



# NN Output of $b$ -Tagged Events

(additional plots for the  
Kinematic Cross Section Analysis  
with  $347 \text{ pb}^{-1}$ )

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# Why Bless These Plots?



- In Gen4 we blessed a plot that compared the NN output of  $b$ -tagged data to the NN output of  $b$ -tagged PYTHIA  $t\bar{t}$  events
  - Shows that  $b$ -tagged events (which have greater top purity) produce a more top-like NN output than pretag events
- We would like to have similar plots for the Gen5 update of the analysis
- Things to note:
  - Same NN used that was used for pretag kinematic cross section measurement
    - ❑ Didn't change anything for these plots
    - ❑ Just selected events with one (or two)  $b$ -tags
  - Not a fit: Signal MC and data shapes compared with equal area normalization
  - No background included: Just to illustrate that NN and  $b$ -tagging agree about which events are most likely top



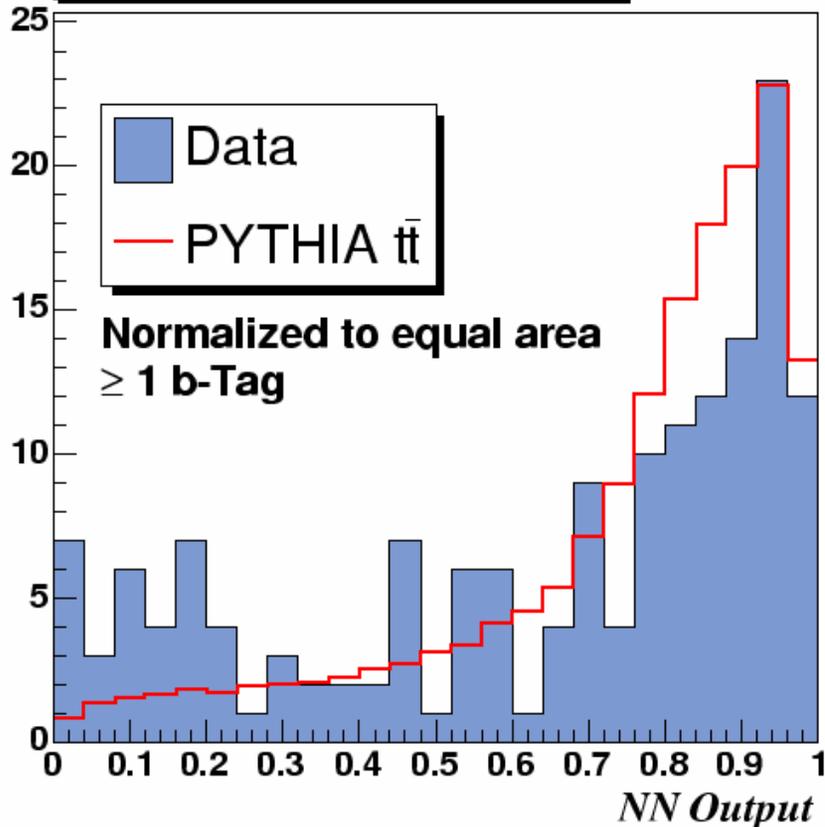
# NN Output for $b$ -Tagged Sample



- Data: NN output for events with  $\geq 1$   $b$ -tag (left) and  $\geq 2$   $b$ -tags (right)
- PYTHIA  $t\bar{t}$ : NN output for events with  $\geq 1$   $b$ -tag (left) and  $\geq 2$   $b$ -tags (right)

