

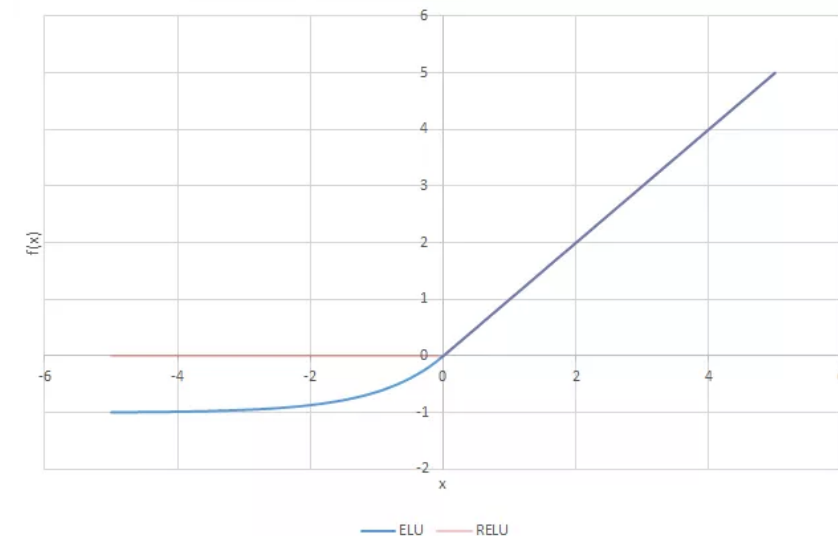
NEW BNN -JB

# Data set

- 0.6 M events
- 35 tracks on average in ALICE acceptance
- 70% prompt events generate by HIJING
- B decays by EvtGen
- Only  $e^+ e^-$  final state
- Dst produced by Himanshu (see slides for cut descriptions)

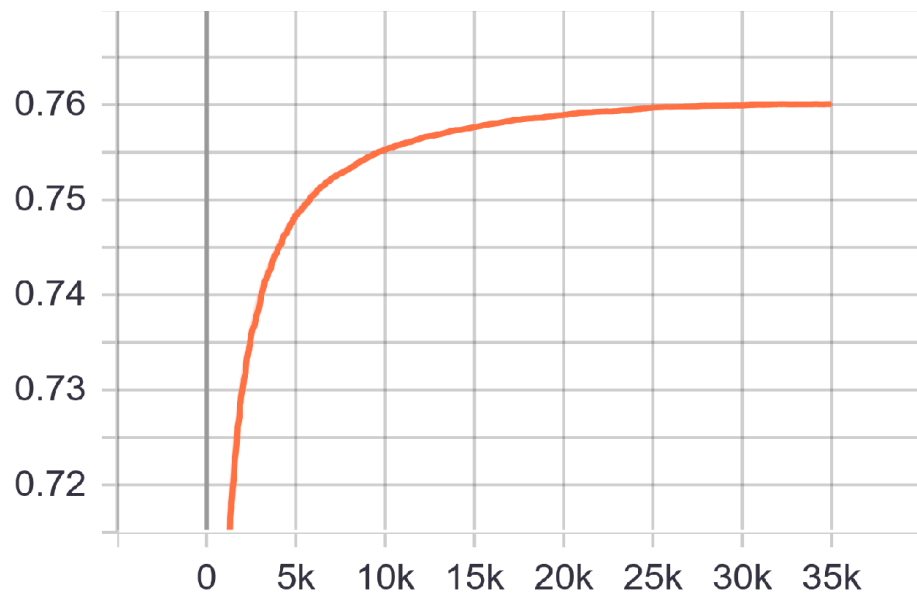
# The Network

- TensorFlow 1.15
- NumPy for data storage
- 50/50 Signal background mixing
- Ram consumption + 10 Gb + 8Gb on RTX 2070
- 42 element input vector
- 4 hidden layers
  - 55 neurons
  - 85 neurons (3x)
  - Activation function “Elu[**Exponential Linear Unit**]”

