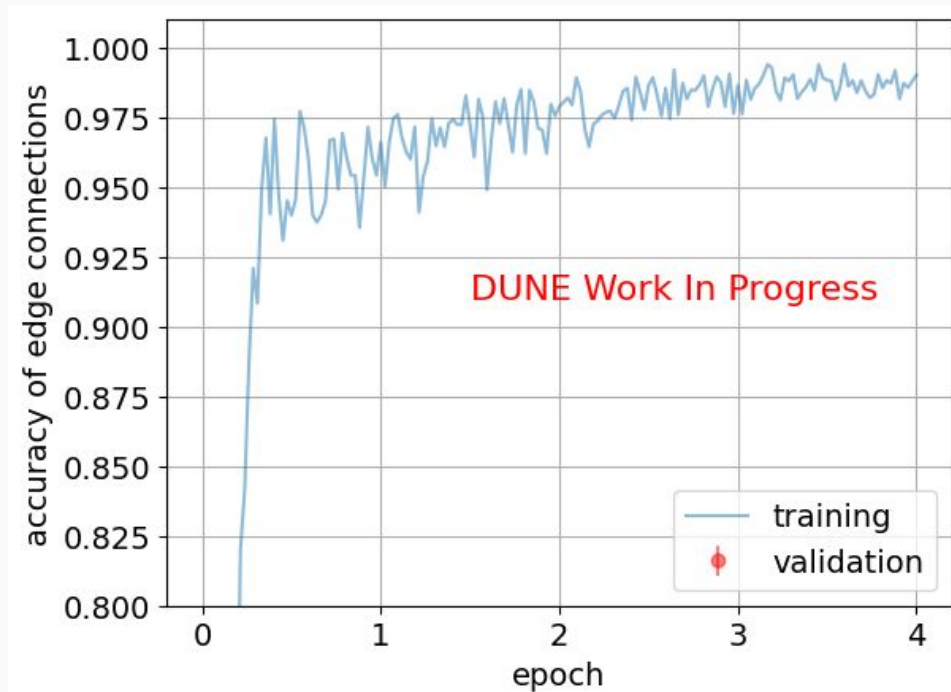
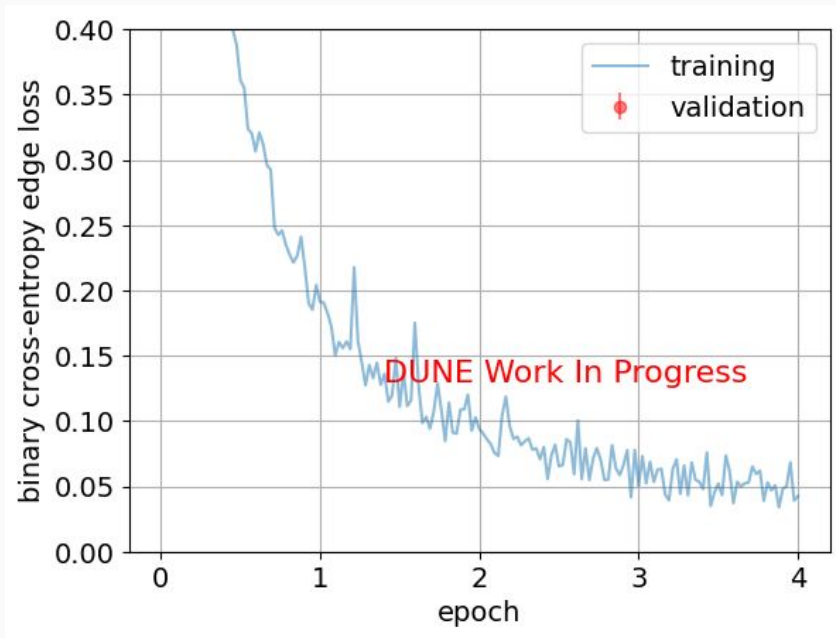
SPINE 2x2 Fragment: 2 Group: 2 Unique ID 2212190000501

