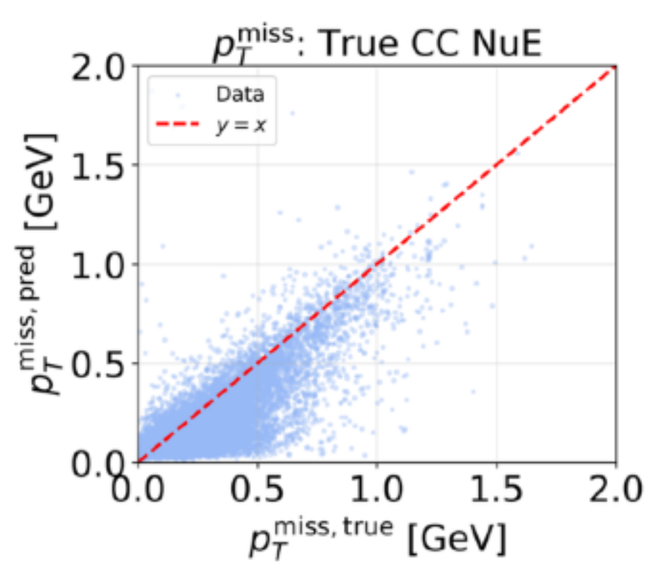
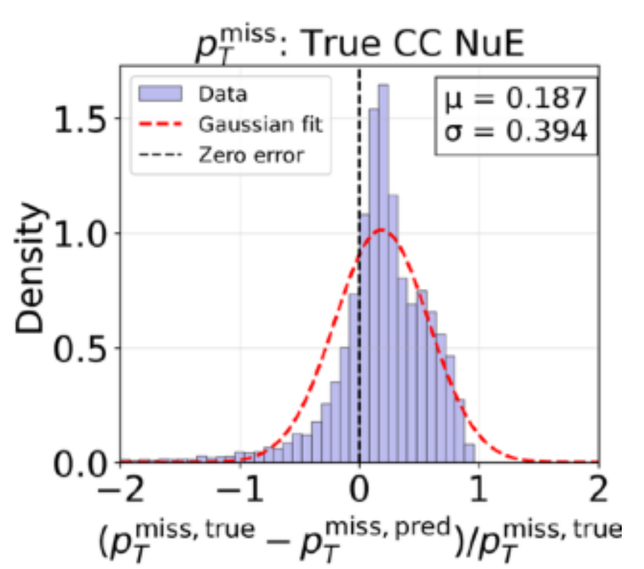
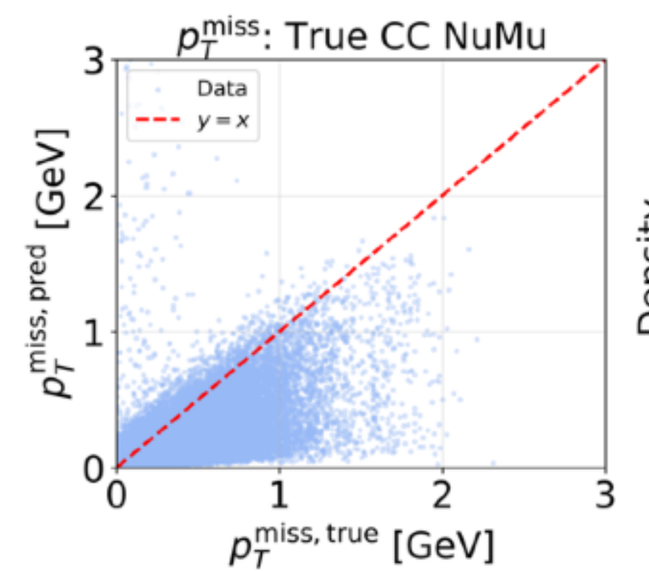
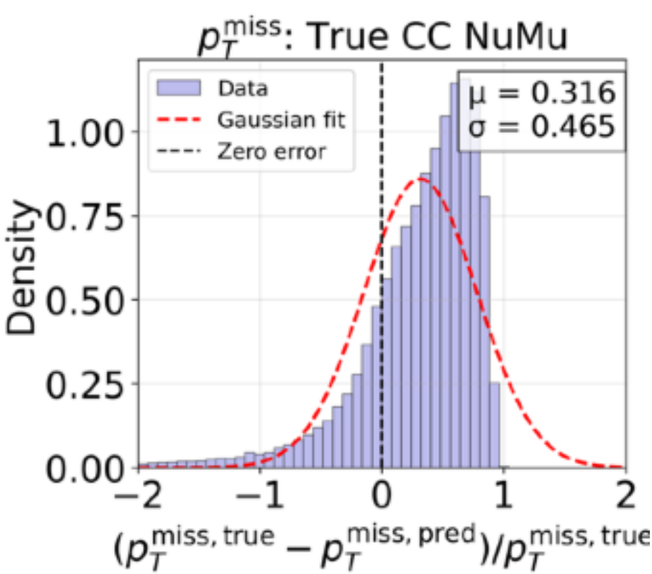
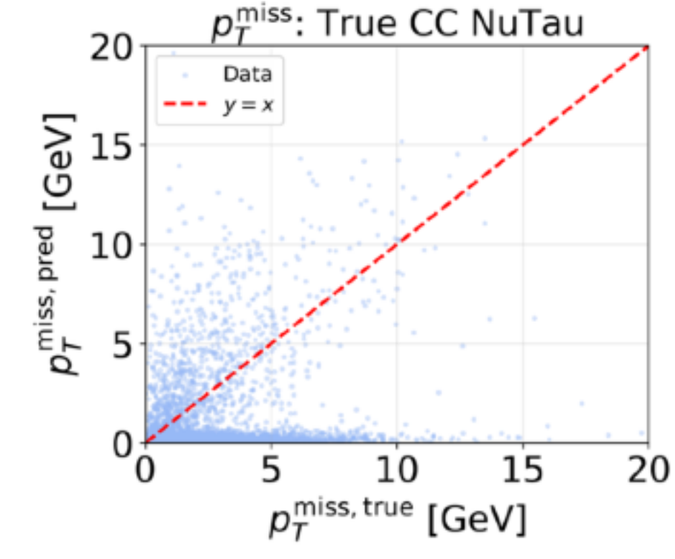
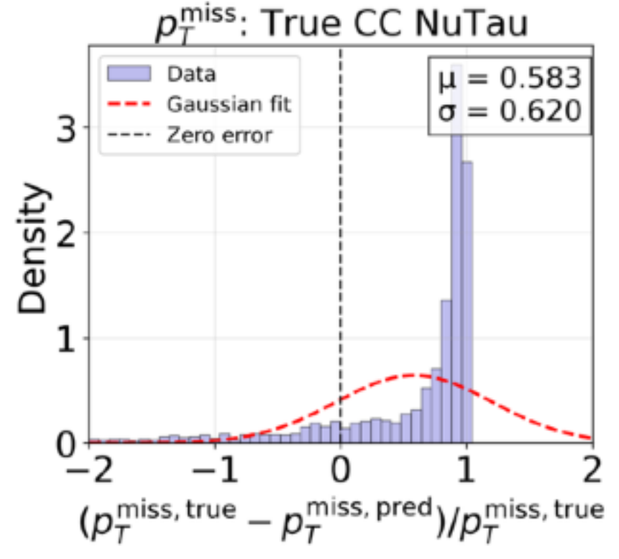

