



Looking at Pandora and Hitpdune Performance with EM CNN Score

Ben Jargowsky
University of California, Irvine

Our Goal

- Last meeting, Francesca looked at CNN shower Tag vs Pandora shower Tag for pions
- I'm following up on this comparing pandora and hitpdune EM CNN score
- Doing this we can see the CNN score of hits, versus which hits are reconstructed as part of a shower

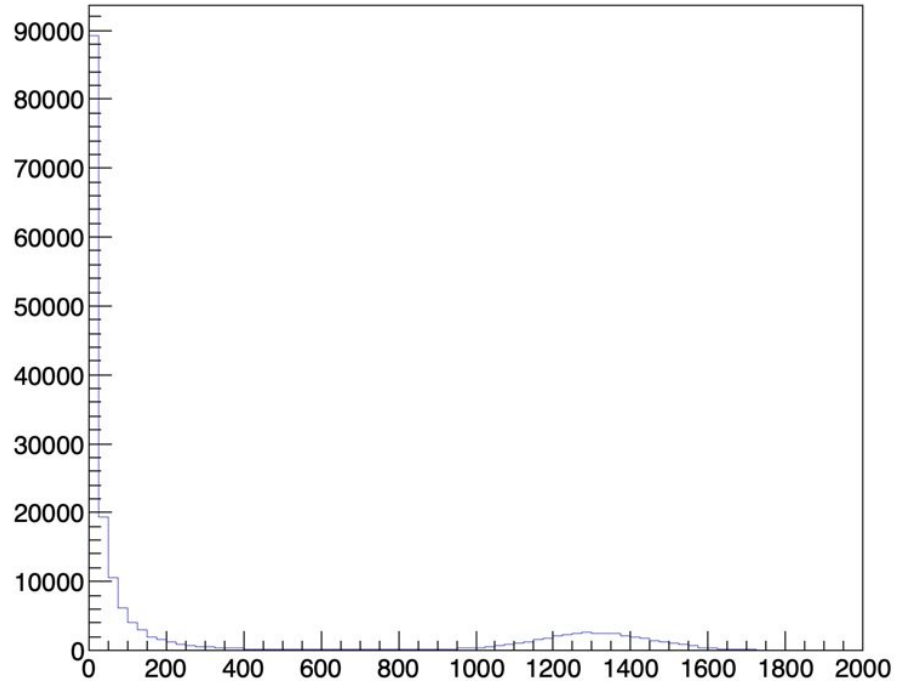
The Setup

- I simulated 50k single electron events (with SCE)
- Loop through all events, and look at all hits both with hitpdune, then using Pandora shower reco
- Next, get EM CNN Score for hits (both Pandora and hitpdune)

Select Complete Showers

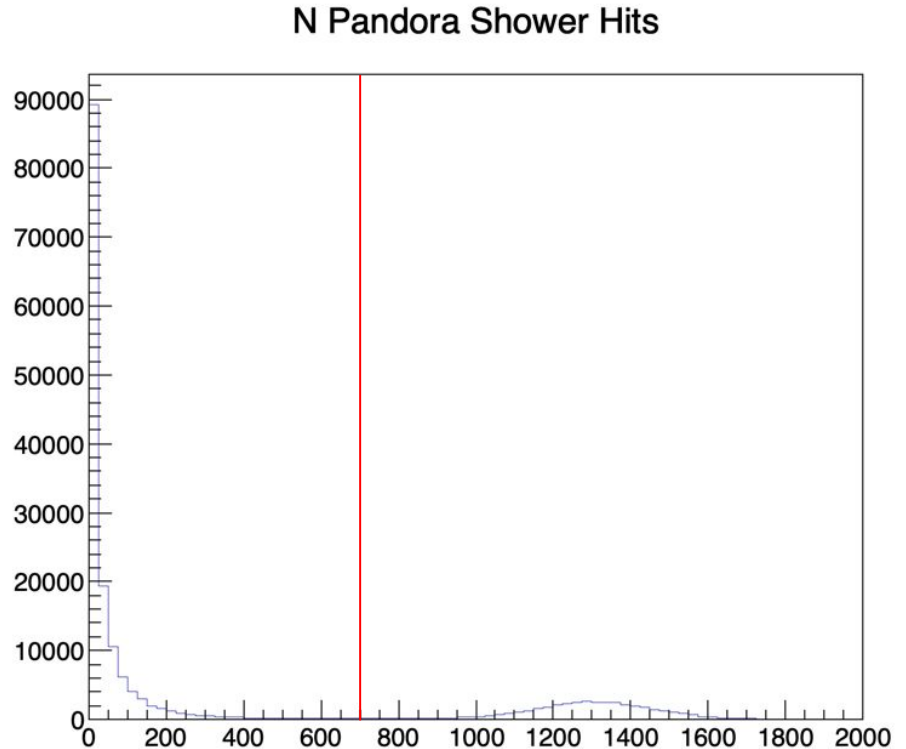
- We see many Pandora showers that have very few hits, which must be incomplete