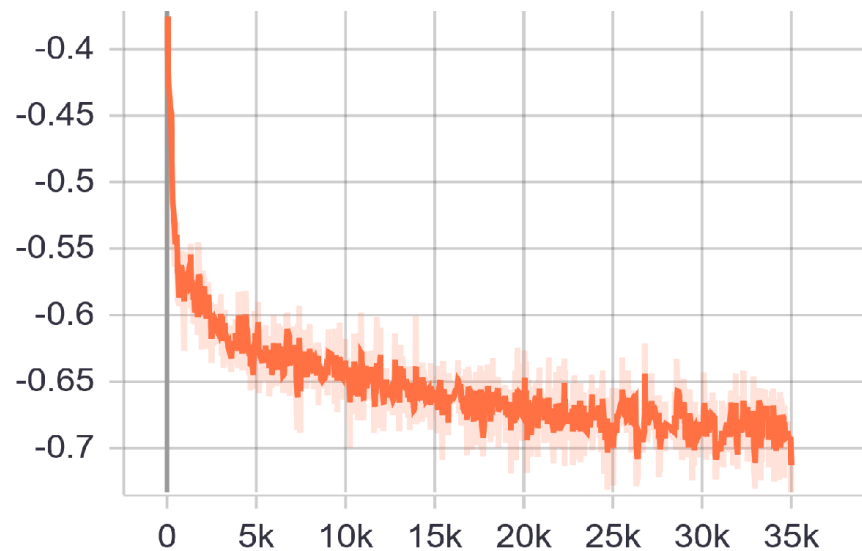


# Training on GPU

- 35 000 training iterations



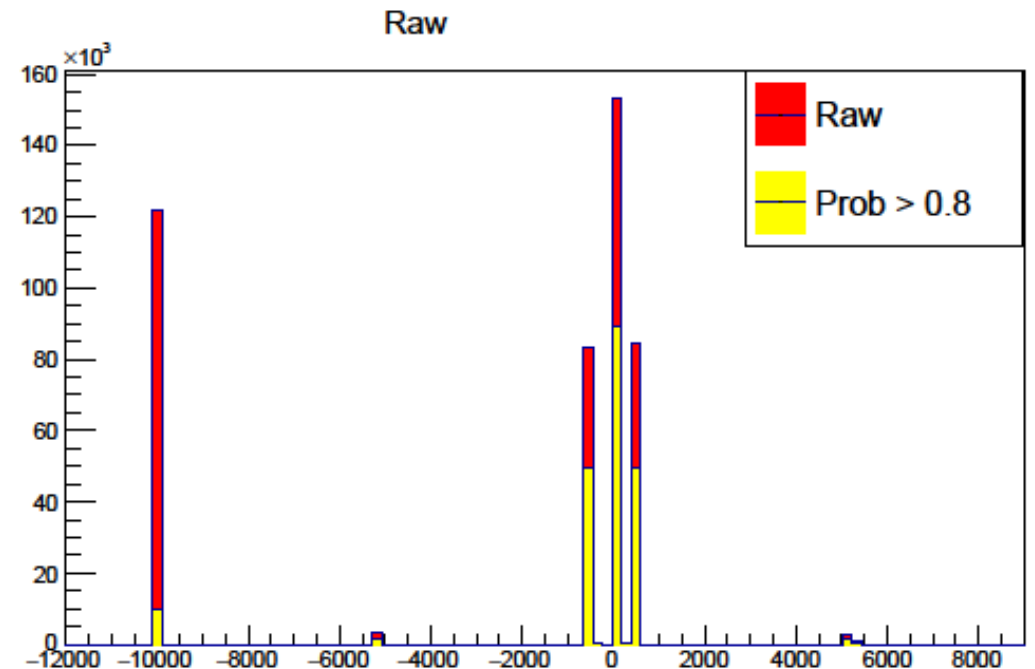
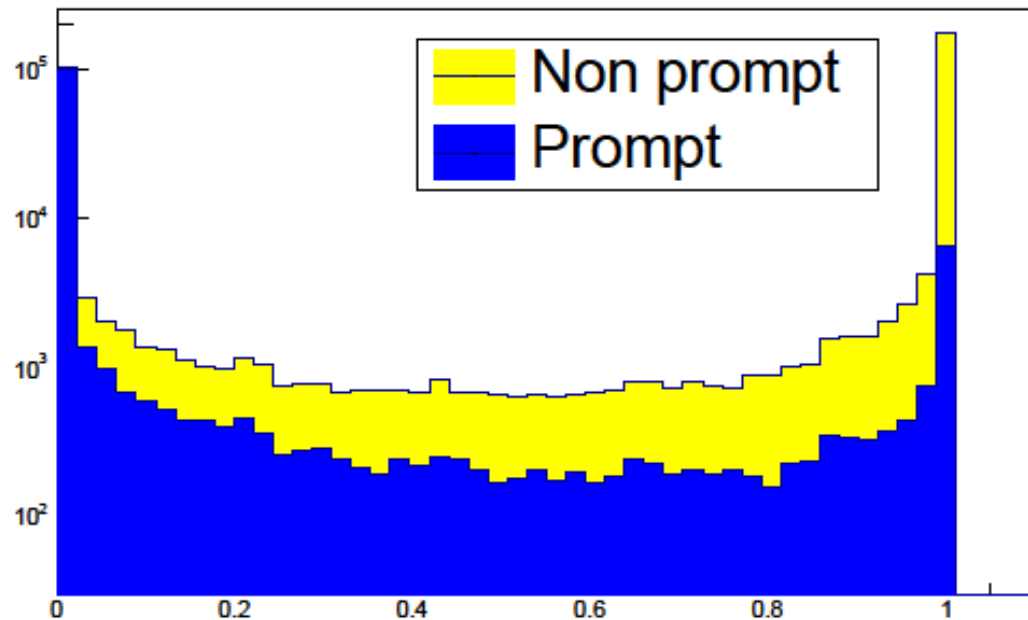
Los function



