BDT: p_T^{miss}

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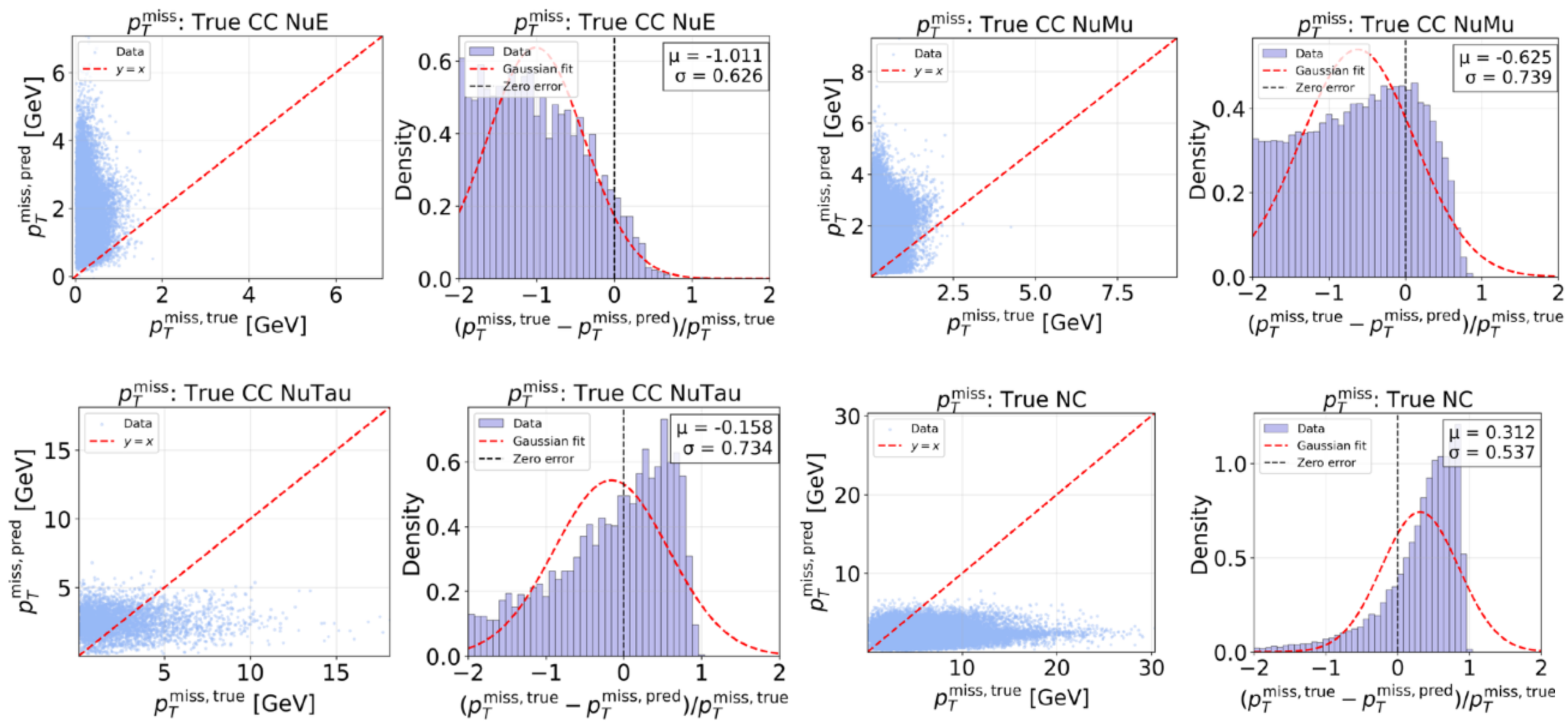
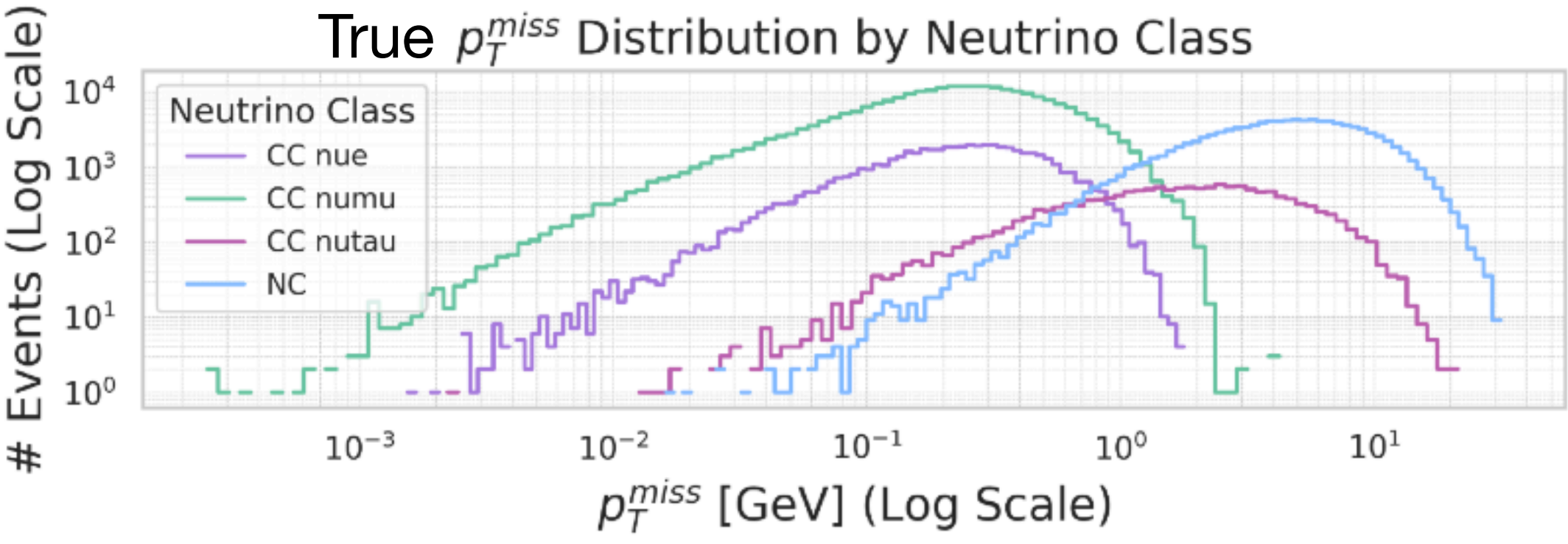
Regression Results