N Pandora Shower Hits



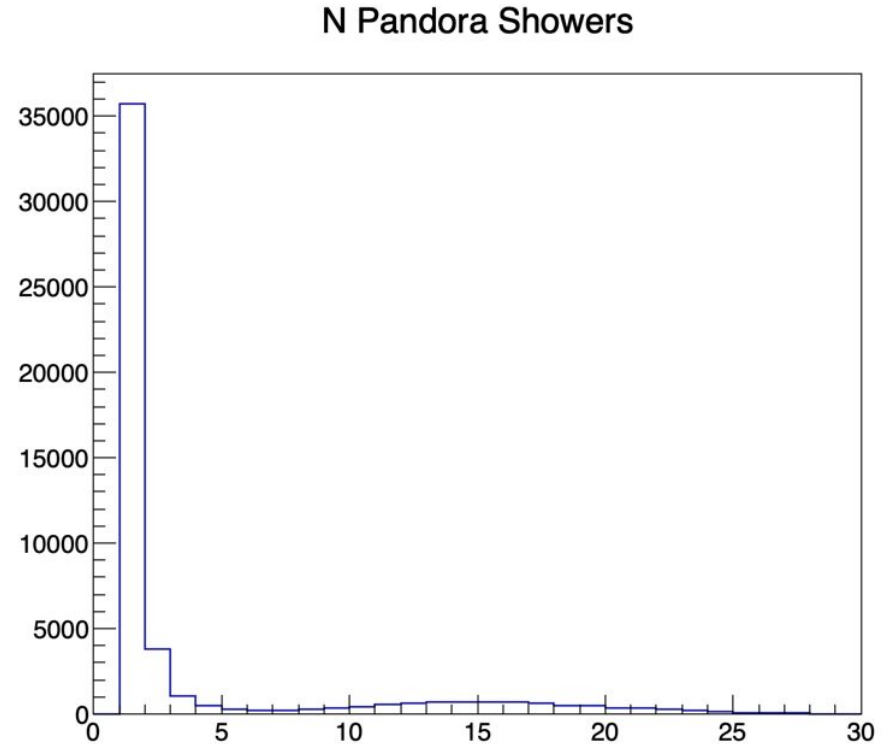
Select Complete Showers

- We see many Pandora showers that have very few hits, which must be incomplete
- So we make a cut at 700 to remove incomplete showers



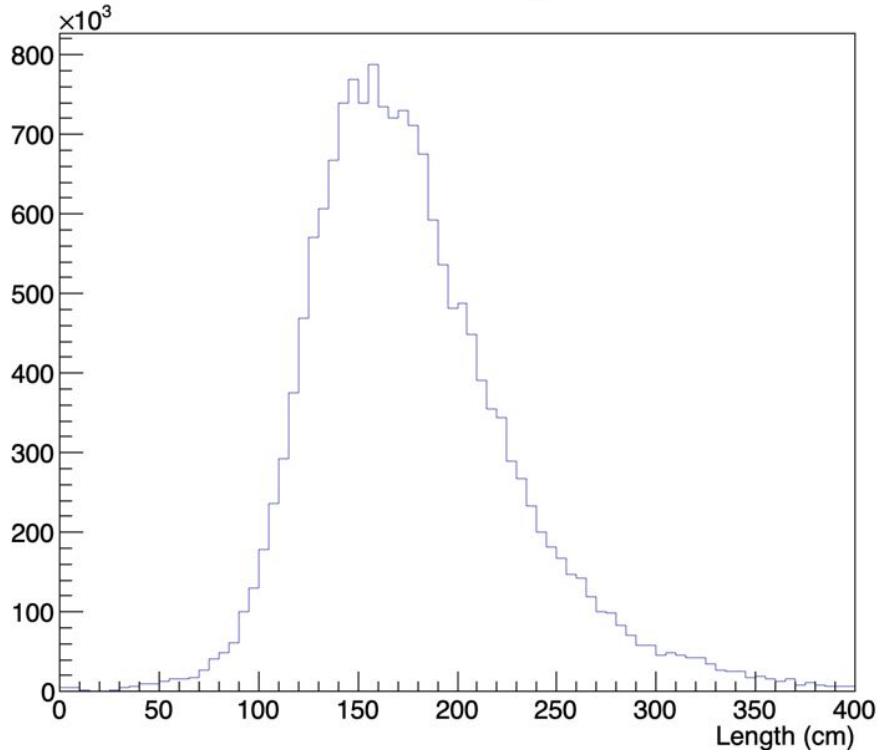
Pandora Multiple Showers

- For events with multiple reconstructed showers, we choose the shower with the leading start position