p_T^{miss}: True CC NuE
Data
$y = x$
$p_T^{miss,\,pred}$ [GeV]
$p_T^{miss,\,true}$ [GeV]

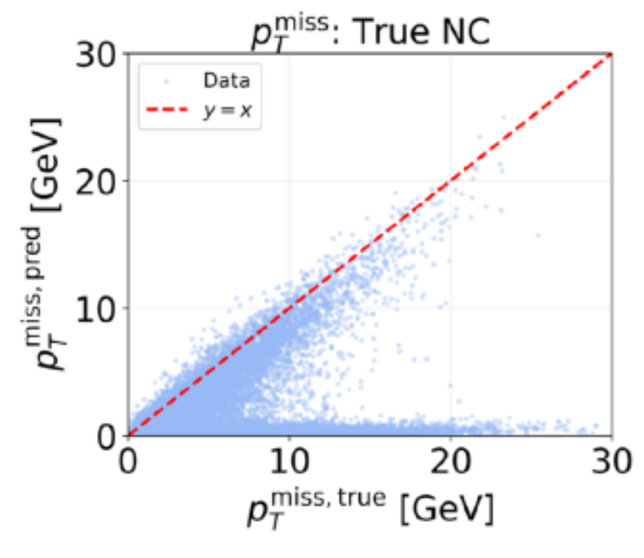

p_T^{miss}: True CC NuE
Data
Gaussian fit
Zero error
μ = 0.187
σ = 0.394
Density
$(p_T^{miss,\,true} - p_T^{miss,\,pred})/p_T^{miss,\,true}$

