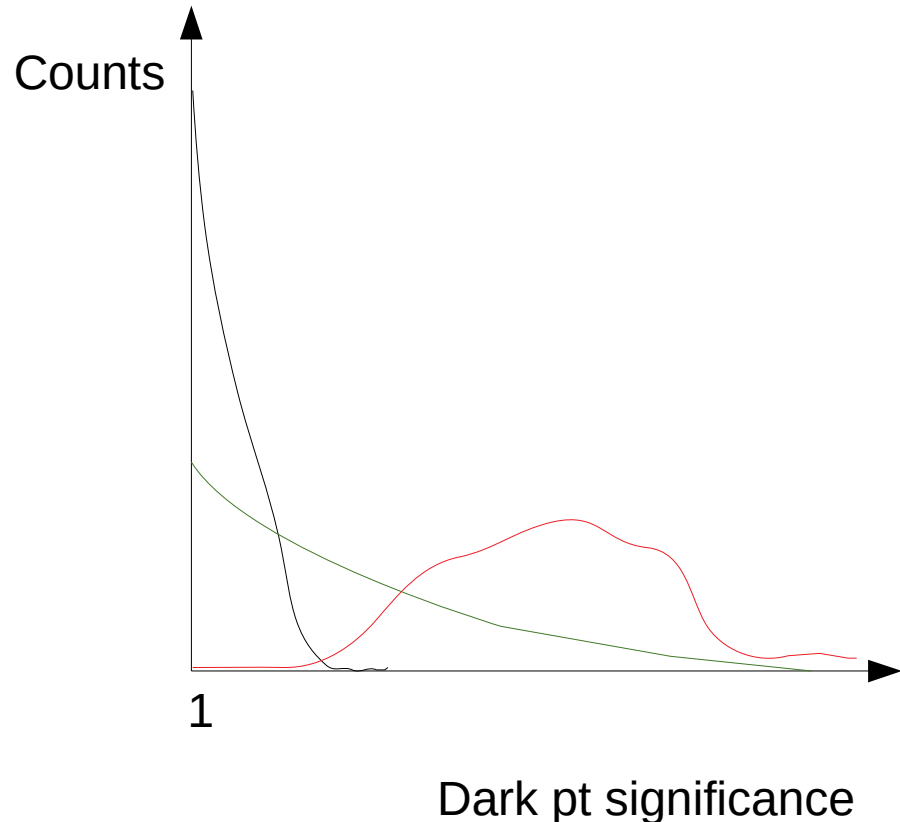


# “Dark pt significance” proposal

- Our second most useful variable currently used by the BDT is MET significance =  $L(\text{MET} = \text{measured MET}) / L(\text{MET} = 0)$  (when it's not bugged)
- IFCA have been using a variable called “Dark pt”, which is the pt which must be attributed to DM required to make the (Betchart) kinematic reconstruction work if it doesn't work
- Idea is to have a variable that gives a significance that this dark pt is due to Dm rather than mismeasurement, i.e.  
 $L(\text{MET} = \text{measured MET}) / L(\text{MET} = \text{MET} - \text{dark pt})$

- Would hope to see a plot like that on the right-  $t\bar{t}$  events (black) all very close to 1 since reco should either work for the measured MET or a value quite close to it, other backgrounds (green) more gently falling, and signal (red) peaked at a higher value of dark pt significance (since there actually is some dark pt)



# Additional possible benefits

- Gives a method to perform reconstruction for cases that would otherwise fail, allowing extended use of variables like  $c_{\text{hel}}$  which require this (though would need to check if these variable remain well-behaved in this case)
- Could choose a dark pt with the highest likelihood, rather than just smallest pt, which may give a small improvement to the dark pt
- Could potentially include terms accounting for errors in the other objects in the reconstruction

# Potential Problems

- Need to calculate likelihood function for MET- need the errors on  $p_t$  and  $\phi$  for all the jets- these can be obtained for miniAOD, but can they be obtained for NanoAOD?
- Will this likelihood behave similarly for data and MC after JERS, or will further corrections be necessary?
- Betchart kin reco still needs updating to be faster than basic python
- May take some time to work out the technical details
- The variable name needs work