Sigma anti-sigma

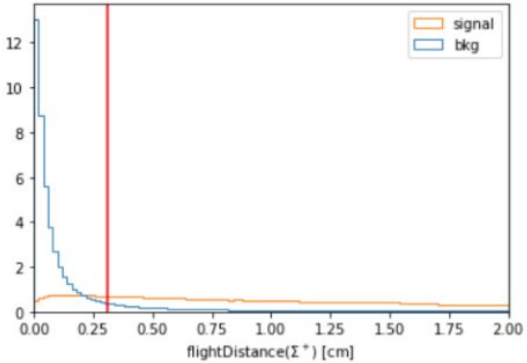
Anil Panta

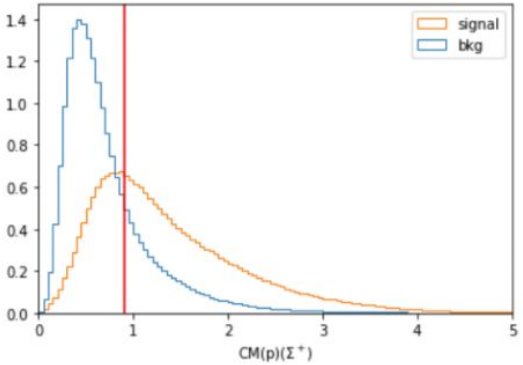
A_{CP}

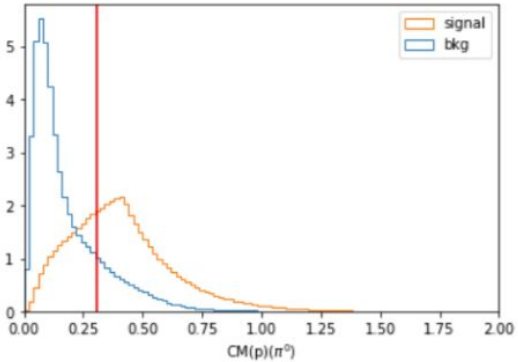
- $A_{CP}^{raw} = \frac{N(\Xi_c) - N(\bar{\Xi}_c)}{N(\Xi_c) + N(\bar{\Xi}_c)}$
- $A_{CP} = A_{CP}^{raw}$ - $A_P^{\Xi_c}$ - A_D

  $A_P^{\Xi_c} = \Xi_c$ production asymmetry
  $A_D =$ Detection asymmetry (Σ)
- $A_D^{\Sigma} = \frac{\epsilon^{\Sigma} - \epsilon^{\bar{\Sigma}}}{\epsilon^{\Sigma} + \epsilon^{\bar{\Sigma}}}$
- $\epsilon = \frac{\#\,\text{Reconstructed}}{\#\,\text{Generated}}$
- Can't get generated info from Data.
- $A_D^{\Sigma} = \frac{N(\Sigma) - N(\bar{\Sigma})}{N(\Sigma) + N(\bar{\Sigma})}$

variables of interest (Normalized) (optimized)