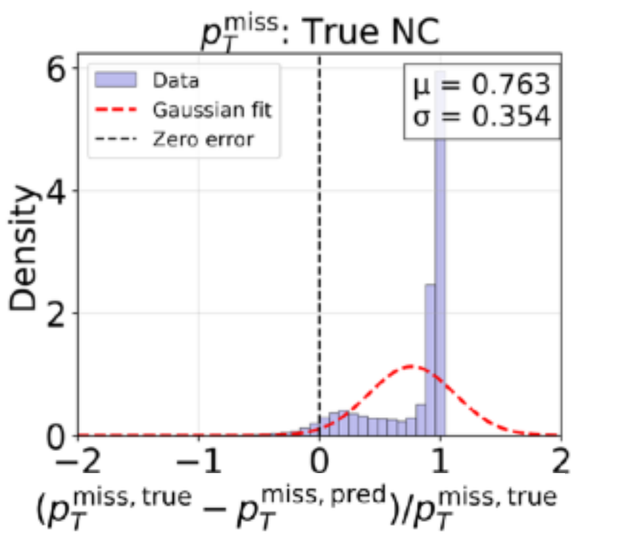

p_T^{miss}: True CC NuMu
Data
$y = x$
$p_T^{miss,\,pred}$ [GeV]
$p_T^{miss,\,true}$ [GeV]


p_T^{miss}: True CC NuMu
Data
Gaussian fit
Zero error
μ = 0.316
σ = 0.465
Density
$(p_T^{miss,\,true} - p_T^{miss,\,pred})/p_T^{miss,\,true}$

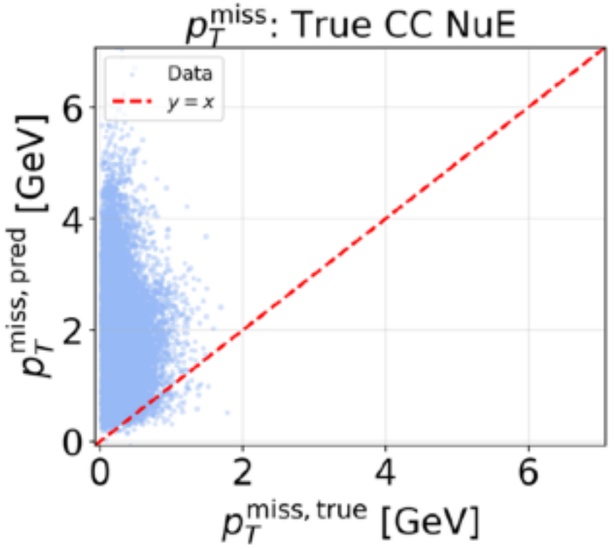

p_T^{miss}: True CC NuTau
Data
$y = x$
$p_T^{miss,\,pred}$ [GeV]
$p_T^{miss,\,true}$ [GeV]

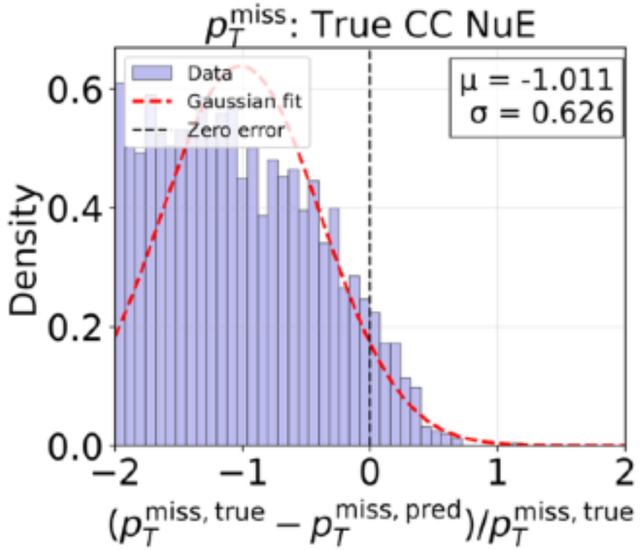

p_T^{miss}: True CC NuTau
Data
Gaussian fit
Zero error
μ = 0.583
σ = 0.620
Density
$(p_T^{miss,\,true} - p_T^{miss,\,pred})/p_T^{miss,\,true}$

