SCNN + Transformer: Pt Miss

Regression Results

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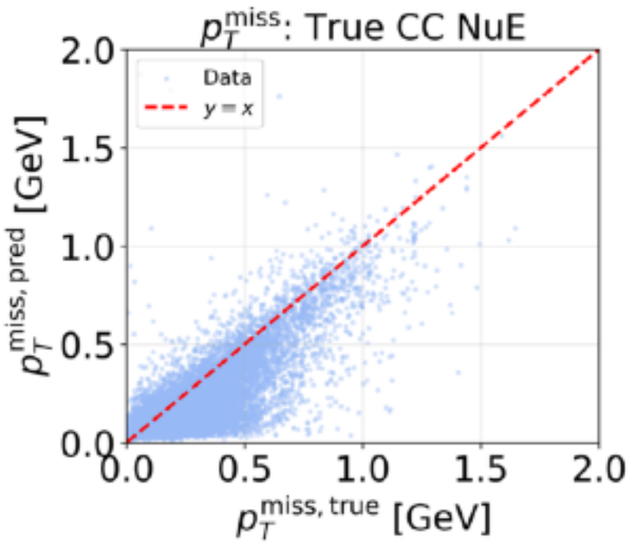
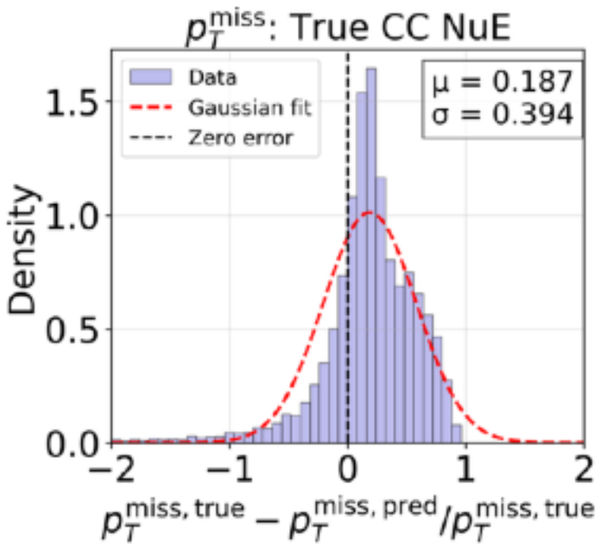
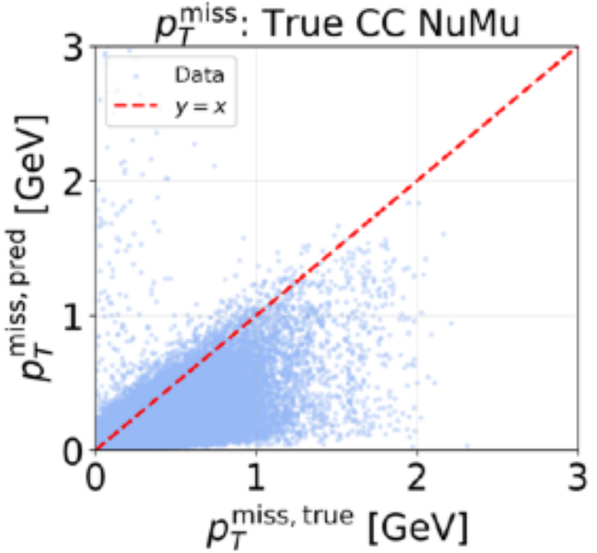
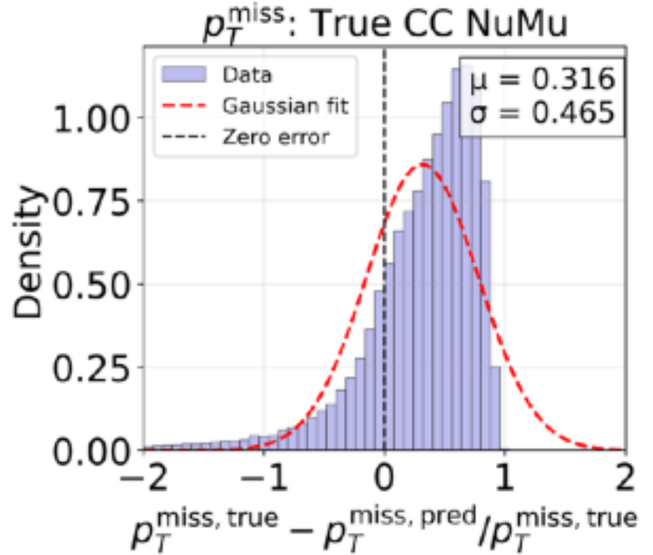
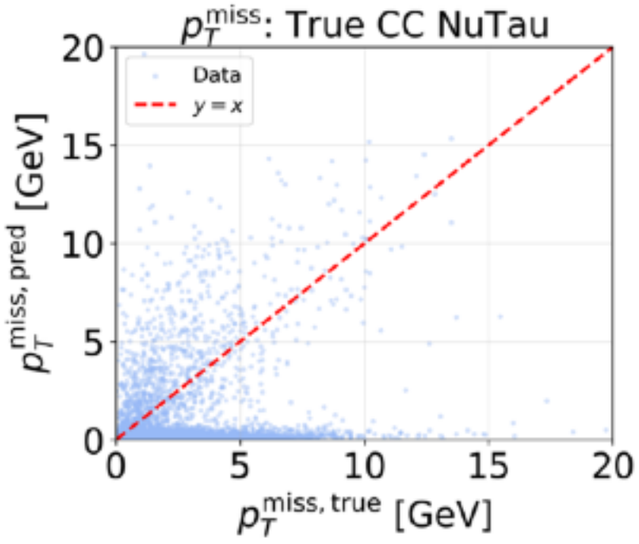
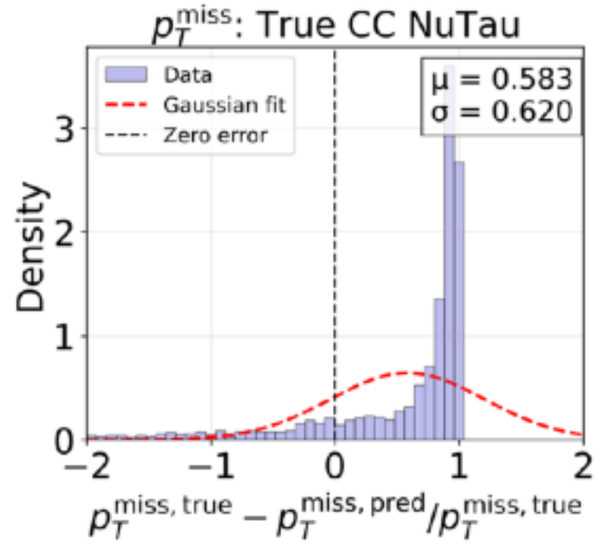

