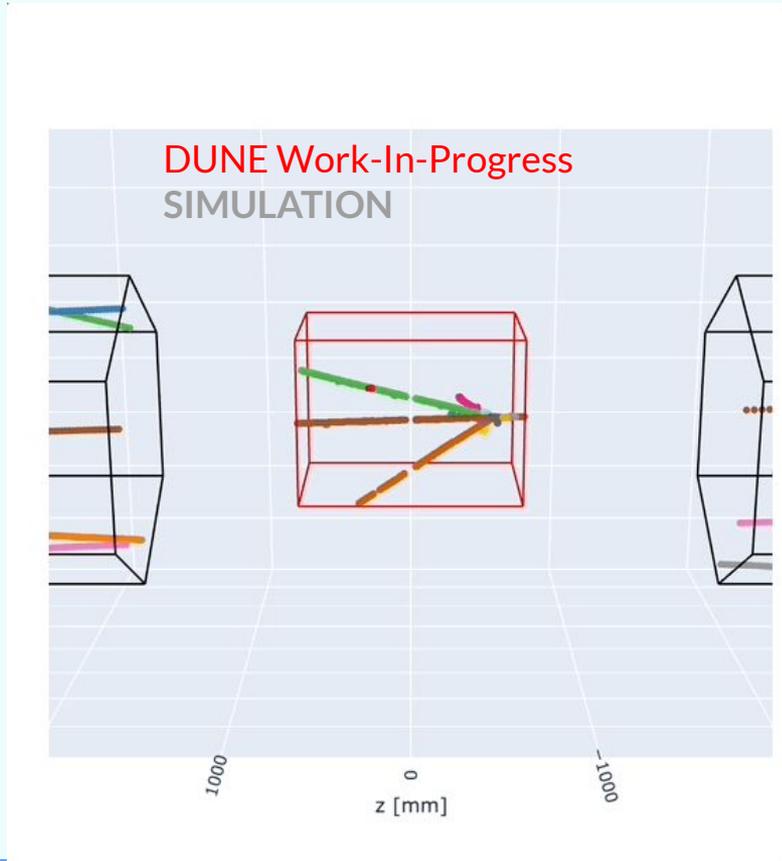


# Track Matching Across Detectors: Using GNNs to Match Particles across Mx2 and 2x2

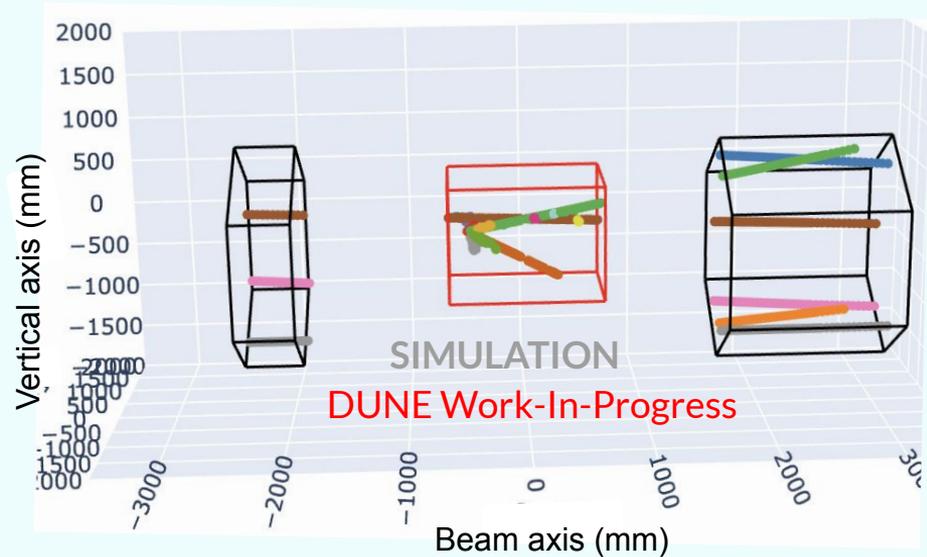
Jessie Micallef (they), Daniel Xing  
[jessie.micallef@tufts.edu](mailto:jessie.micallef@tufts.edu)