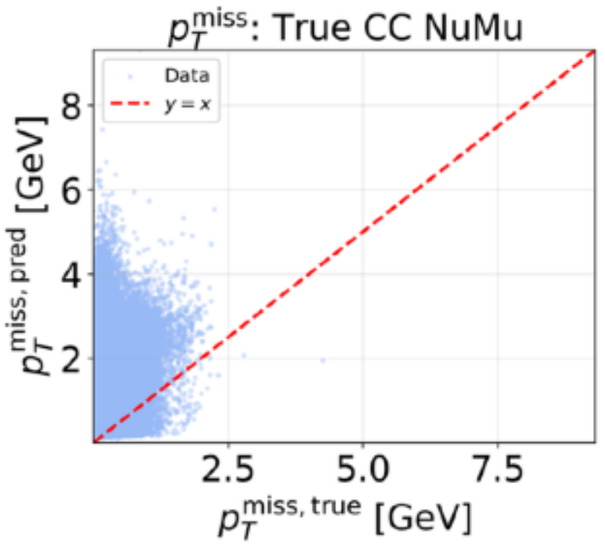

p_T^{miss}: True NC
Data
$y = x$
$p_T^{miss,\,pred}$ [GeV]
$p_T^{miss,\,true}$ [GeV]

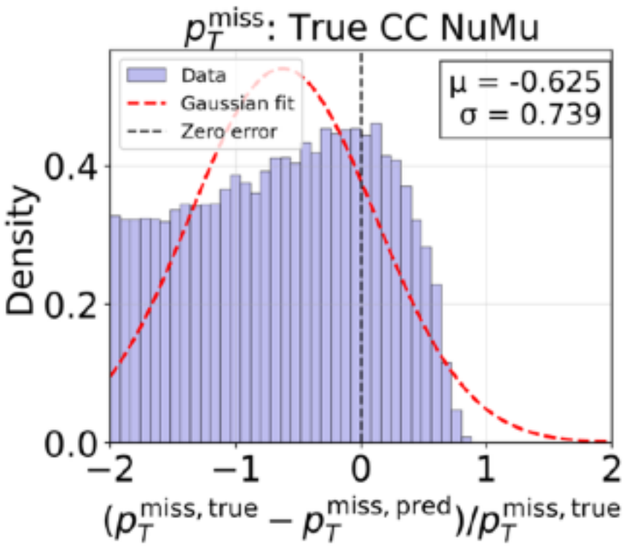

p_T^{miss}: True NC
Data
Gaussian fit
Zero error
μ = 0.763
σ = 0.354
Density
$(p_T^{miss,\,true} - p_T^{miss,\,pred})/p_T^{miss,\,true}$