p_T^{miss}: True CC NuE
Data
$y = x$
$p_T^{miss, pred}$ [GeV]
$p_T^{miss, true}$ [GeV]

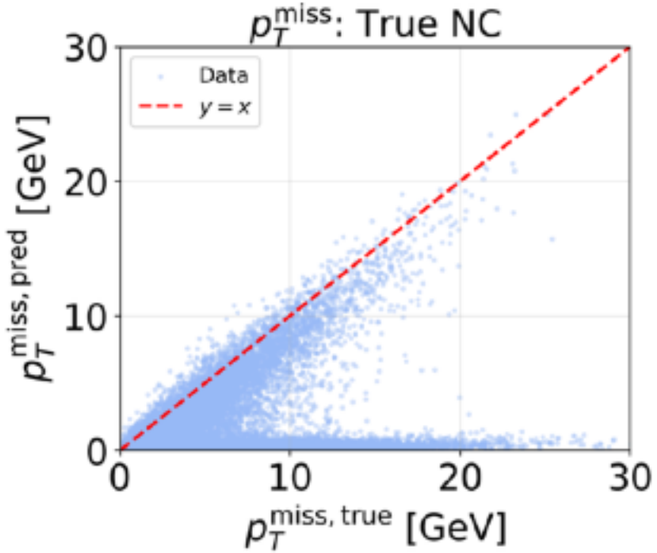

p_T^{miss}: True CC NuE
Data
Gaussian fit
Zero error
μ = 0.187
σ = 0.394
Density
$p_T^{miss, true} - p_T^{miss, pred}/p_T^{miss, true}$