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
$(p_T^{miss,\,true} - p_T^{miss,\,pred})/p_T^{miss,\,true}$

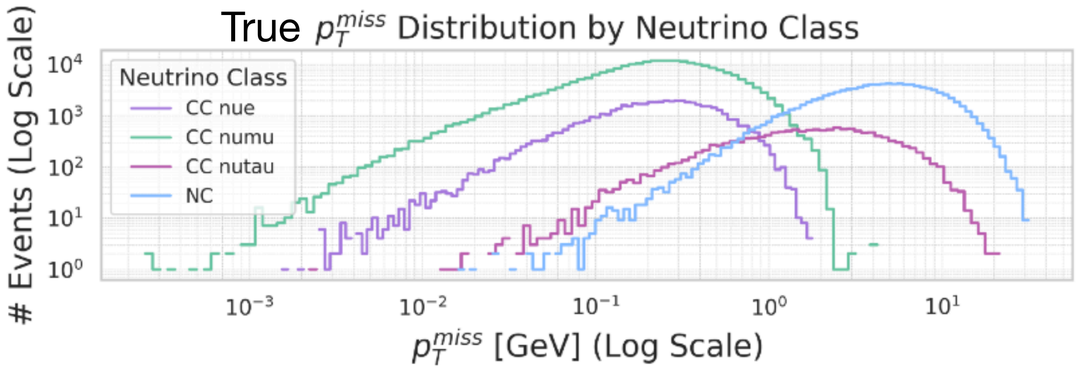
- **The BDT's Failure:** The model performs poorly on **all** classes.
  - Massive Over-prediction for low p_T^{miss} events.
  - Poor Resolution for high p_T^{miss} events.
- **The Problem:** p_T^{miss} distribution is bimodal.