SPINE 2x2 Fragment: 3 Group: 0 Unique ID -13190000500

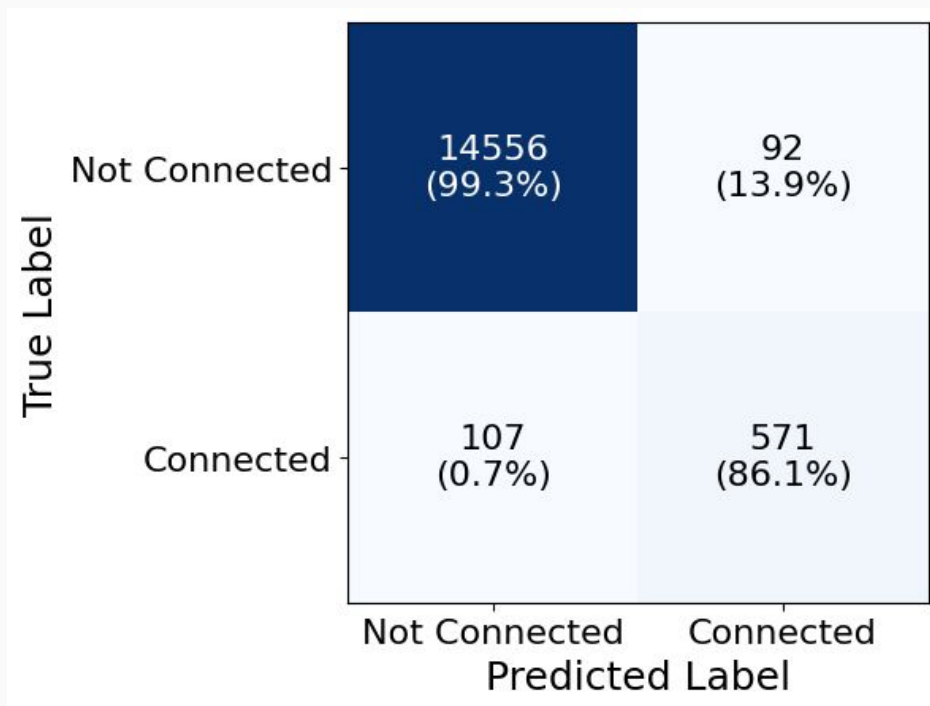
Spill 164 {'-1310000000190157190': 0, '-21110000000190155211': 1, '1310000000190152170': 2, '211190000586': 3, '221219000058951': 4, '221900005847': 5, '-211190000582': 6, '22121900005811': 7, '2212190000584': 8, '221219000058257': 9, '-13190000580': 10, '22121900005810': 11, '221900005848': 12, '211190000583': 13, '2219000058588': 14, '2219000058587': 15}

MINERVA Fragment: 0	Group: 2	Unique ID 1310000000190152170
MINERVA Fragment: 1	Group: 1	Unique ID -21110000000190155211
MINERVA Fragment: 2	Group: 0	Unique ID -1310000000190157190
Fragment: 3	Group: 9	Unique ID 221219000058257
Fragment: 4	Group: 6	Unique ID -211190000582
Fragment: 5	Group: 7	Unique ID 22121900005811
Fragment: 6	Group: 3	Unique ID 211190000586
Fragment: 7	Group: 13	Unique ID 211190000583
Fragment: 8	Group: 11	Unique ID 22121900005810
Fragment: 9	Group: 10	Unique ID -13190000580
Fragment: 10	Group: 8	Unique ID 2212190000584
Fragment: 11	Group: 4	Unique ID 221219000058951
Fragment: 12	Group: 8	Unique ID 2212190000584