# Setting up 2x2 True Particles + Mx2 Reco Tracks



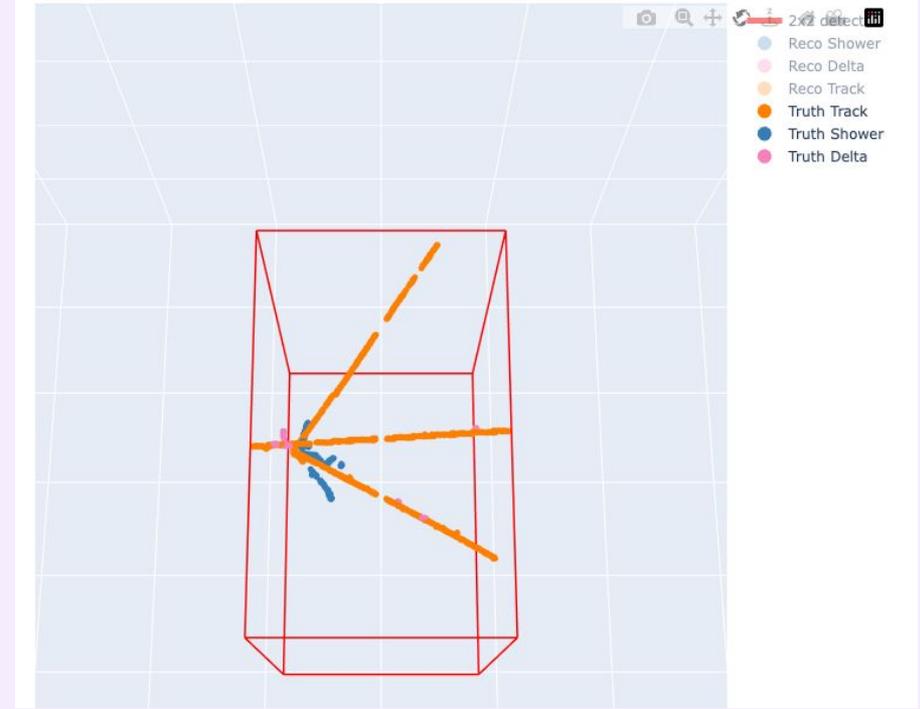
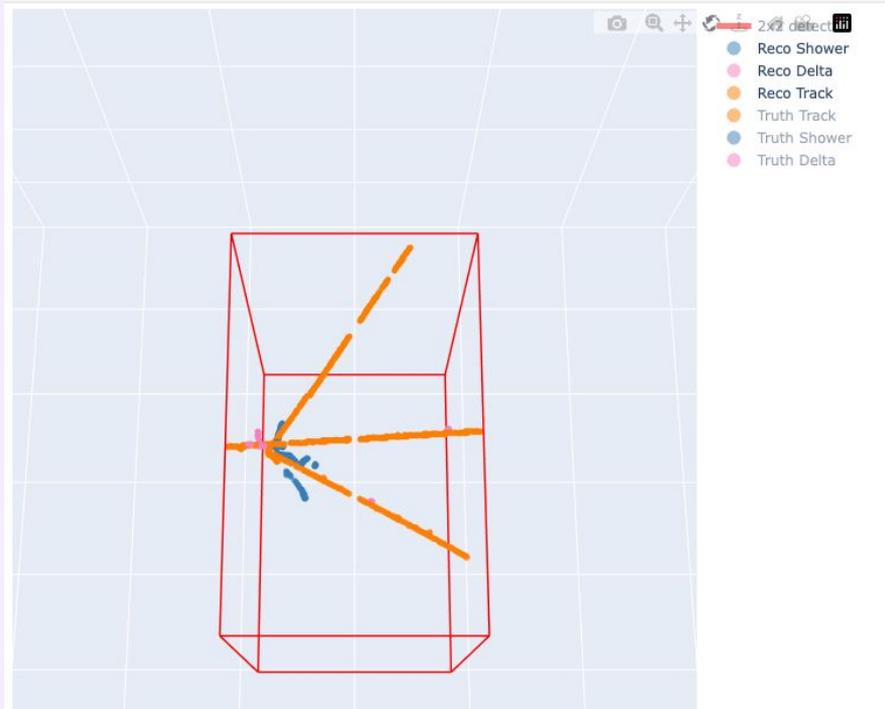
More “match” cases + **more messy**:

- 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 SPINE Objects

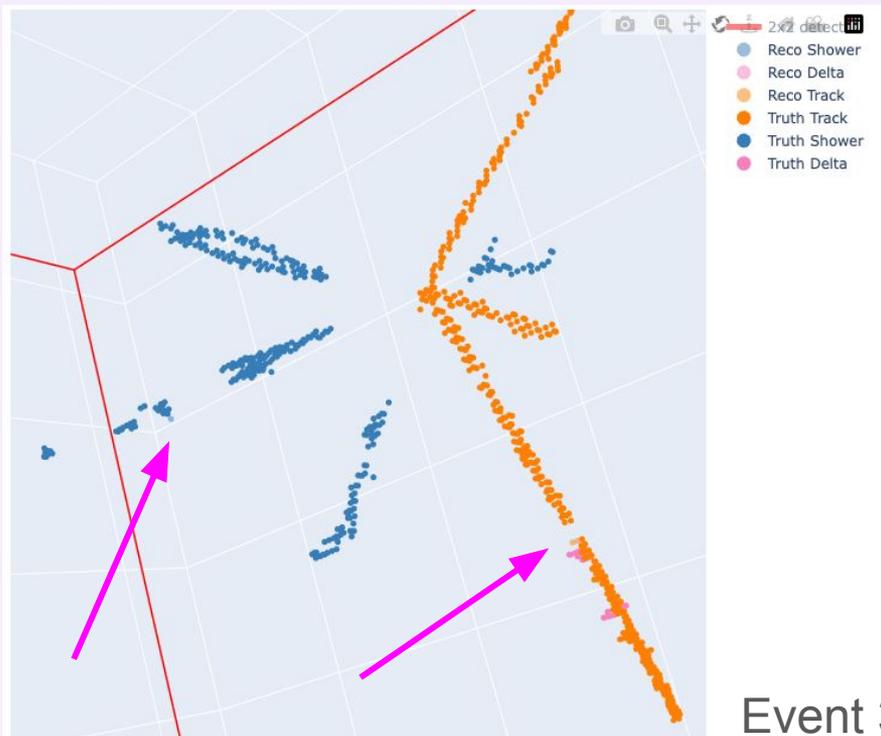
- Reco + True agrees pretty well



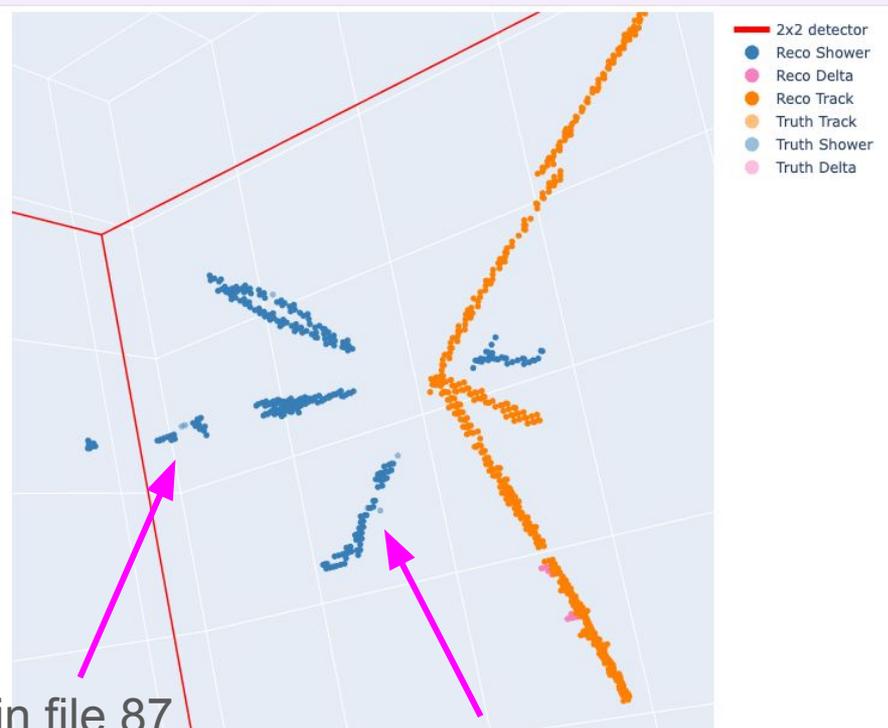
Event 3 in file 87

# Reco SPINE Objects

Reco lighter → some extra