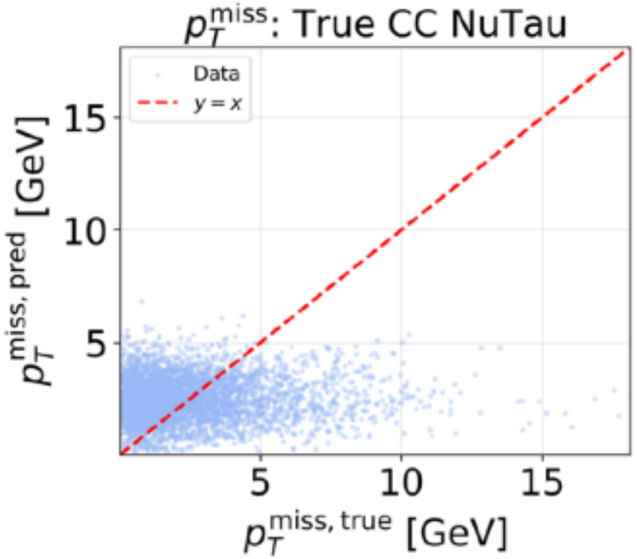
*BDT Results

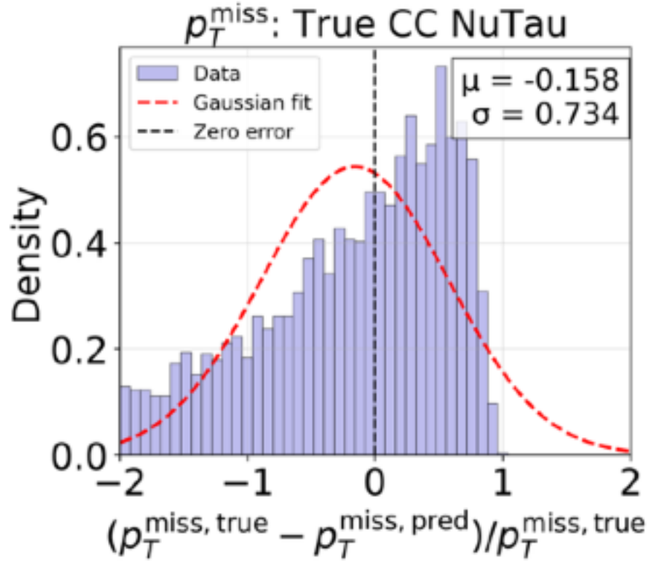

p_T^{miss}: True CC NuE
Data
$y = x$
$p_T^{miss,\,pred}$ [GeV]
$p_T^{miss,\,true}$ [GeV]

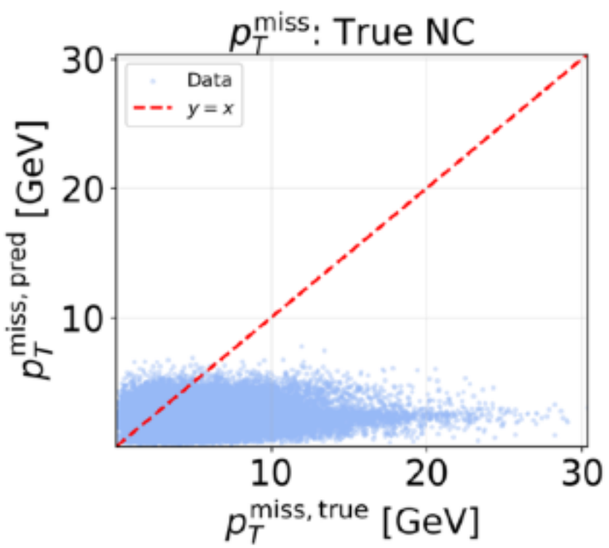

p_T^{miss}: True CC NuE
Data
Gaussian fit
Zero error
μ = -1.011
σ = 0.626
Density
$(p_T^{miss,\,true} - p_T^{miss,\,pred})/p_T^{miss,\,true}$

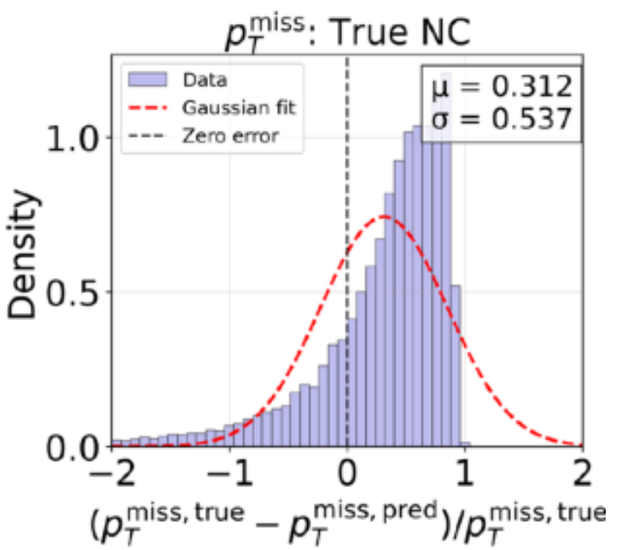

p_T^{miss}: True CC NuMu
Data
$y = x$
$p_T^{miss,\,pred}$ [GeV]
$p_T^{miss,\,true}$ [GeV]


p_T^{miss}: True CC NuMu
Data
Gaussian fit
Zero error
μ = -0.625
σ = 0.739
Density
$(p_T^{miss,\,true} - p_T^{miss,\,pred})/p_T^{miss,\,true}$


p_T^{miss}: True CC NuTau
Data
$y = x$
$p_T^{miss,\,pred}$ [GeV]
$p_T^{miss,\,true}$ [GeV]


p_T^{miss}: True CC NuTau
Data
Gaussian fit
Zero error
μ = -0.158
σ = 0.734
Density
$(p_T^{miss,\,true} - p_T^{miss,\,pred})/p_T^{miss,\,true}$


p_T^{miss}: True NC
Data
$y = x$
$p_T^{miss,\,pred}$ [GeV]
$p_T^{miss,\,true}$ [GeV]


p_T^{miss}: True NC
Data
Gaussian fit
Zero error
μ = 0.312
σ = 0.537
Density
$(p_T^{miss,\,true} - p_T^{miss,\,pred})/p_T^{miss,\,true}$

Deep Learning Model: p_T^{miss}

Regression Results

27

- **`pt_miss`**: magnitude of x,y components `visible_momentum`.