First Check: Trained with ~1300 events



First Check: Tested with ~300 events

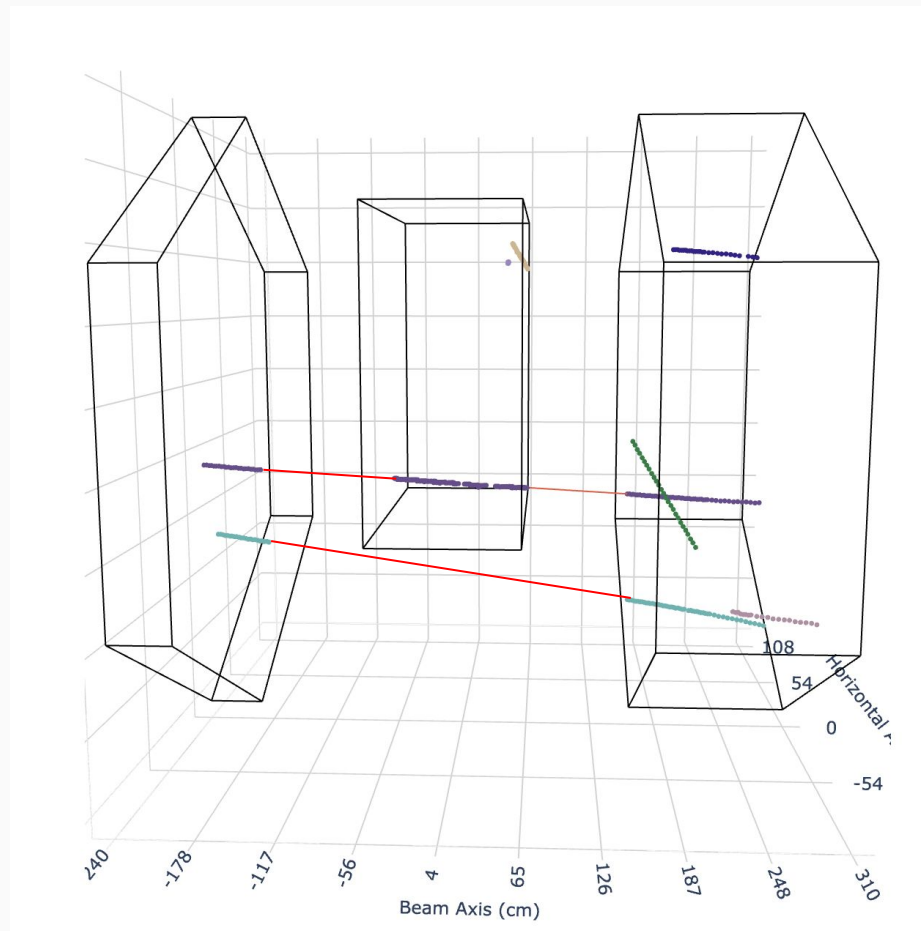


Super small training sample!
Very short training

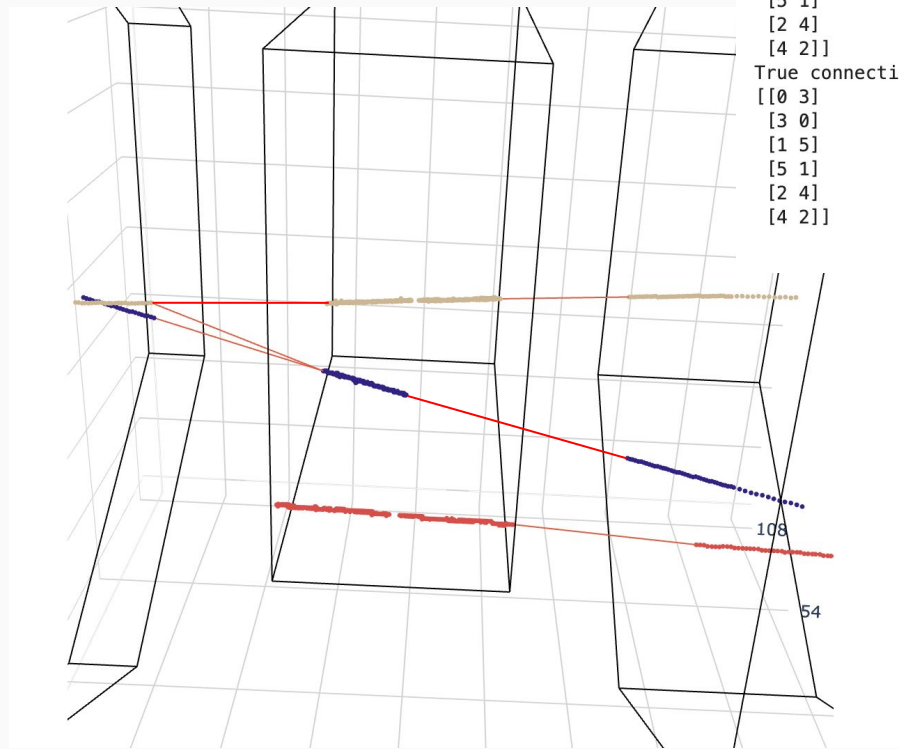
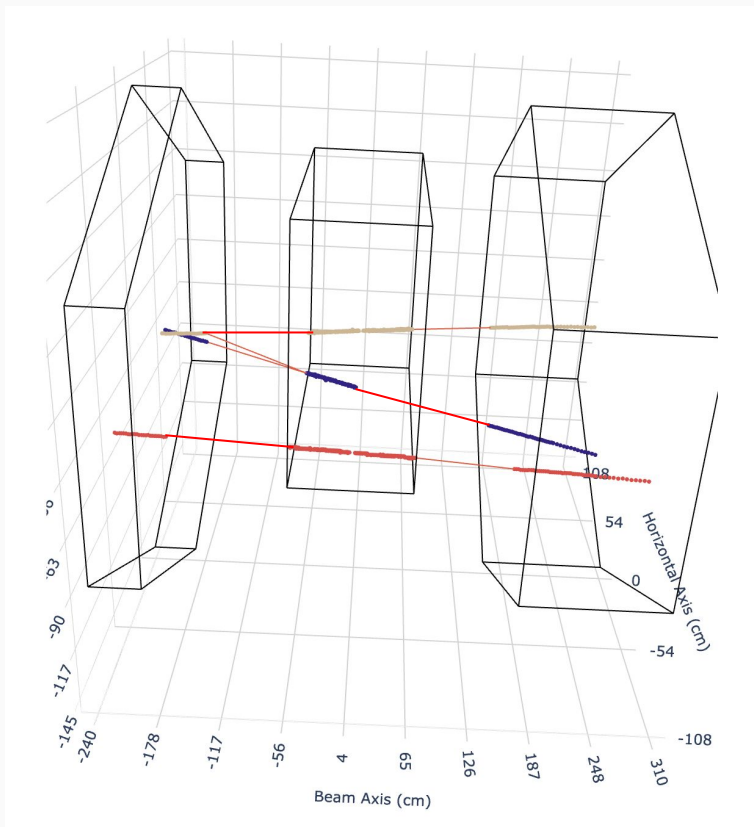
Correct Event