- More training iterations
- Unstable system (look loss function)

# Results (tested on 27% prompt 73% non prompt mixture)

- 80 % probability cut (Arb.)
- Contamination  $\approx 4.7\%$
- Prompt reduction = 78% (only prompt/only prompt after cut)
- Non Prompt reduction = 42% (only non prompt/ only non prompt after cut)



# Input vector

```
branches = [  
#   'fTrack_fP0',  
#   'fTrack_fP1',  
#   'fTrack_fP2',  
    'fTrack_fTrackParam0',  
    'fTrack_fTrackParam1',  
    'fTrack_fTrackParam2',  
    'fTrack_fTrackParam3',  
    'fTrack_fTrackParam4',  
    'fTrack_fTrackParam5',  
    'fTrack_fDCA0',  
    'fTrack_fDCA1',  
    'fTrack_fTPCDCA0',  
    'fTrack_fTPCDCA1',  
    'fTrack_fTPCCrossedRows',  
    'fTrack_fTOFbeta',  
    'fTrack_fCovMatrix0',  
    'fTrack_fCovMatrix1',  
    'fTrack_fCovMatrix2',  
    'fTrack_fCovMatrix3',  
    'fTrack_fCovMatrix4',  
    'fTrack_fCovMatrix5',  
    'fTrack_fCovMatrix6',  
    'fTrack_fCovMatrix7',  
    'fTrack_fCovMatrix8',  
    'fTrack_fCovMatrix9',  
    'fTrack_fCovMatrix10',  
    'fTrack_fCovMatrix11',  
    'fTrack_fCovMatrix12',  
    'fTrack_fCovMatrix13',  
    'fTrack_fCovMatrix14',  
    'fTrack_fCovMatrix15',  
    'fTrack_fCovMatrix16',  
    'fTrack_fCovMatrix17',  
    'fTrack_fCovMatrix18',  
    'fTrack_fCovMatrix19',  
    'fTrack_fCovMatrix20',  
    'fTrack_fTrackLength',  
    'fTrack_fTOFnSig0',  
    'fTrack_fTOFnSig1',  
    'fTrack_fTOFnSig2',  
    'fTrack_fTOFnSig3',  
    'fTrack_fCharge',  
    'fTrack_fHelixCenter0',  
    'fTrack_fHelixCenter1',  
    'fTrack_fHelixRadius',  
]
```