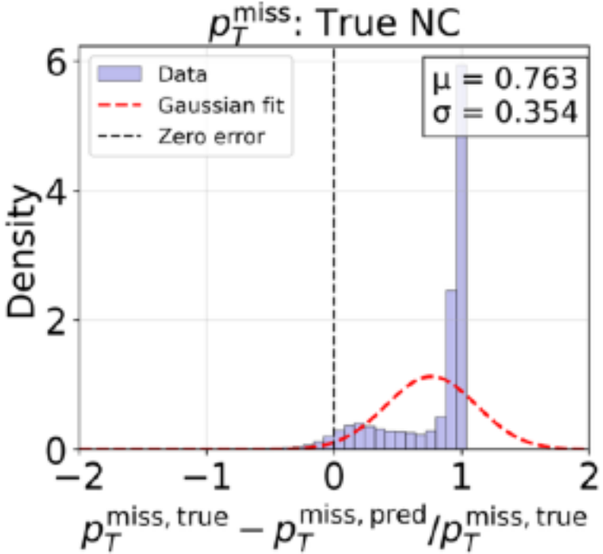

p_T^{miss}: True CC NuMu
Data
$y = x$
$p_T^{miss, pred}$ [GeV]
$p_T^{miss, true}$ [GeV]


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]

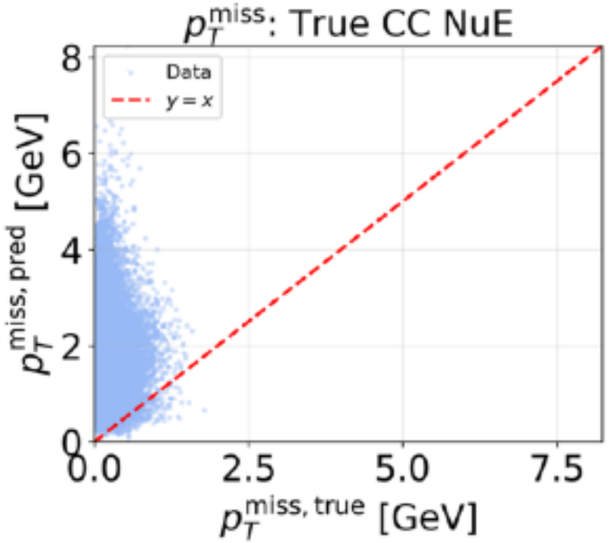

p_T^{miss}: True CC NuTau
Data
Gaussian fit
Zero error
μ = 0.583
σ = 0.620
Density
$p_T^{miss, true} - p_T^{miss, pred}/p_T^{miss, true}$

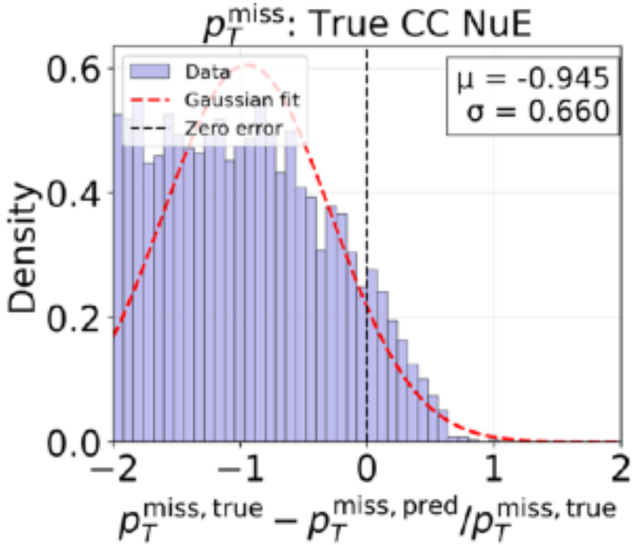

p_T^{miss}: True NC
Data
$y = x$
$p_T^{miss, pred}$ [GeV]
$p_T^{miss, true}$ [GeV]