Doing well:

MINERvA segments
automatically connected (not
shown in plot)



One Additional Match



Entry 7
Predicted connection:
[[0 3]
[3 0]
[0 4]
[4 0]
[1 5]
[5 1]
[2 4]
[4 2]]
True connection:
[[0 3]
[3 0]
[1 5]
[5 1]
[2 4]
[4 2]]

Next Steps

Make larger training sample

- Should I do more than 200 files?

Hand off to Daniel!

→ Will there be issues if there are some group numbers skipped?

Backup

Spill 149 {'-13180000820': 0, '11100000001802297314': 1,
'1310000000180222090': 2, '-13180000810': 3, '11100000001802172531': 4,
'11100000001802220943': 5, '-211180000822': 6}

MINERVA Fragment: 0 Group: 4 Unique ID 11100000001802172531

MINERVA Fragment: 1 Group: 2 Unique ID 1310000000180222090

MINERVA Fragment: 2 Group: 3 Unique ID -13180000810

MINERVA Fragment: 3 Group: 0 Unique ID -13180000820

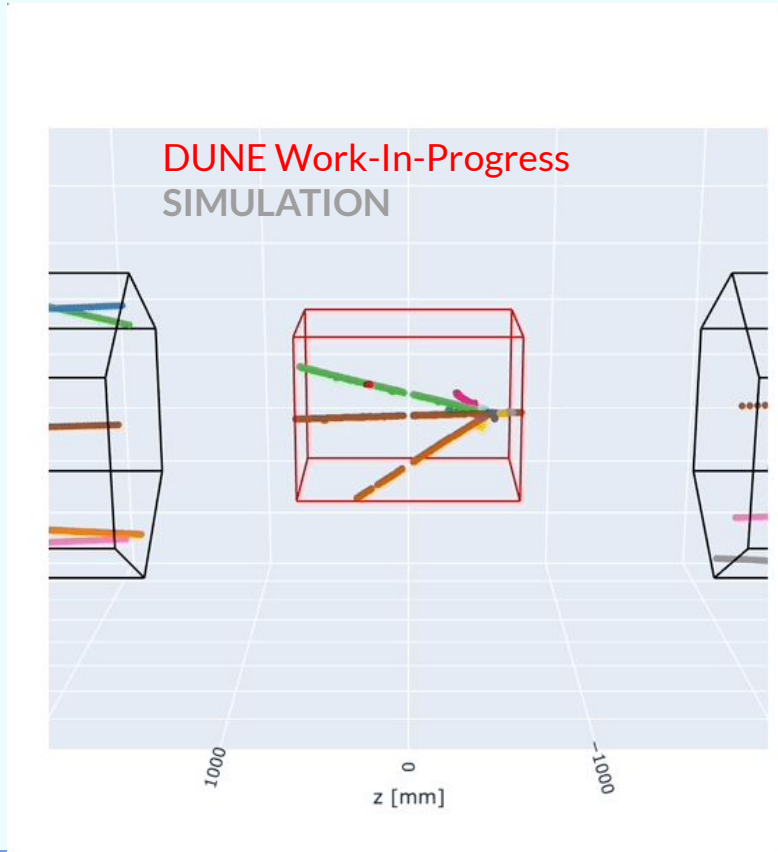
MINERVA Fragment: 4 Group: 1 Unique ID 11100000001802297314