Truth lighter → some missed



Event 3 in file 87

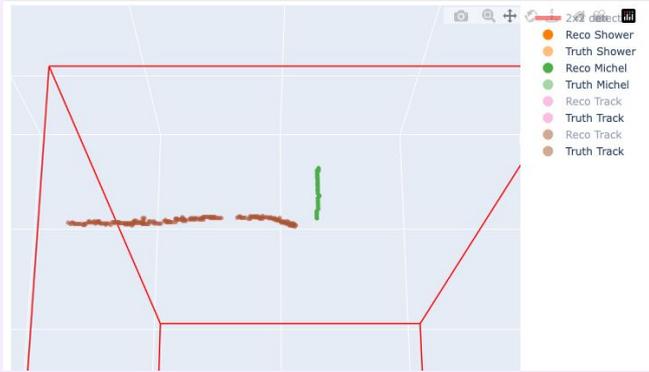
# Reco misses some voxels

- Removed orange truth

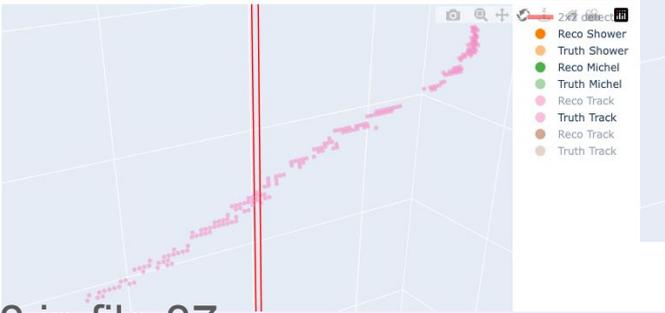
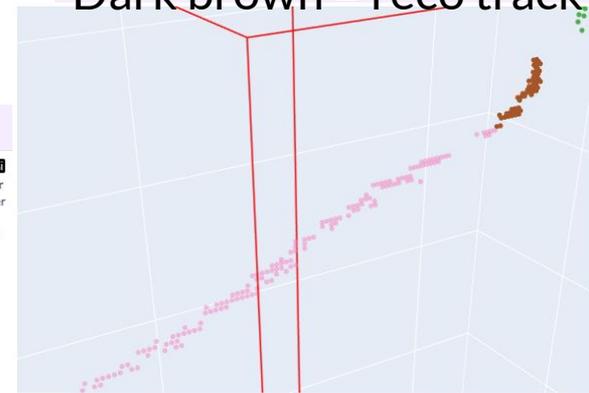


