SEARCHING FOR SHOWERS

MILO VERMEULEN — 7-3-2019

BACKGROUND

- Good shower reconstruction necessary for π⁰ reconstruction
- Pandora currently the standard
- This presentation: π⁰ shower accuracy in 10kt and ProtoDUNE models from analyst's perspective
- Preliminary π⁰ reconstruction

VERY FIRST LOOK

- Simply compare
 MC photon and
 reco shower
 - Record distance, relative angle



1 GeV π^0 in DUNE

VERY FIRST LOOK

- Did not go very well
- Shower matching looked to be more or less random



A CLOSER LOOK

- Pandora
 considered all
 particles outside
 beam window as
 cosmic
- Also removed
 external п⁰s



1 GeV π^0 in ProtoDUNE



PANDORA SHOWER RECONSTRUCTION SUMMARY — MILO VERMEULEN





CHALLENGE 1: SHOWER MATCHING

- Match MC photons to nearest reco showers
 - These are often the same shower!
- Challenge: find algorithm to match unique showers



CHALLENGE 2: NEAREST POINT FINDING

Find shortest distance between back-tracked matched showers to judge quality of reconstruction

Reconstructed π⁰

Shower 1

Shower 2

Smaller closest distance points to a better π⁰ determination



10000 DUNE events



10000 DUNE events







INVARIANT MASS FROM PHOTONS







FUTURE PLANS

Find unique showers for each photon

- Develop shower matching algorithm
 - Only use reco information
 - Distinguish photon showers from electron shower

Test other reconstruction algorithms