Looking at (Cleaned Up) Shower Length

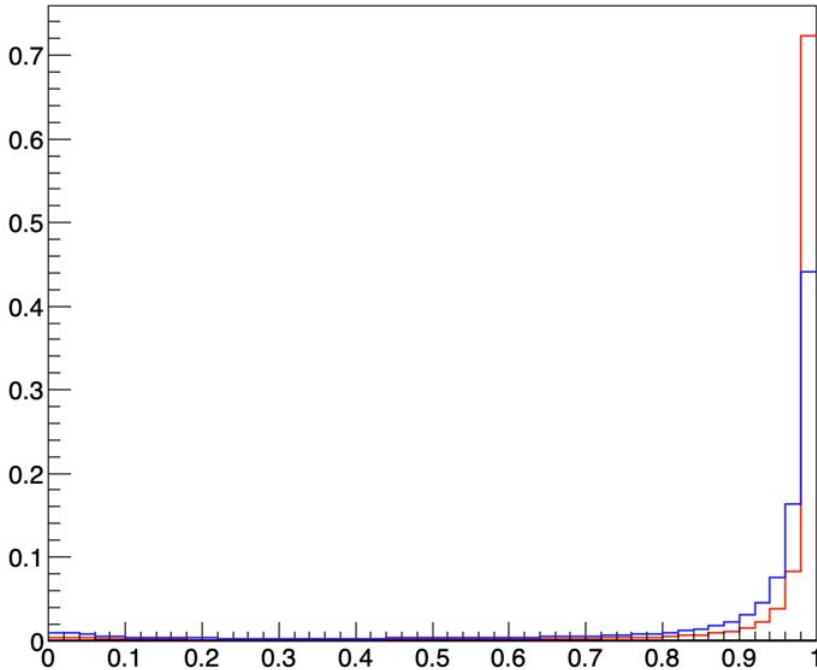
Shower Length



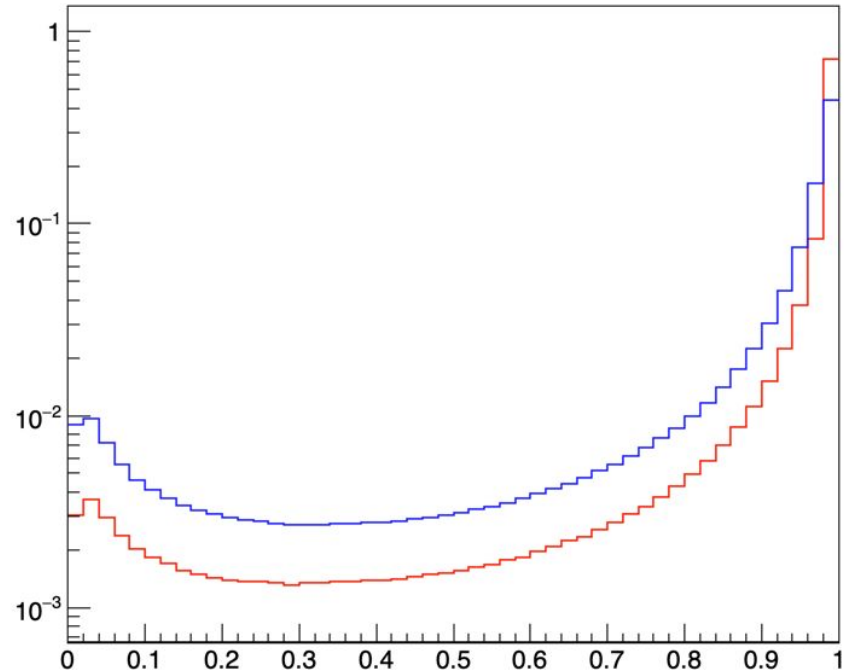
- We now have a length distribution with no sharp peak at 0