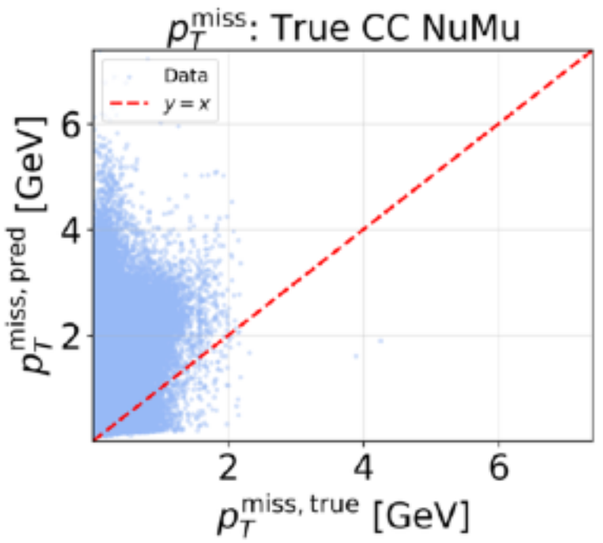

p_T^{miss}: True NC
Data
Gaussian fit
Zero error
μ = 0.763
σ = 0.354
Density
$p_T^{miss, true} - p_T^{miss, pred}/p_T^{miss, true}$

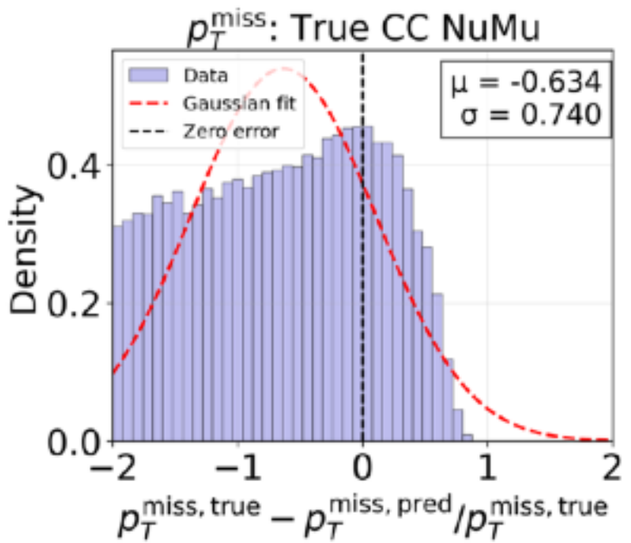
- **Resolving the p_T^{miss} Dilemma:** MAE finds a much more physically robust solution to the bimodal distribution.
  - Excellent, low-bias prediction for ν_e and ν_μ
  - Simultaneously improving prediction for high-p_T^{miss} NC and ν_τ classes.
- Superior understanding, but still with remarkable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