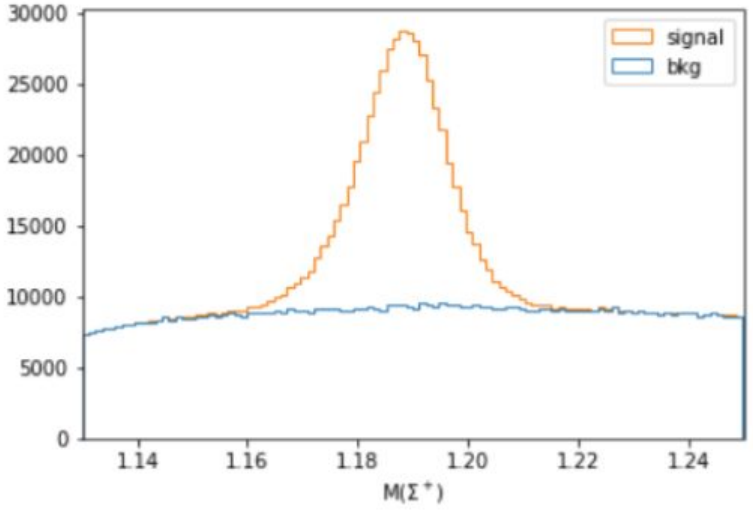


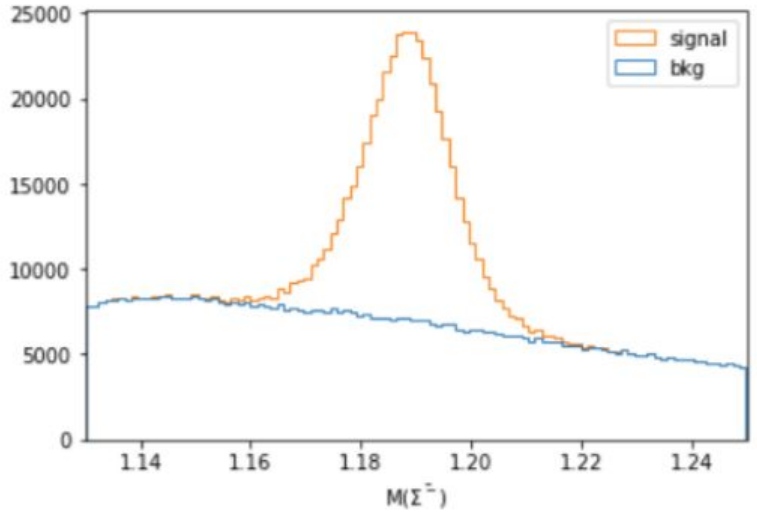


$\text{flightDistance} > 0.31$ cm
$\text{CM(p)}\ (\Sigma) > 0.91$ GeV/c
$\text{CM(p)}\ (\pi^0) > 0.31$ GeV/c