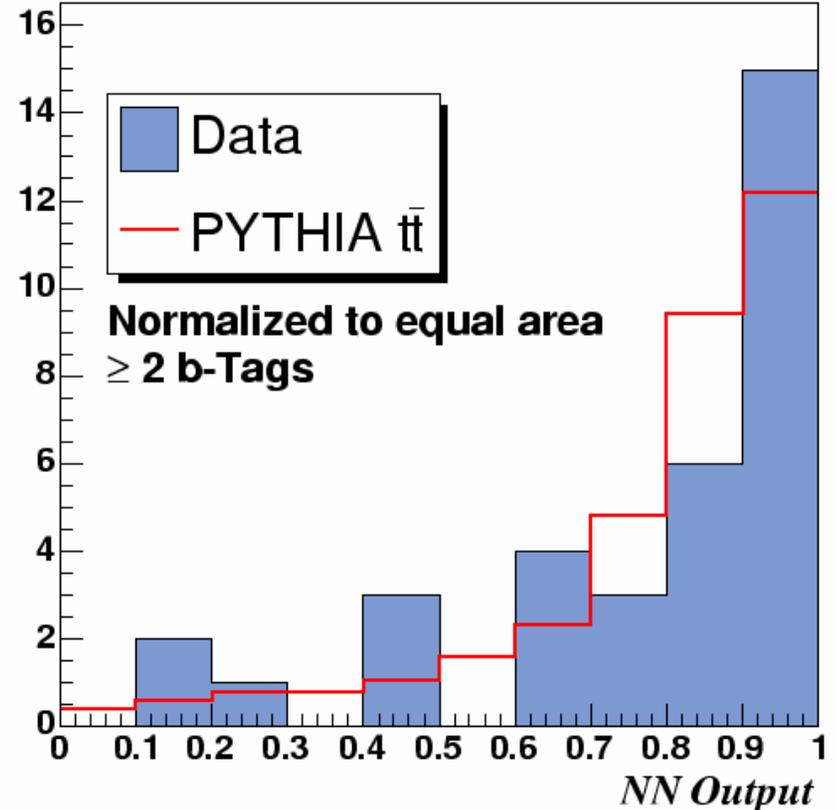
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# What about the Background Shapes?



- Would it be useful to show the shape of the background on these plots?
  - If so, how do we normalize the signal and background contributions?
  - What to use for the background shape?
- Options
  - Background shape: Use tagged ALPGEN  $W+bb+1p$  as a representative background shape
    - ❑ May not be exactly the right shape, but it should be really close
    - ❑ Shouldn't matter too much since we're not doing a fit
  - Normalizations:
    - ❑ Option 1: Normalize signal to expectation for 6.1 pb (theory). Normalize background to be (# events in data) - (expected top)
    - ❑ Option 2: Same as above, but with the total of the signal + background also shown
    - ❑ Option 3: Same as above, but use the Method II  $b$ -tag cross section numbers to normalize the signal (7.9 pb for  $\geq 1$ -tag and 8.7 for  $\geq 2$ -tag)
- Couldn't decide, so we'll show you all



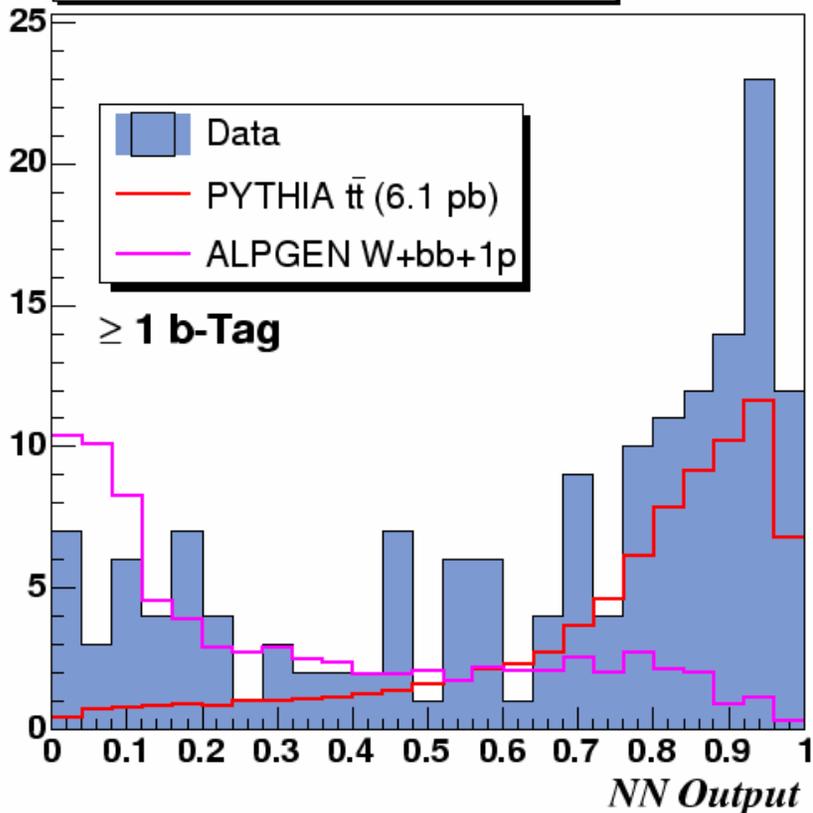
# Option 1



- Normalize signal to expectation for 6.1 pb (theory). Normalize background to be (# events in data) - (expected top)