Resulting EM CNN Score

EM Score



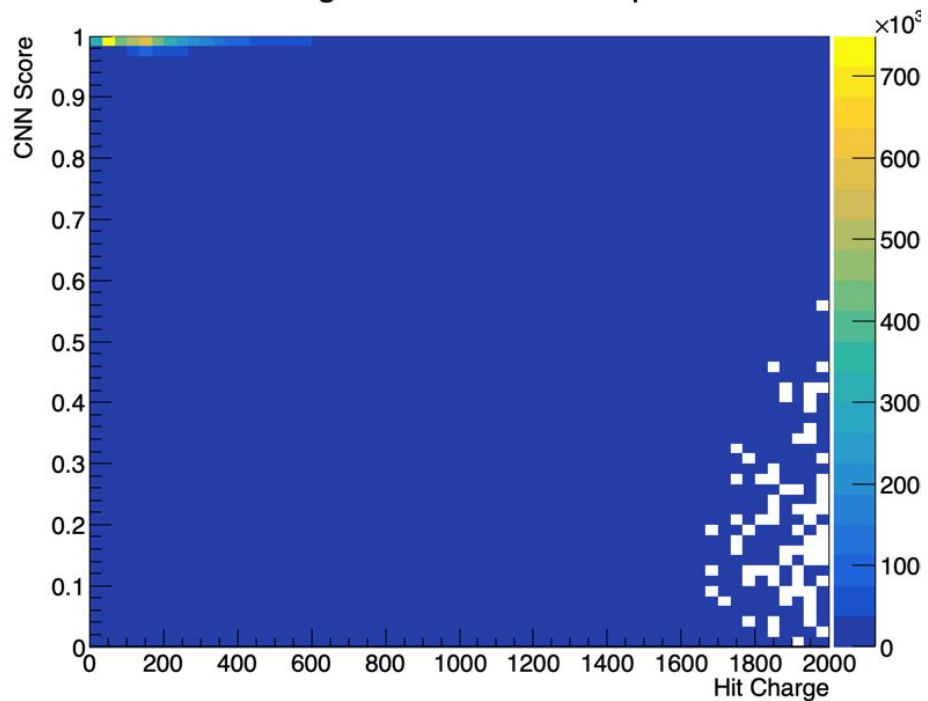
EM Score



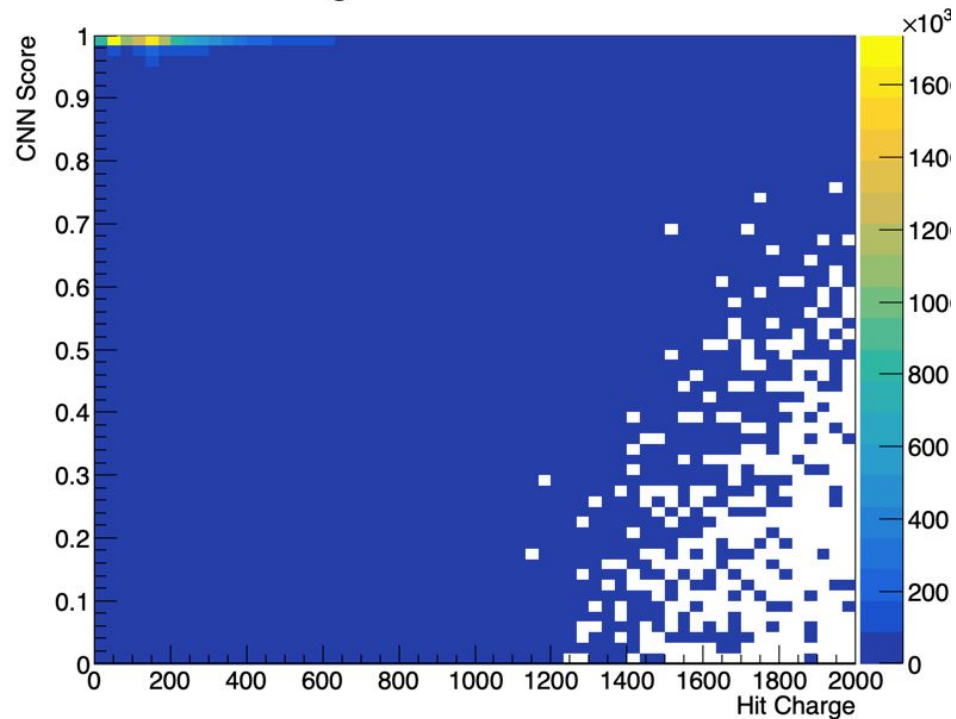
- Red is Pandora, blue is hitpdune

Hit Charge vs EM Score

Hit Charge vs CNN Score hitpdune

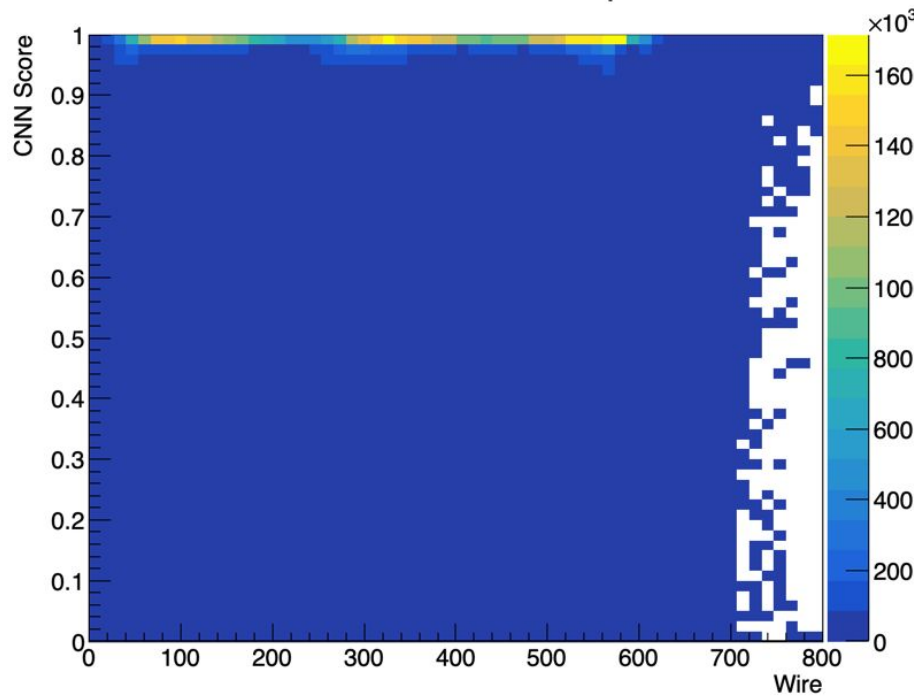


Hit Charge vs CNN Score Pandora

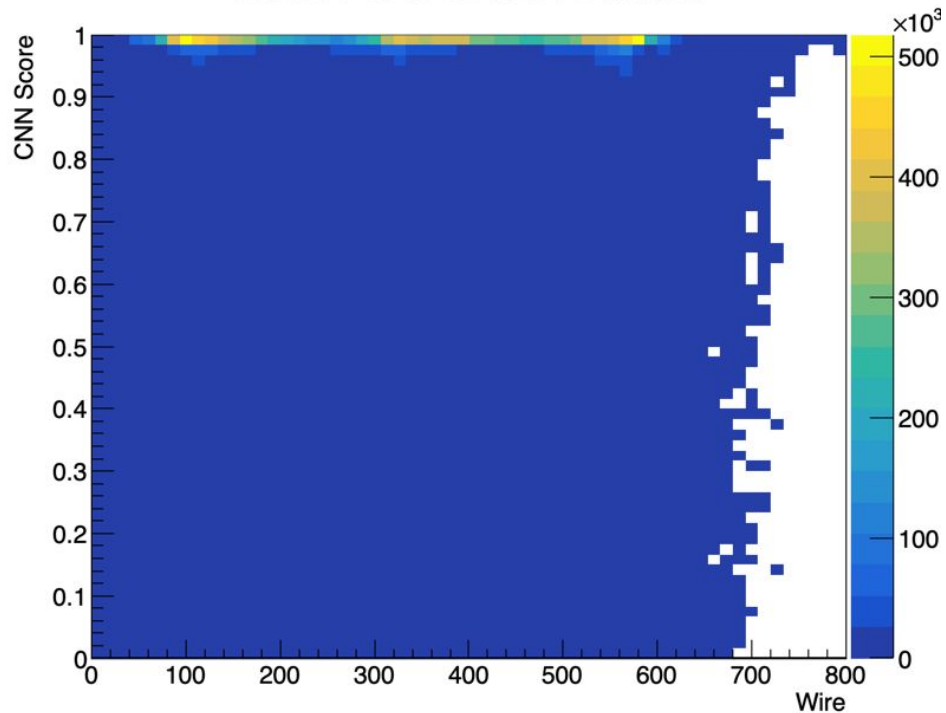


Hit Wire vs EM Score

Hit Wire vs CNN Score hitpdune