Fragment: 5 Group: 2 Unique ID 1310000000180222090

Fragment: 6 Group: 6 Unique ID -211180000822

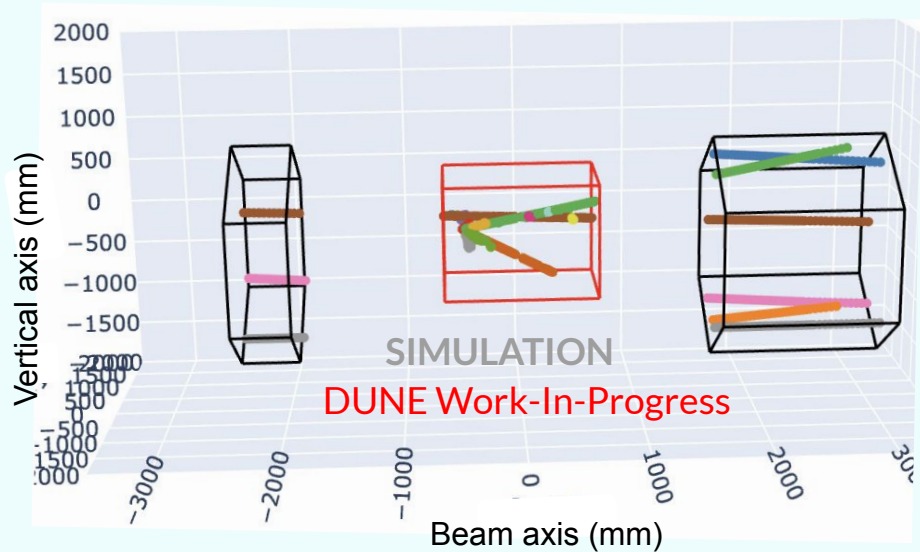
Fragment: 7 Group: 0 Unique ID -13180000820

Setting up 2x2 True Particles + Mx2 Reco Tracks



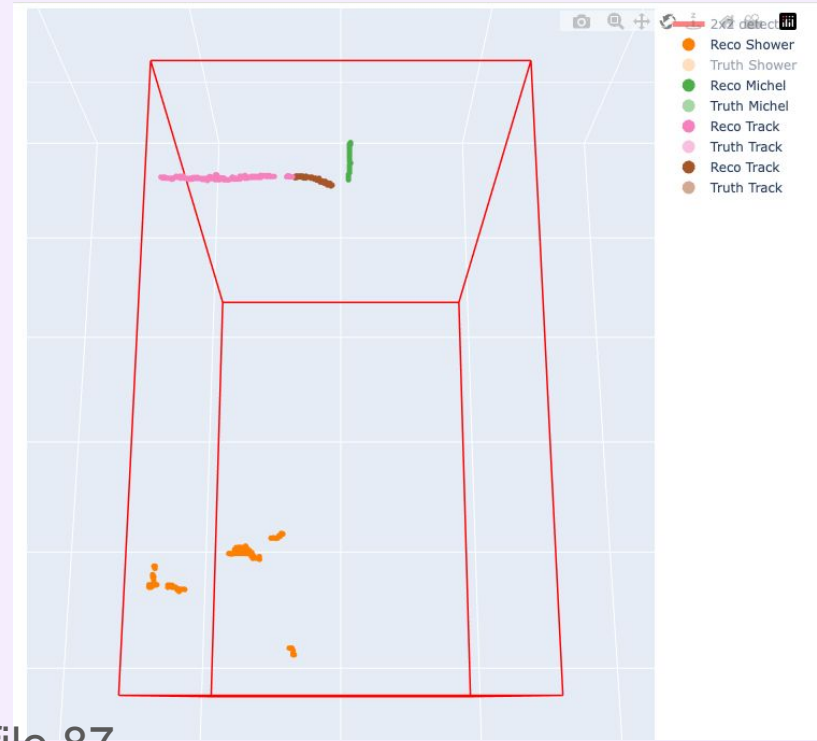
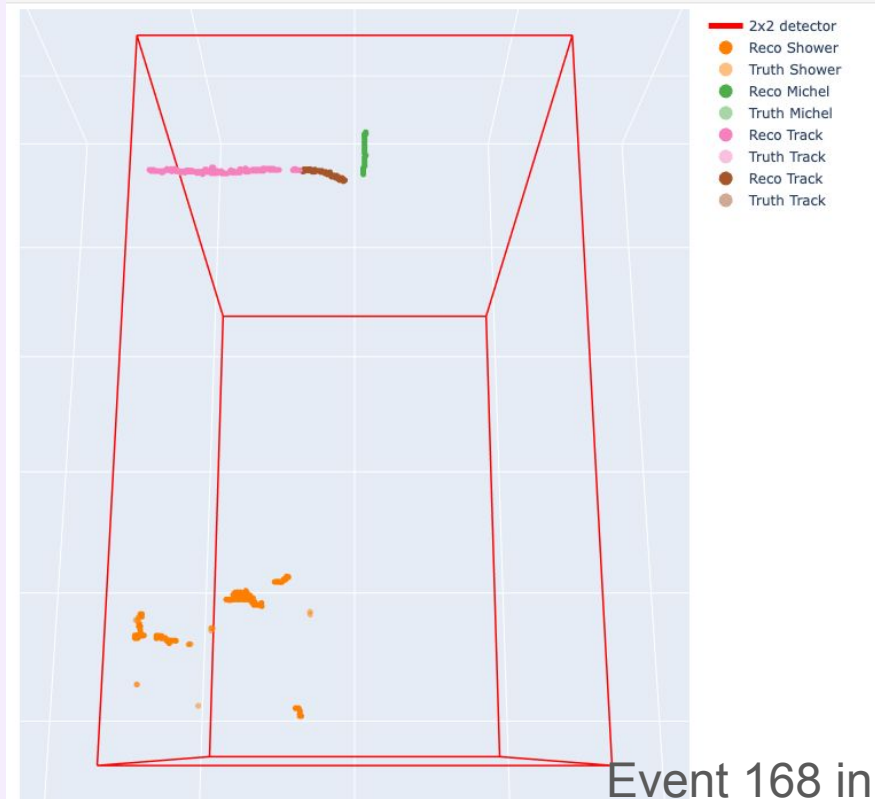
More “match” cases + **more messy**:

- Upstream to Downstream (**pink & gray here**)
- Upstream to 2x2 to Downstream (**brown here**)
- Upstream to 2x2 (not shown here)
- 2x2 to Downstream (**green here**)



Reco misses some voxels

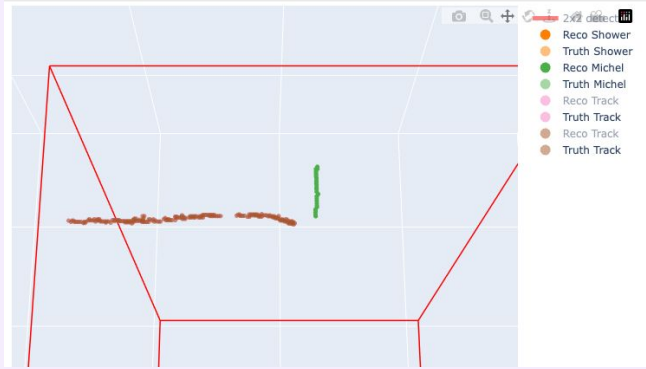
- Removed orange truth



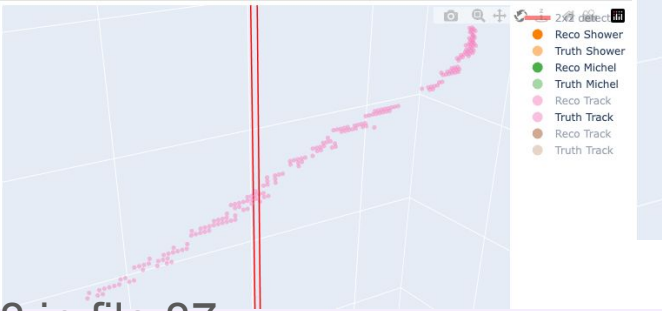
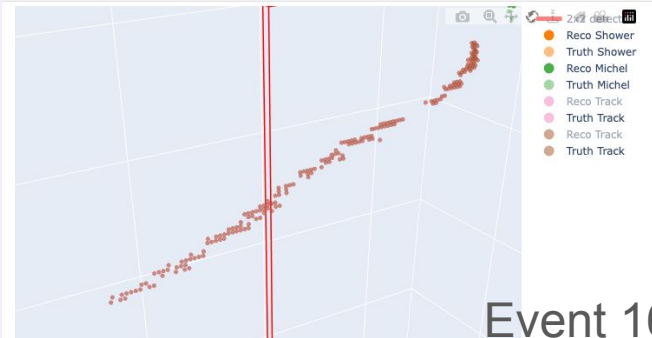
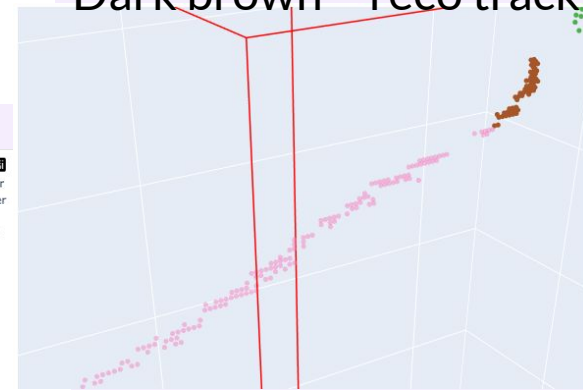
Event 168 in file 87

Double Truth Track?