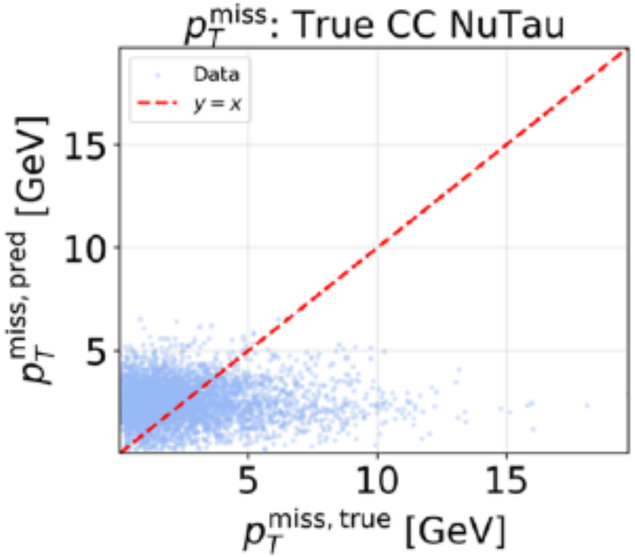
*BDT Results

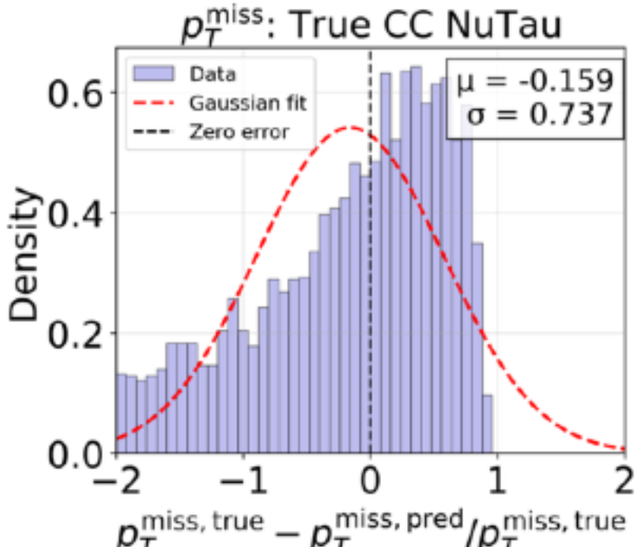

p_T^{miss}: True CC NuE
Data
$y = x$
$p_T^{miss, pred}$ [GeV]
$p_T^{miss, true}$ [GeV]

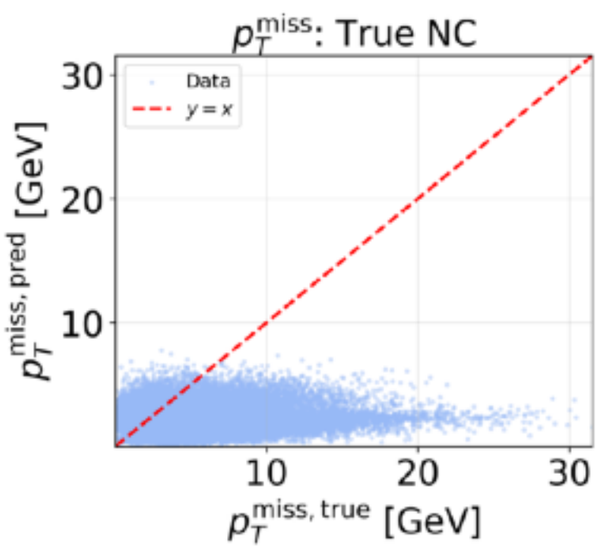

p_T^{miss}: True CC NuE
Data
Gaussian fit
Zero error
μ = -0.945
σ = 0.660
Density
$p_T^{miss, true} - p_T^{miss, pred}/p_T^{miss, true}$

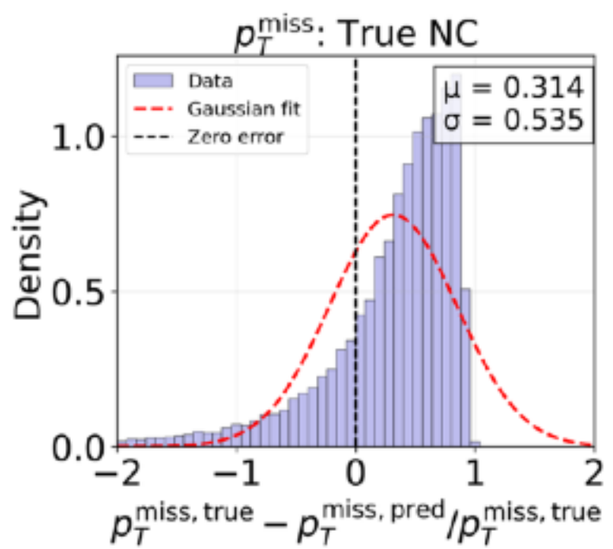

p_T^{miss}: True CC NuMu
Data
$y = x$
$p_T^{miss, pred}$ [GeV]
$p_T^{miss, true}$ [GeV]