# Next step`s

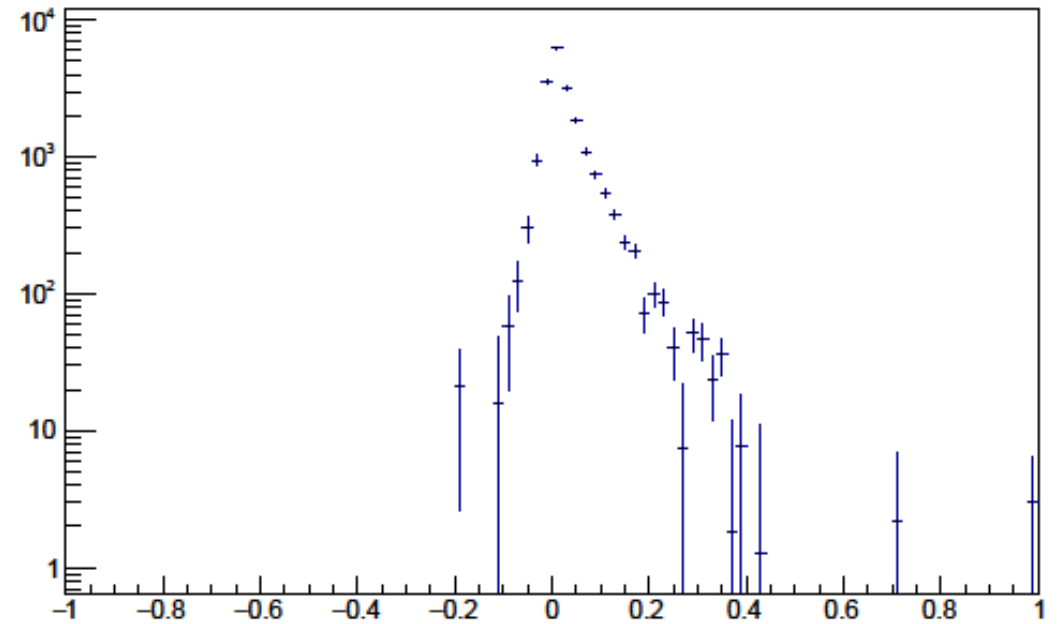
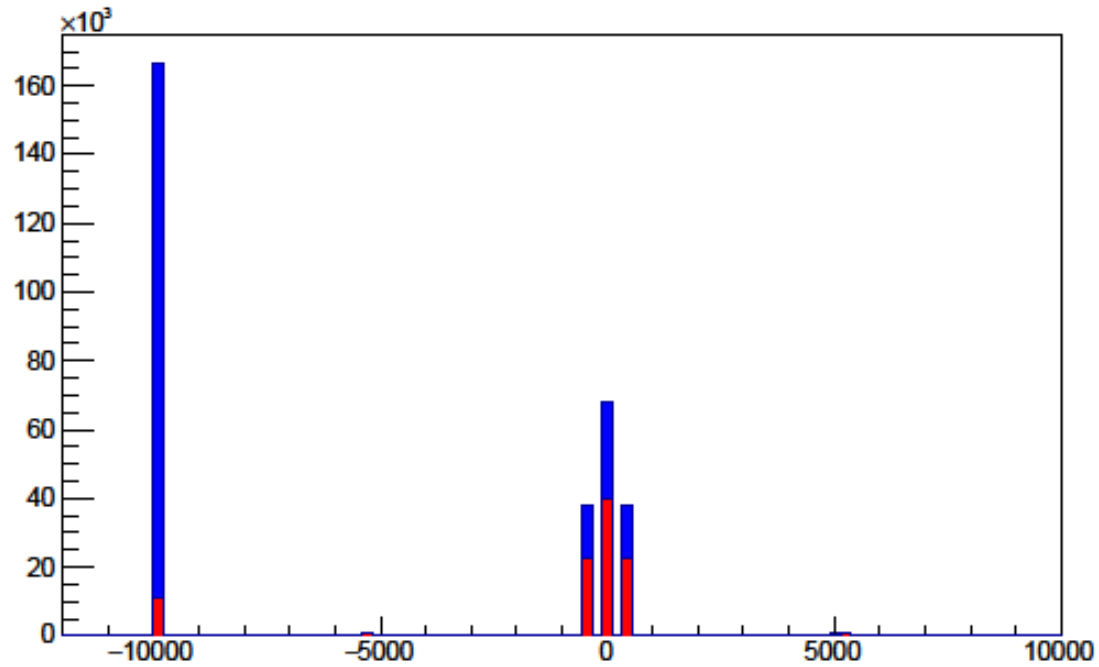
- Do track- candidate matching
- Plot j/psi invmass after track Prob > 0.8
- Apply model on data