Hit Wire vs CNN Score Pandora

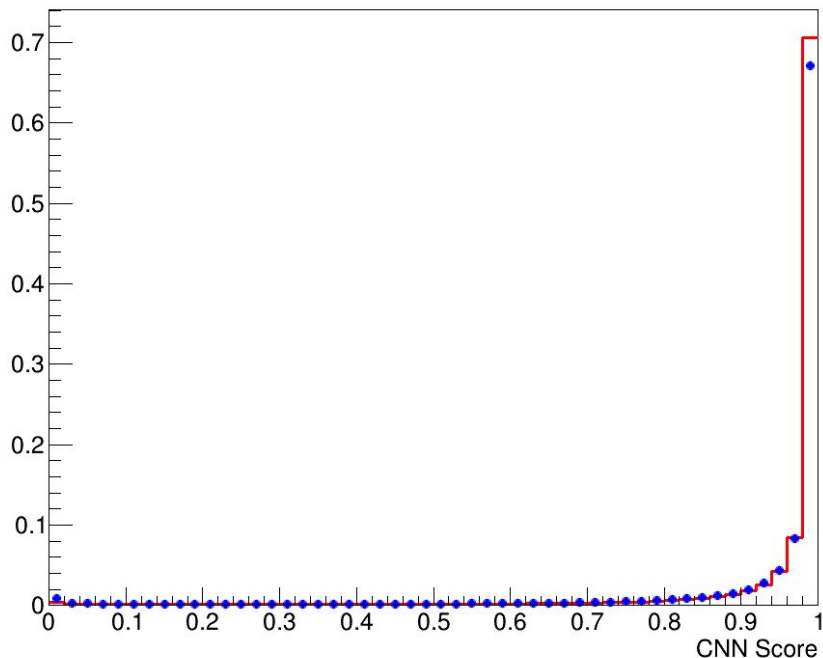


Additional Checks

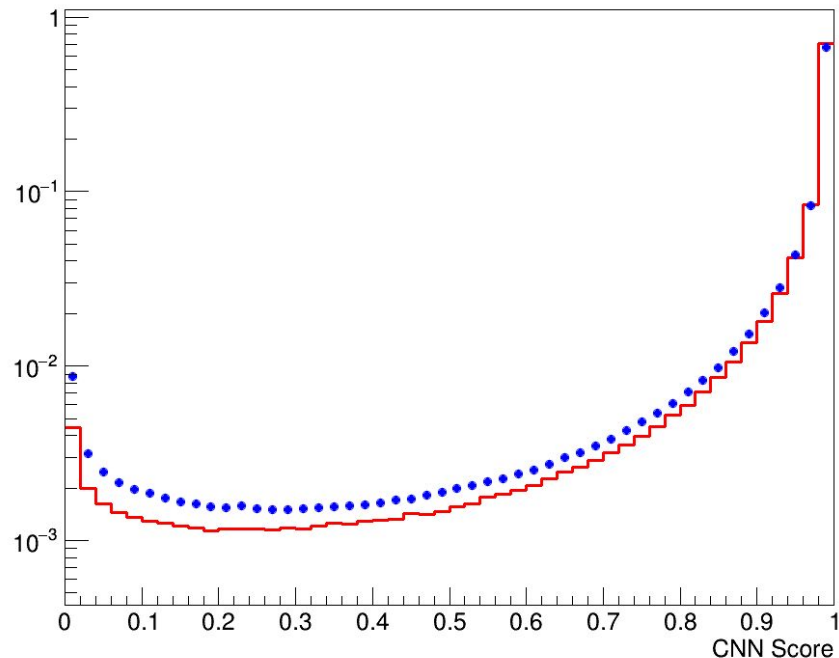
- We see that after the cuts, we have good performance for Pandora and also Hitpdune on EM CNN score for the single electron sample
- Next we check how data and MC agree for the CNN score
- We look at 1 GeV data (run 5809) and 1 GeV MC (SAM definition “PDSPProd2_MC_1GeV_reco_sce_datadriven”)
- We check for electrons, reconstructed beam momentum, and complete showers

EM CNN Score for Data and MC

CNN Score



CNN Score



- Red is MC, blue is data
- We see very good agreement between the two

Conclusions

- Hitpdune and Pandora perform comparably with the EM CNN score on an electron sample
- Data and MC hits have good EM CNN score agreement

Thanks Aaron

The End