Truth brown & black track = same
→ 2 reco track matched to the same
true particle?



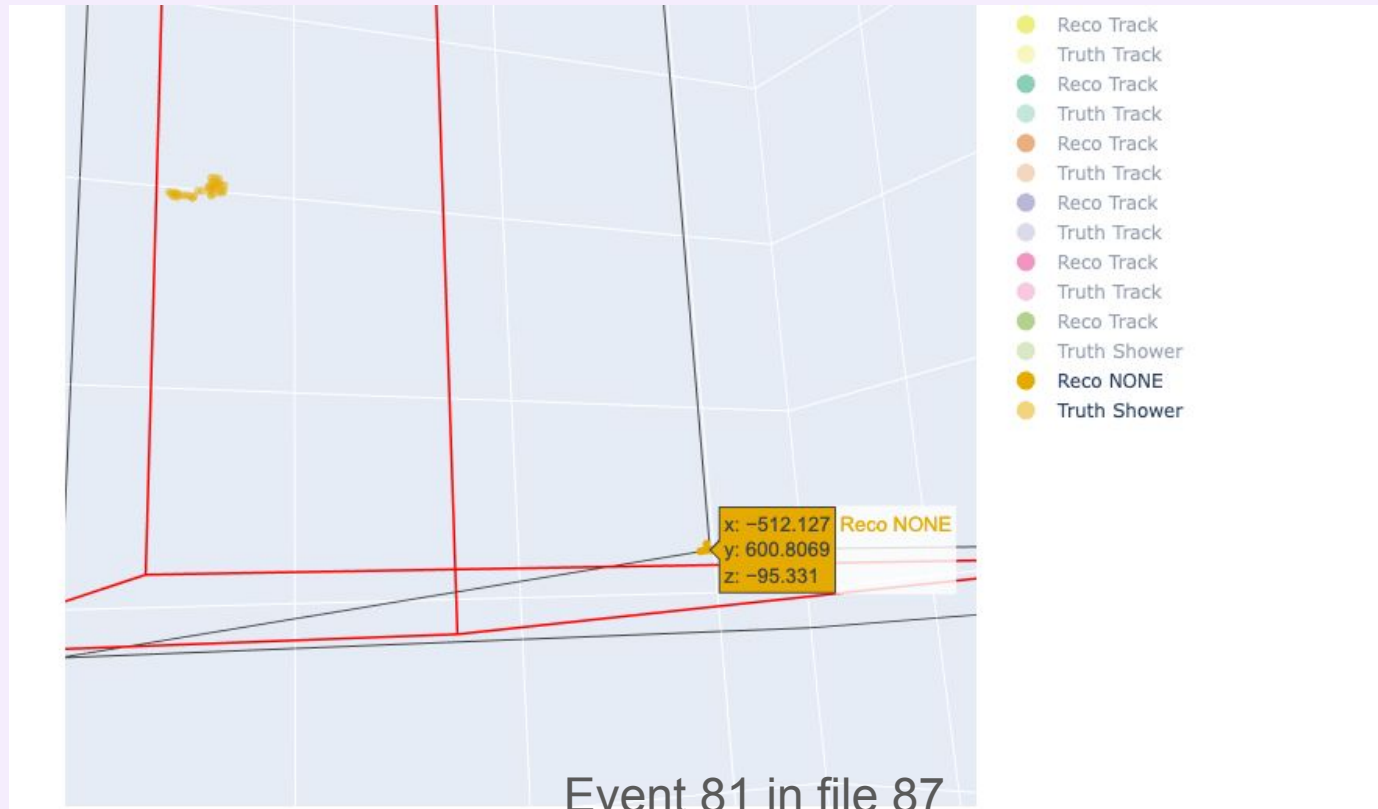
Dark brown = reco track



Event 168 in file 87

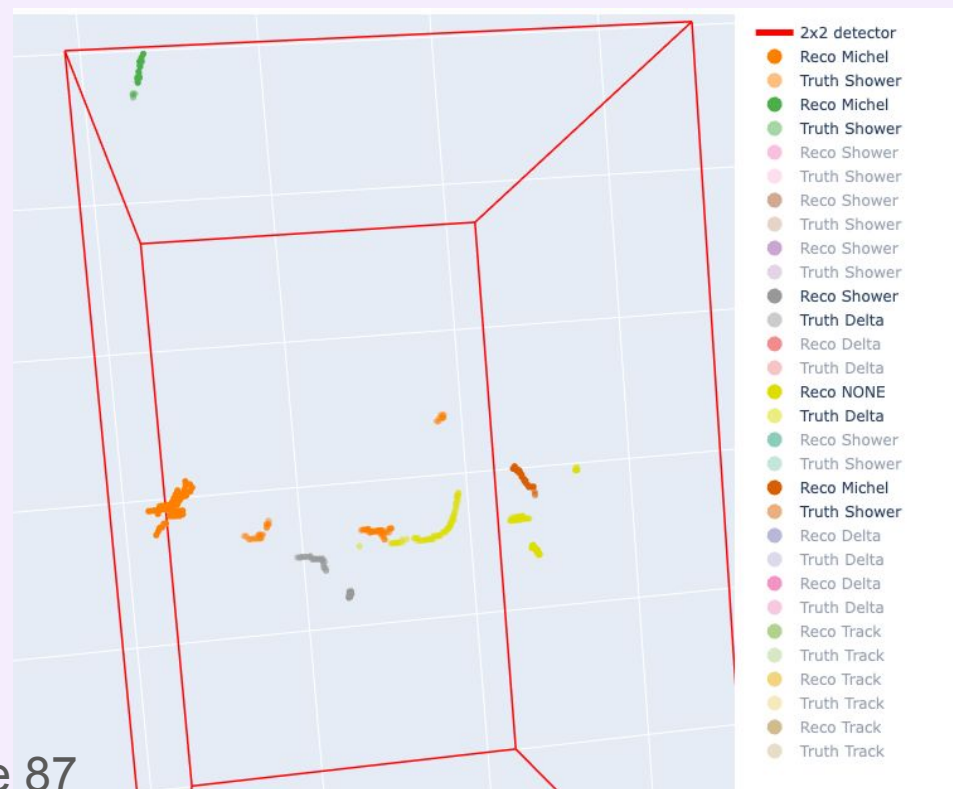
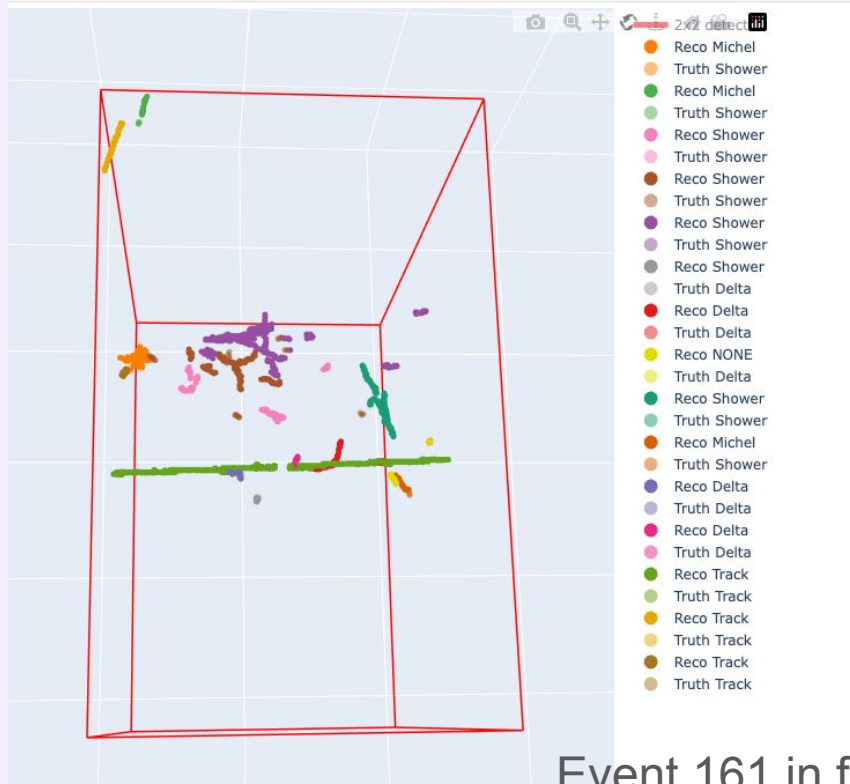
No Reco Shape

- Not a good match to truth either



Complex Event

- 4 wrong shapes & 1 None shape



A sampling from file 87

- Total: 171 spills with 607 particle clusters (between true or reco)
- 27 reco_shapes are mismatched from their nearest IOU match truth
 - 8 missed true tracks
 - 3 false reco tracks
- 45 reco_shapes are NONE
 - 6 NONE have > 10 voxels
 - 6 NONE are matched to true particles (same events as > 10 voxels)
 - 3 NONE are match to true tracks