protonID > 0.9
clsuterE9E21 > 0.9

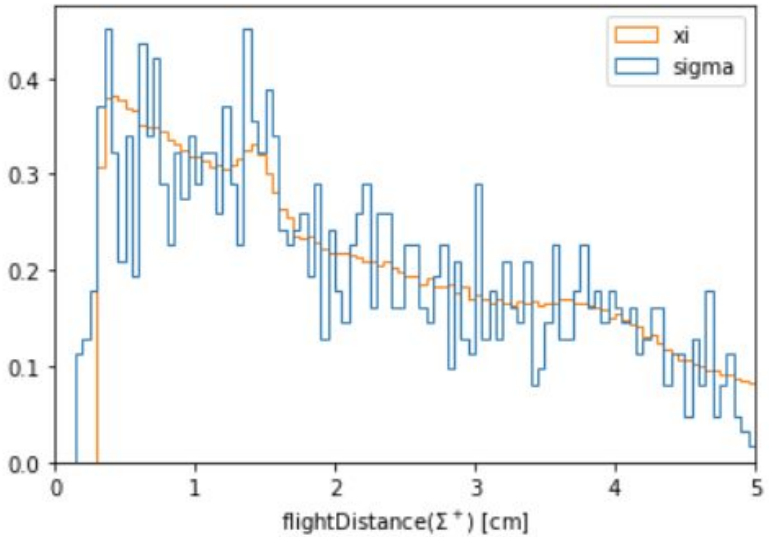
After optimization: 100 /fb MC14ri_a

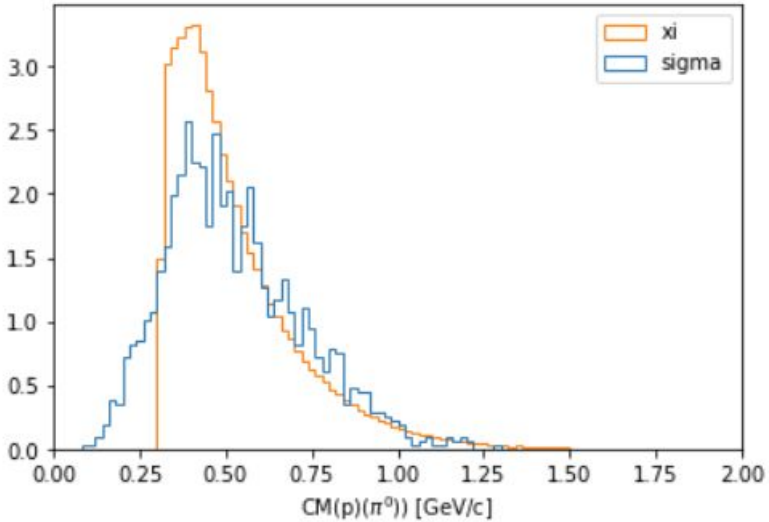




Σ^+ Square cuts vs Ξ_c^+ MVA

Only Signal





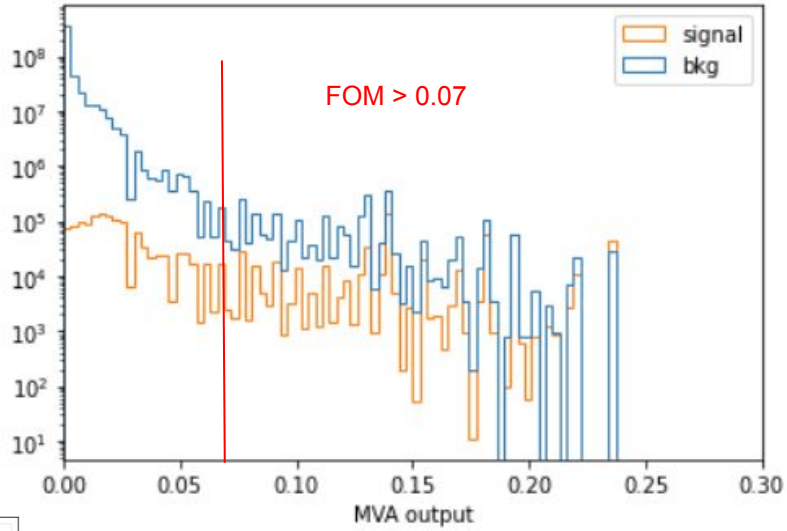
Xi : After MVA cut

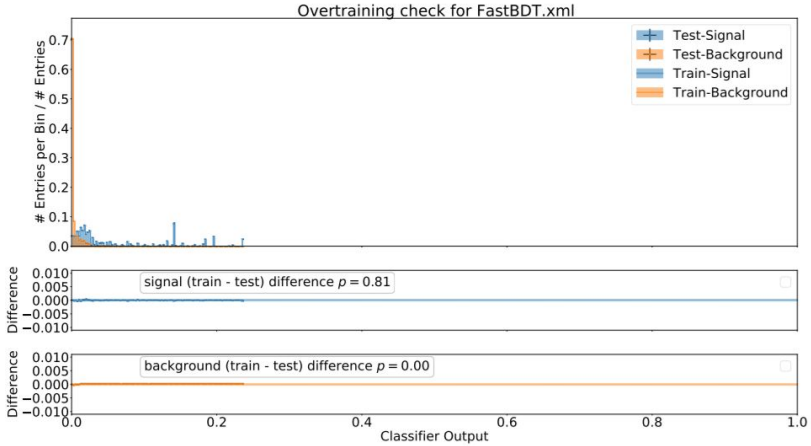
FastBDT

- Train on variables that was used in main analysis ( )
  - clusterE9E21
  - CM(π^0)
  - flightDistance (Σ^+)
- Train dataset : 100 /fb MC14
- Test dataset: 100 /fb MC14

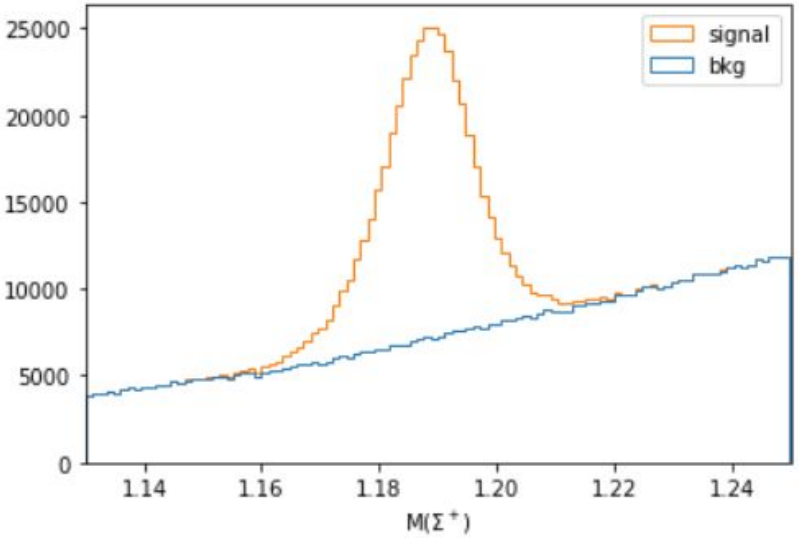
MVA output

- Not Big separation.
- Low signal to train on.
- Next Step:
  - **Add signal MC to train sample.**