- **Resolving the p_T^{miss} Dilemma:** Pre-Train finds a much more physically robust solution to the bimodal distribution.
  - Excellent, low-bias prediction for ν_e and ν_μ.
  - Simultaneously improving prediction for high-p_T^{miss} NC and ν_τ classes.

- Superior understanding, but still with remarkable bias.

Deep Learning Model: p_T^{miss}

Regression Results

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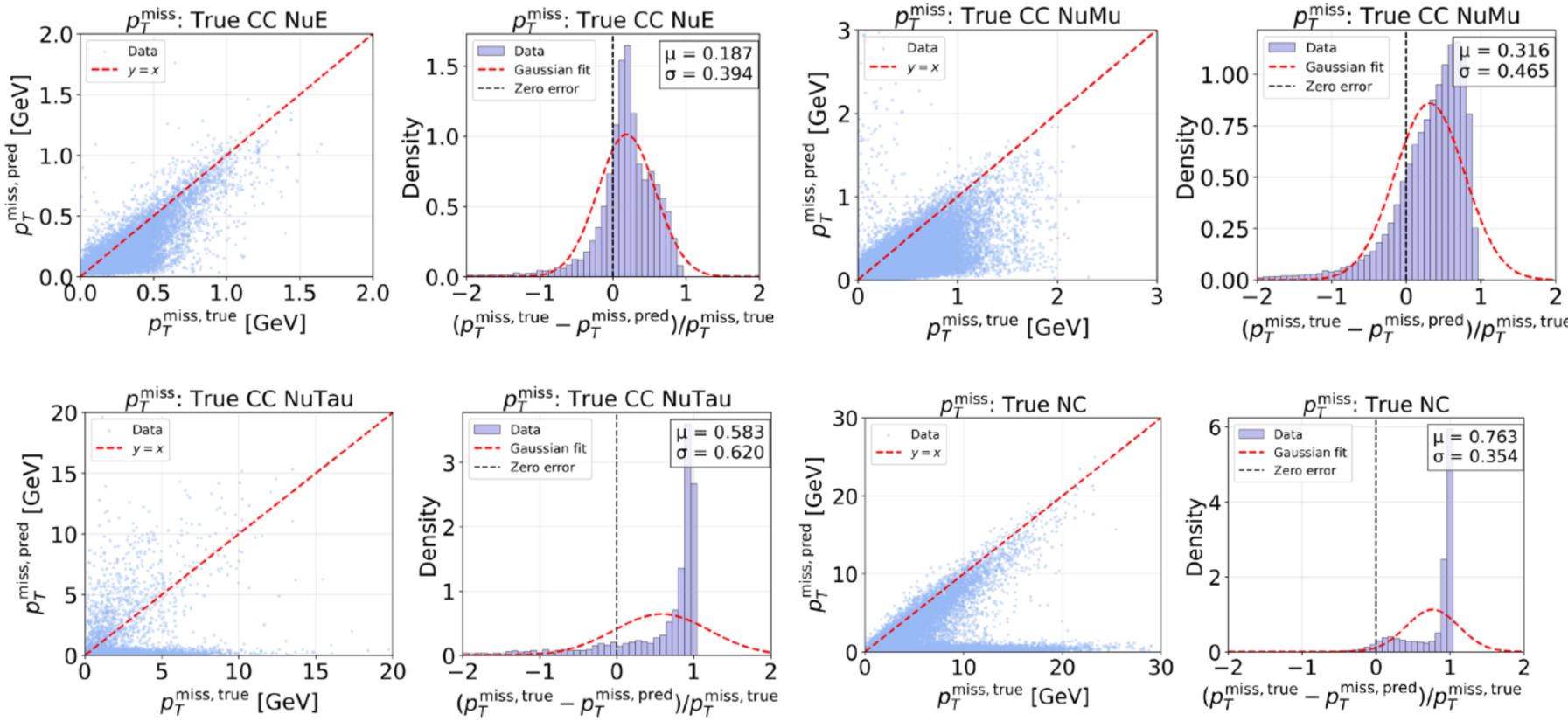