# Training model preparation

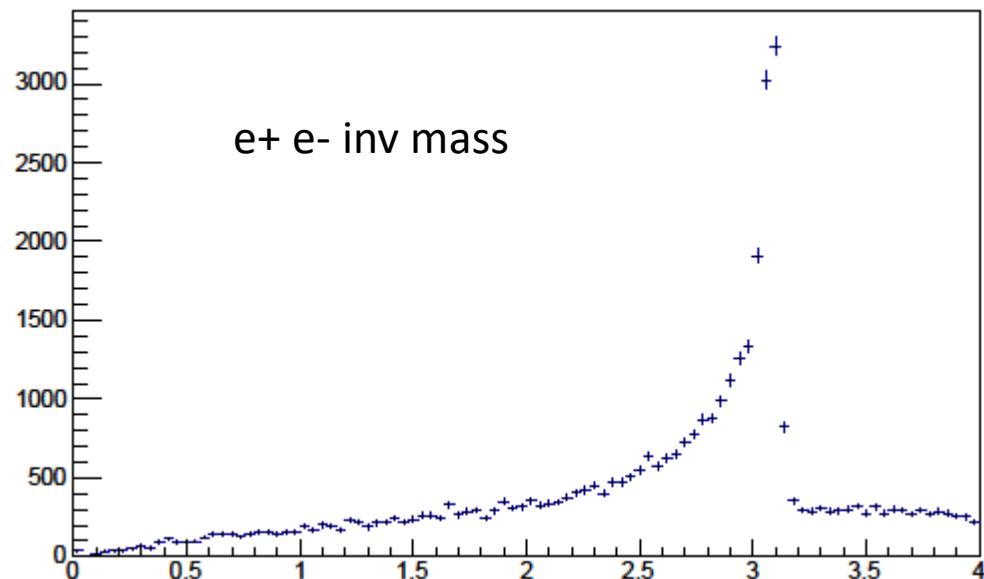
- Track –candidate matching
- Additional training observable  $L_{xy}$
- $\text{Abs(PID)} == 11$  (electron/positron)
- Same NN architecture
- No standard PID cuts
- 2M events



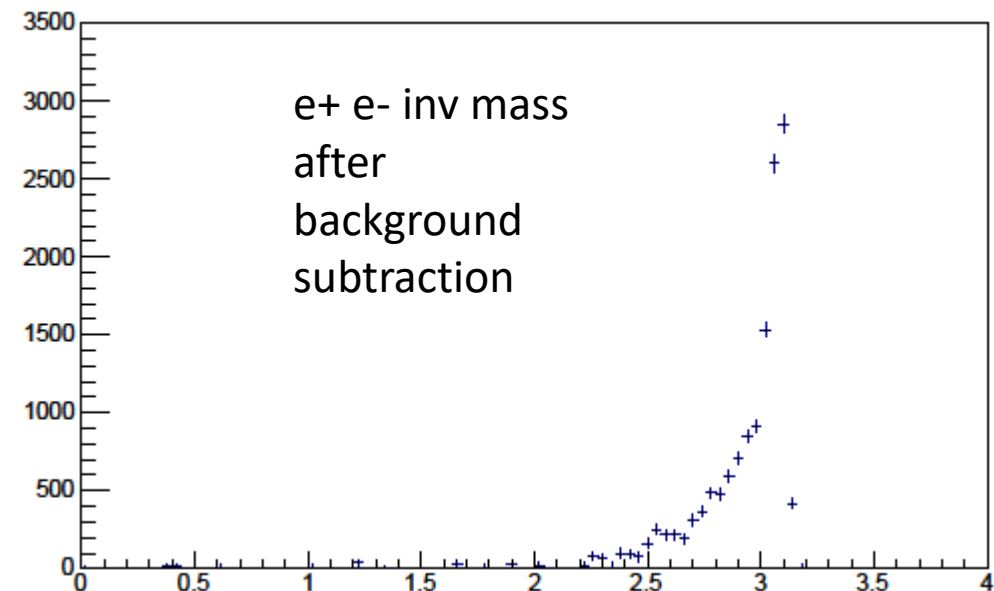
# Results Prob > 0.8 cut



# J/psi inv mass & contamination



$$\text{Bkg} = \sqrt{N_{e^+e^+} * N_{e^-e^-}}$$



Contamination: (signal region 2.9 up to 3.2 GeV)

$N_{nn}$  – number of events after NN cut

$N_{nn\_ID}$  = number of events after NN and ID selection of actual non prompt events

N_nn	N_nn_ID
10474	8749

$N_{nn} - N_{nn\_ID} = \text{number of prompt events (1725)}$

$N_{nn} / (N_{nn} - N_{nn\_ID}) \approx 17\%$