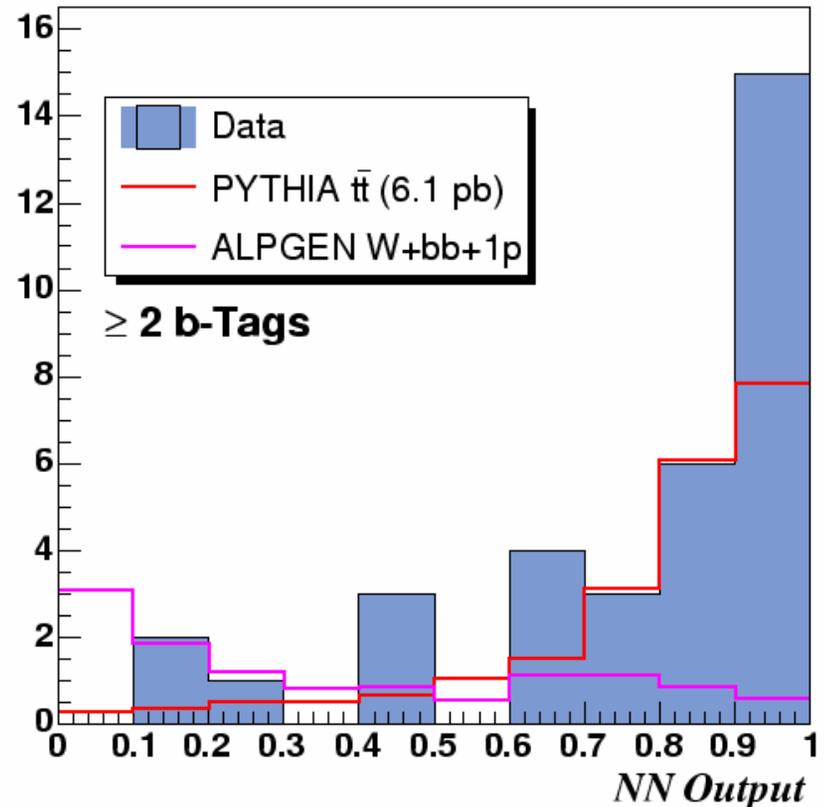
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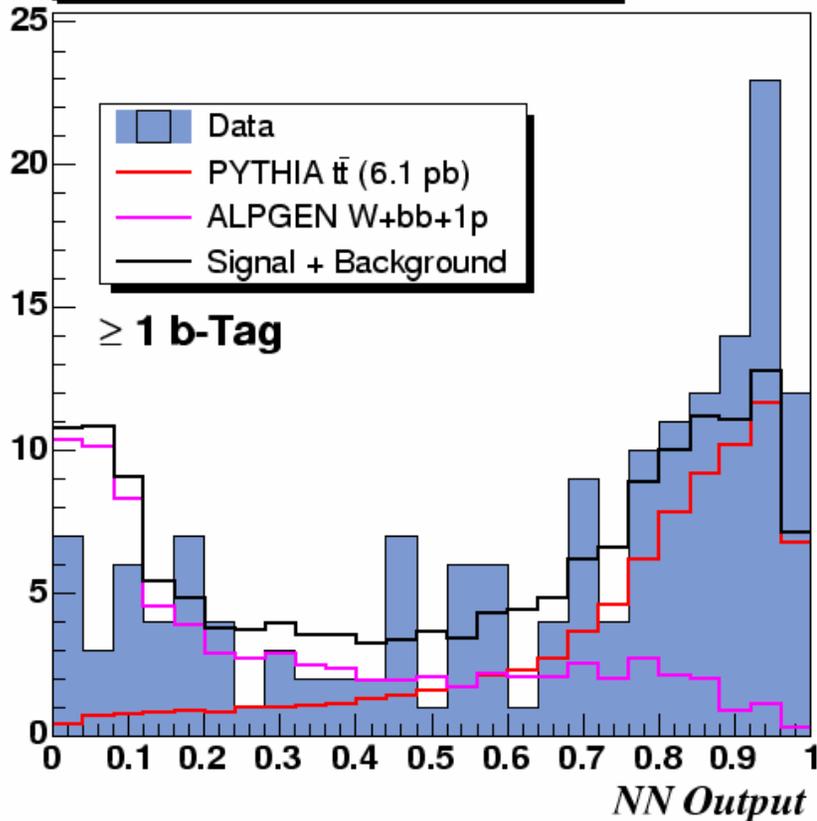
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- Same as above, but with the total of the signal + background also shown