p_T^{miss}: True CC NuMu
Data
Gaussian fit
Zero error
μ = -0.634
σ = 0.740
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 = -0.159
σ = 0.737
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 = 0.314
σ = 0.535
Density
$p_T^{miss, true} - p_T^{miss, pred}/p_T^{miss, true}$

SCNN + Transformer: Pt Miss

Regression Results

- **Resolving the p_T^{miss} Dilemma:** MAE 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.
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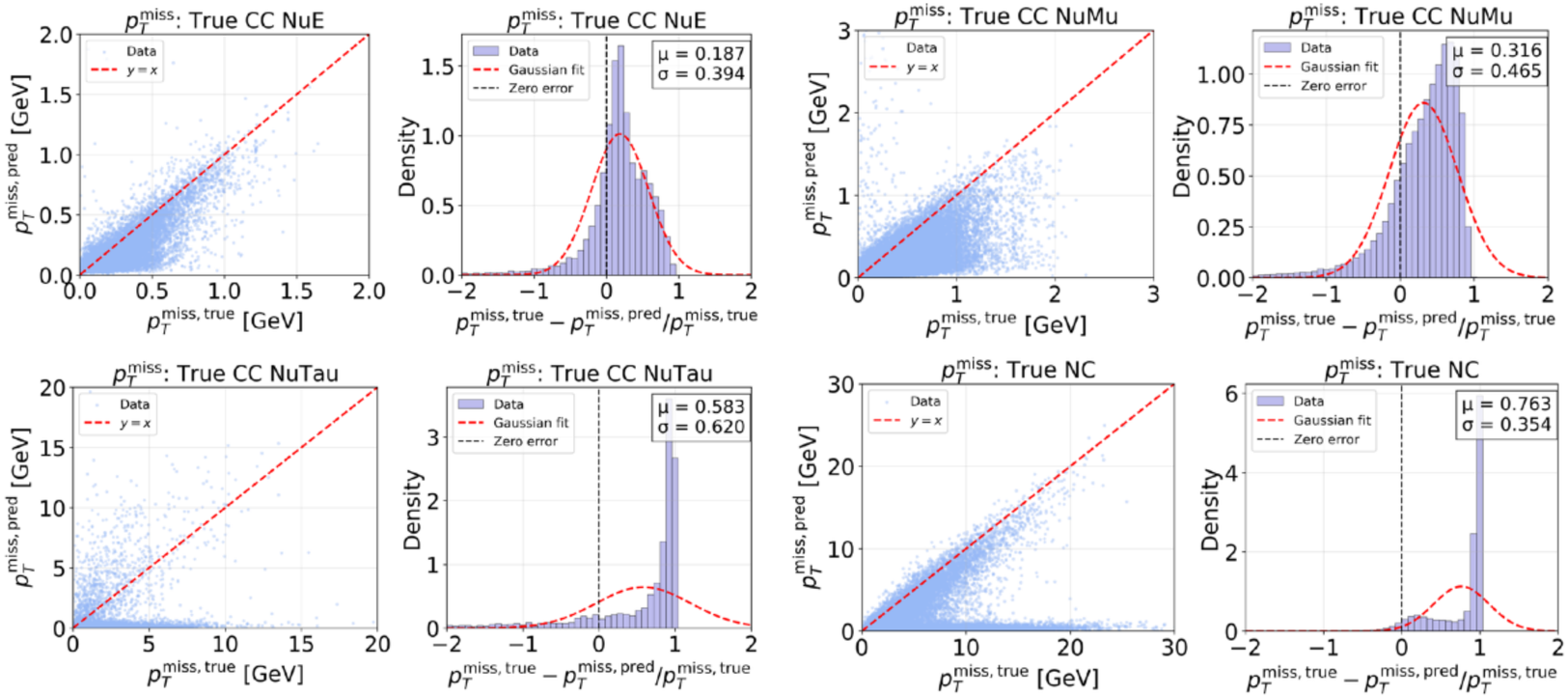
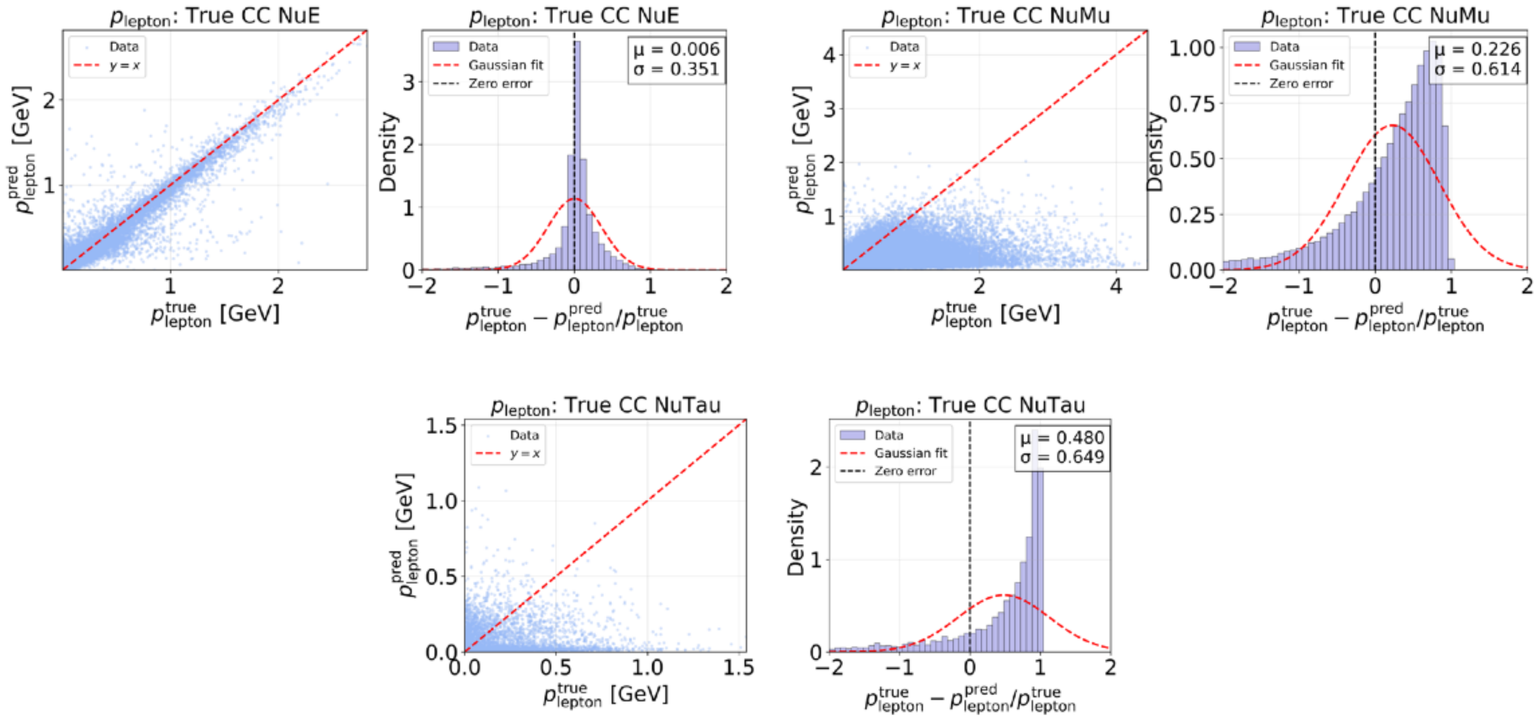


SCNN + Transformer: Lepton Momentum Magnitude

Regression Results

- The model successfully reconstructs the lepton and jet kinematic
  - 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