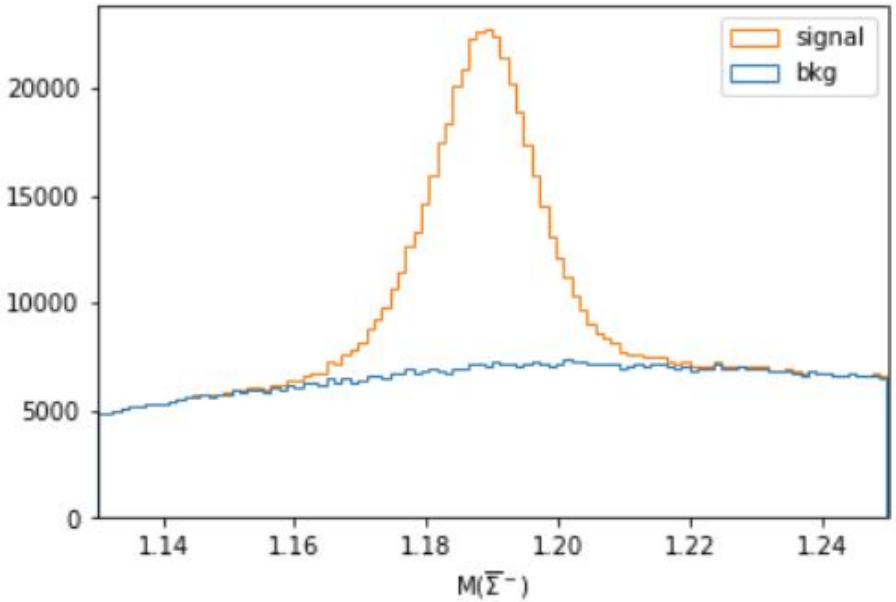




After MVA : > 0.07



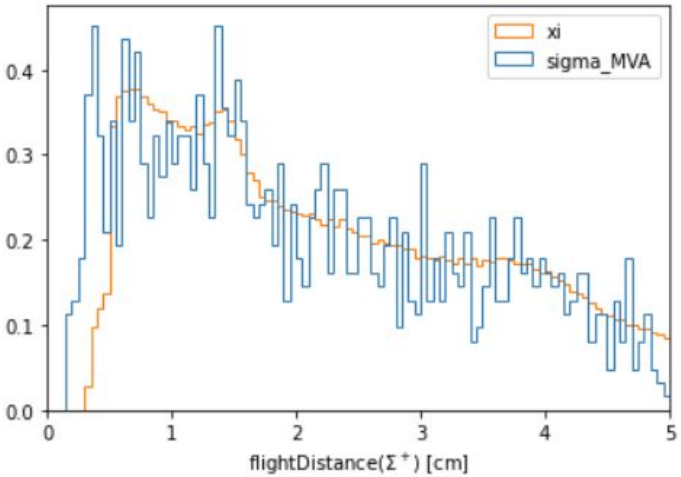
#sig = 293849

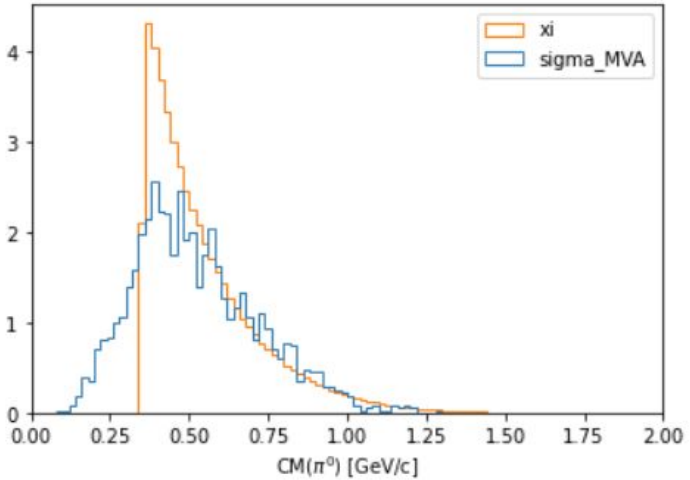


#sig = 262025

Σ^+ MVA vs Ξ_c^+ MVA

Only signal

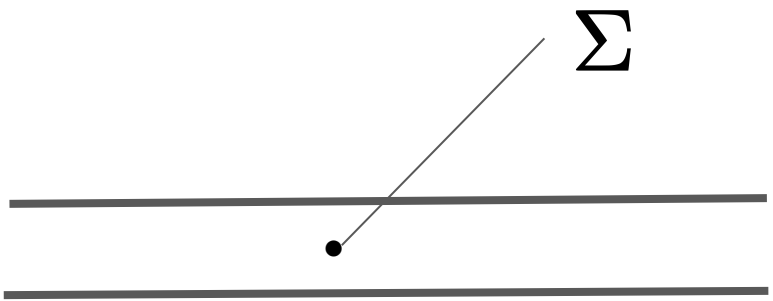




Next step:

- Add signal MC to training in MVA.
- -> Improve MVA.
- Look at variables distribution between Ξ_c^+ and Σ^+

Sketch:



- Interaction to Beam pipe is present in Xi.
- Just taking the asymmetry from Sigma should be fine to subtract from asymmetry in Xi decay.

Beam pipe radius: 0.5 cm