# Double Truth Track?

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



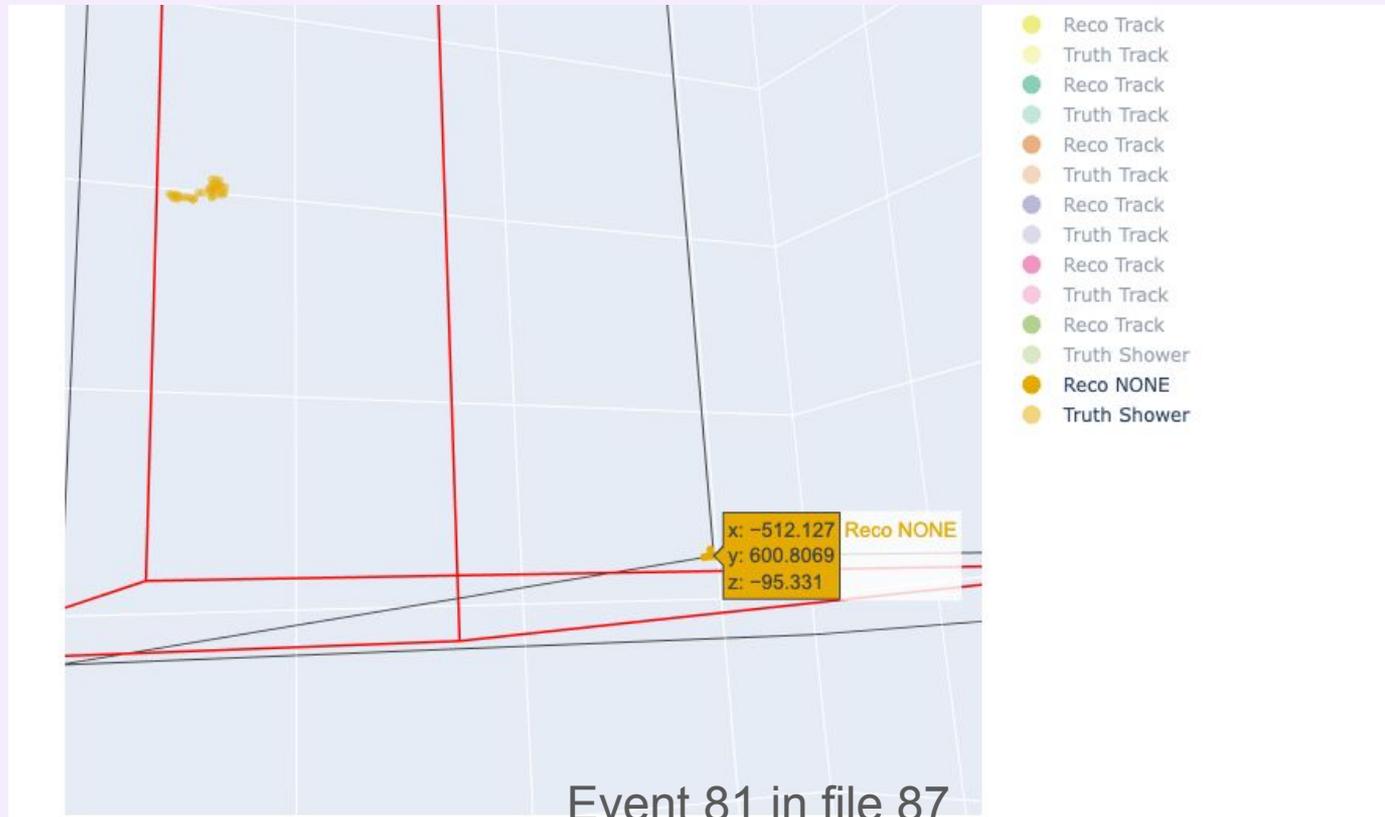
Dark brown = reco track



Event 168 in file 87

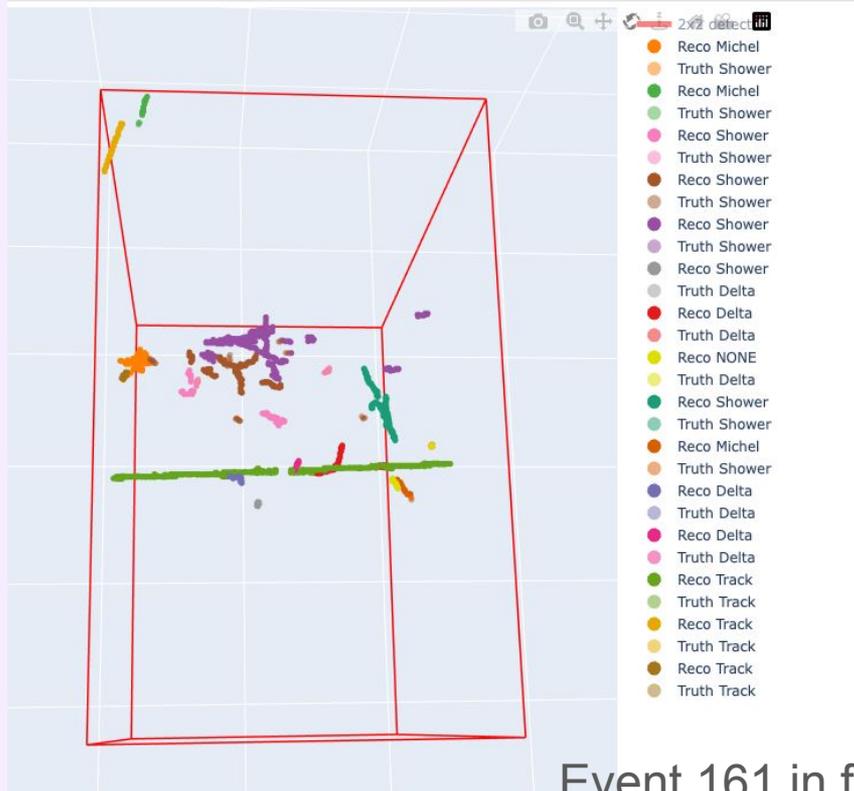