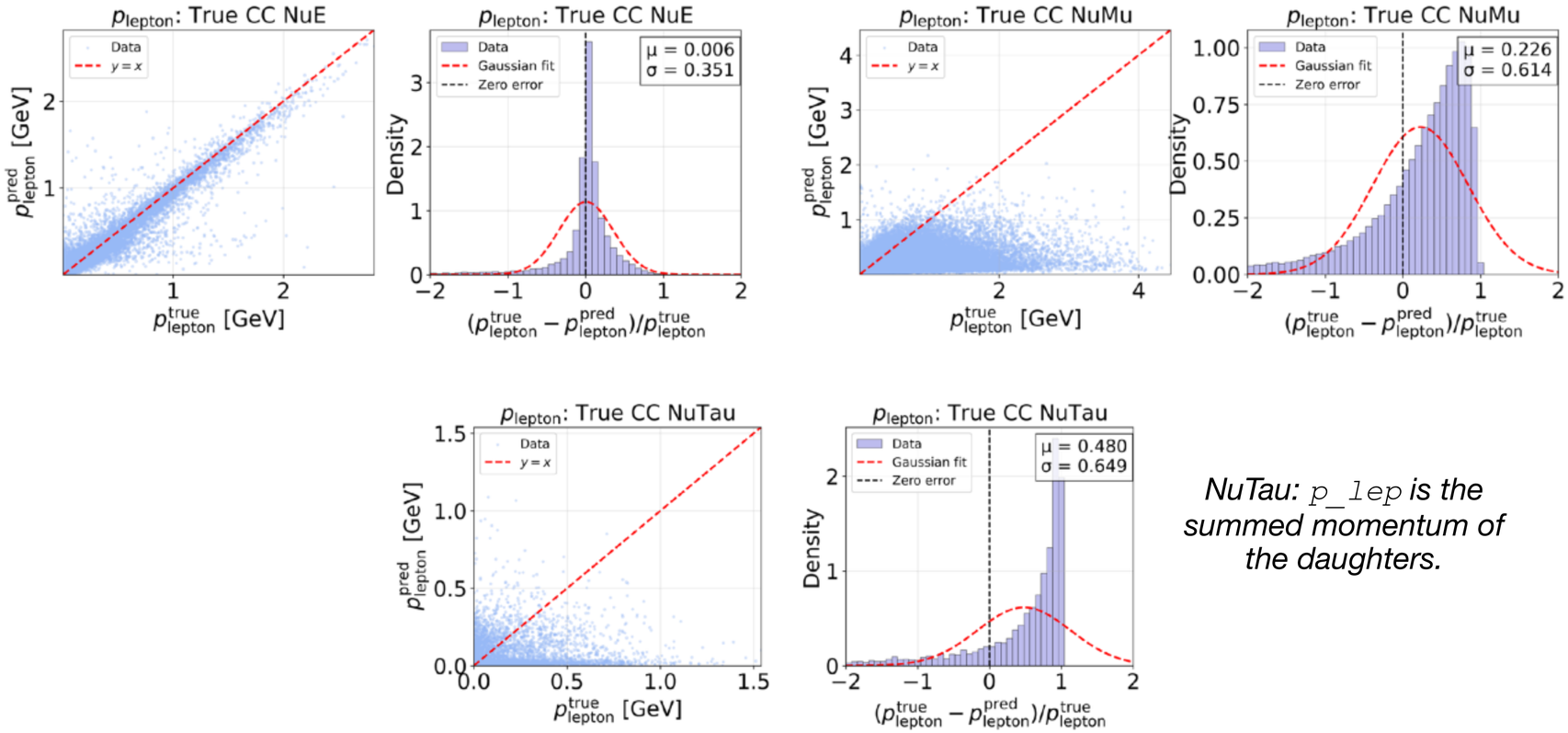


Deep Learning Model: Lepton Momentum Magnitude

Regression Results

- The model successfully reconstructs the lepton and jet kinematics:
  - ν_τ **CC:** Challenge!
  - ν_μ **CC:** Misclassification of ν_μ as NC biasing the distribution.
- *No direct info on the Primlepton is given to the model!*
- Simultaneously successfully reconstructs the jet kinematics.



NuTau: `p_lep` *is the summed momentum of the daughters.*