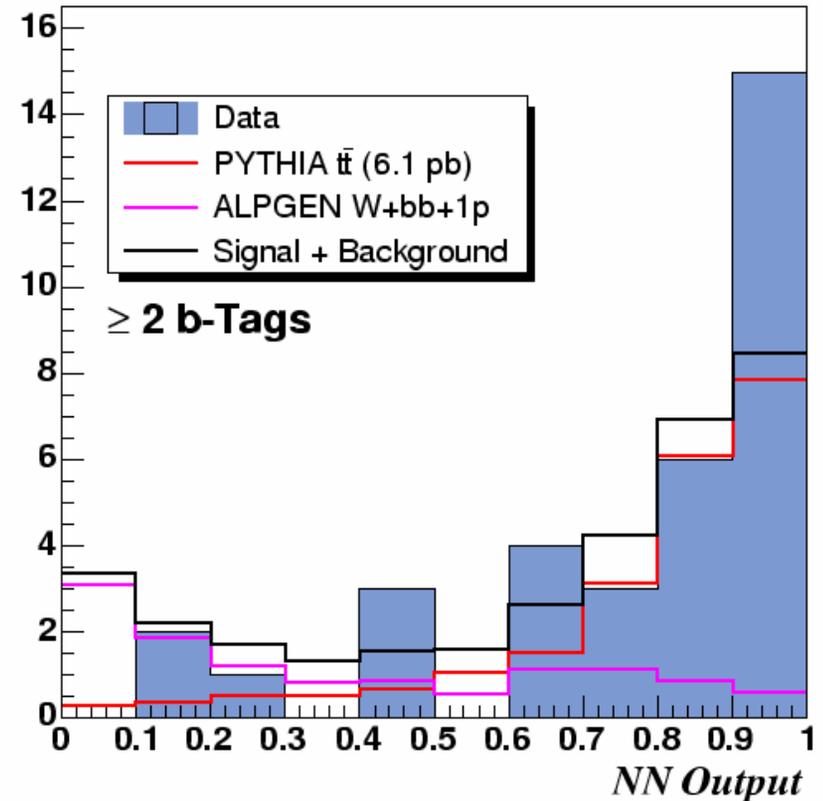
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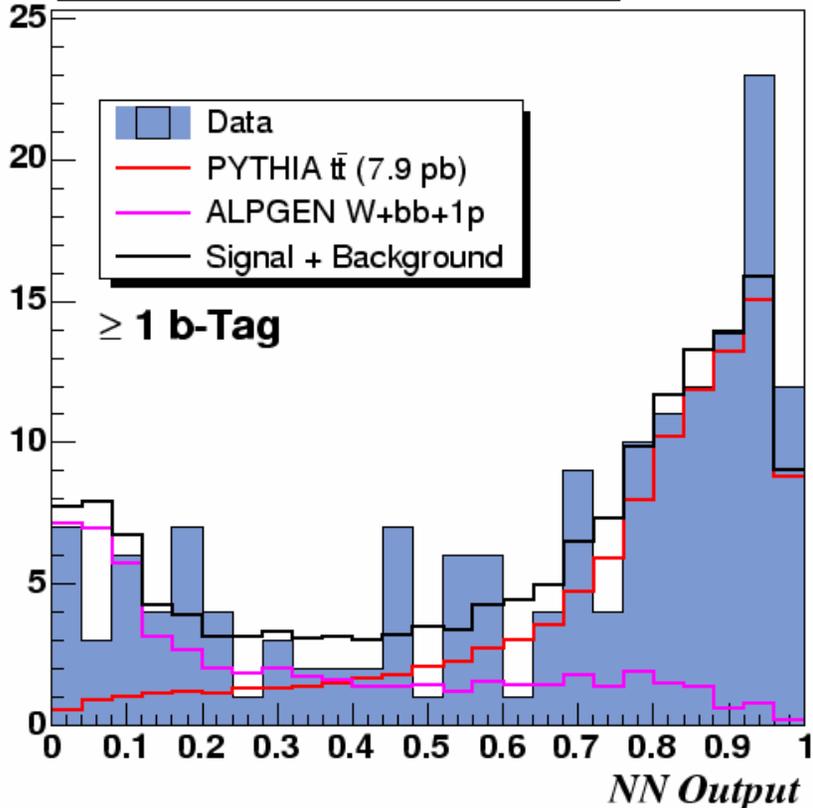
# Option 3