# No Reco Shape

- Not a good match to truth either

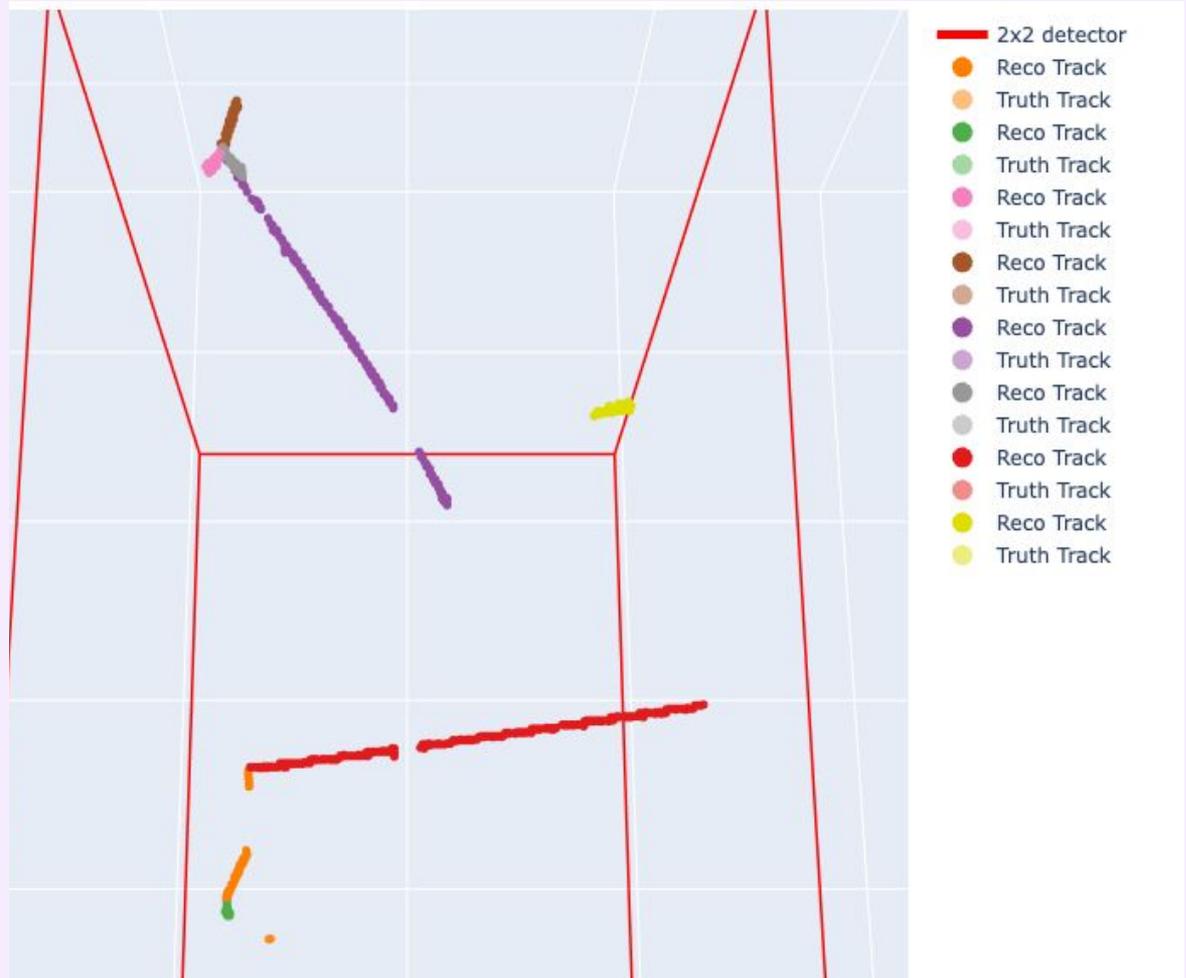


# Complex Event

- 4 wrong shapes & 1 None shape



# Reco == Track



Event 33 in file 87

# 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

# Backup