- Same as above, but use the Method II  $b$ -tag cross section numbers to normalize the signal (7.9 pb for  $\geq 1$ -tag and 8.7 for  $\geq 2$ -tag)

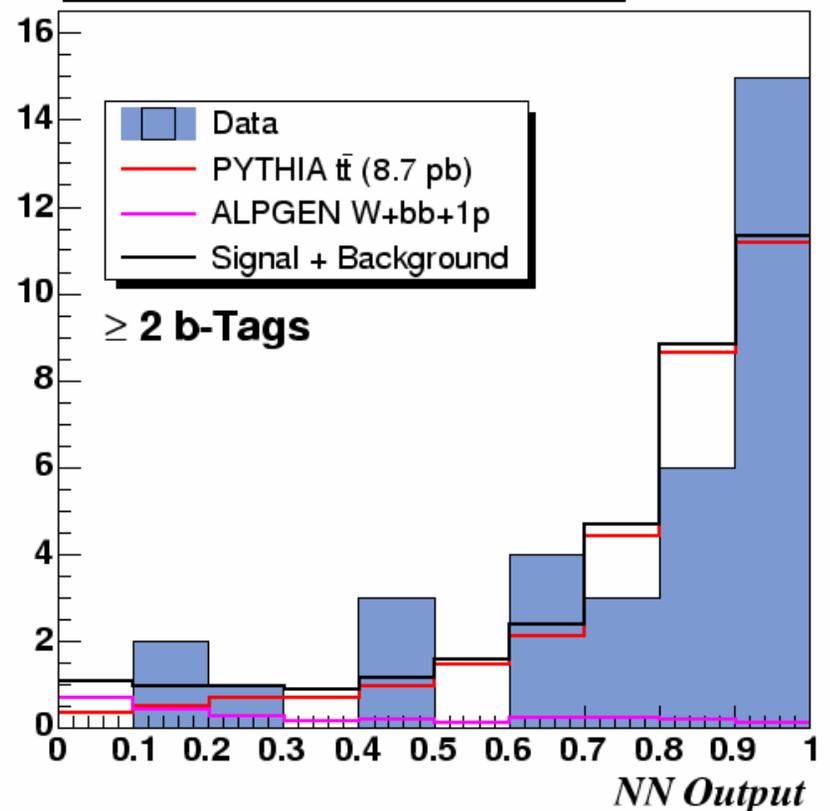
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# Conclusions



- We would like to bless one set of plots showing the NN output of the  $b$ -tagged events for speakers to use
  - Had these blessed in Gen4
  - There are several options
    - ❑ We have no strong leanings towards one over the other
    - ❑ Probably only want to bless one set
- Give us your advice (multiple choice):
  - Option 0: No background on plots.
  - Option 1: Normalize signal to expectation for 6.1 pb (theory). Normalize background to be (# events in data) - (expected top)
  - Option 2: Same as above, but with the total of the signal + background also shown
  - Option 3: Same as above, but use the Method II  $b$ -tag cross section numbers to normalize the signal (7.9 pb for  $\geq 1$ -tag and 8.7 for  $\geq 2$ -tag)