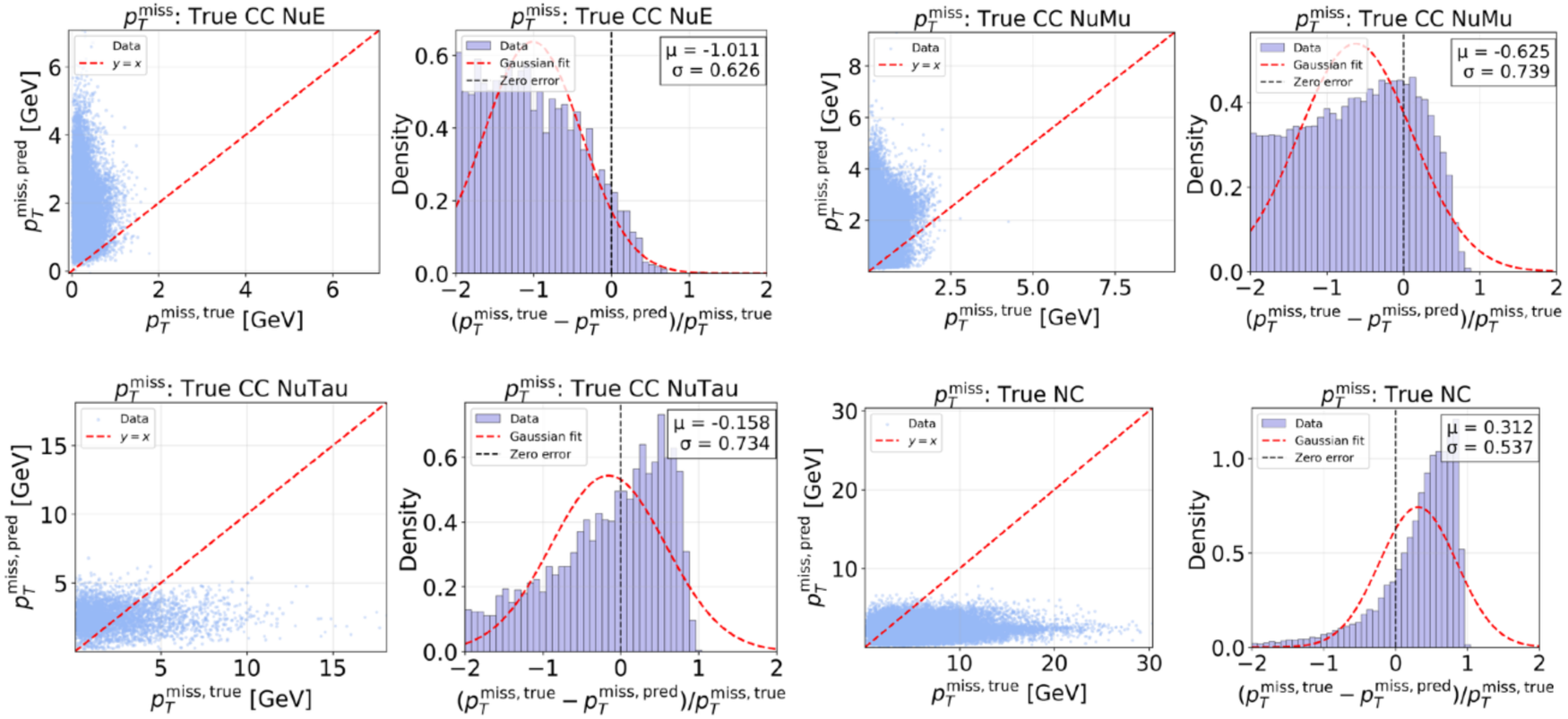

True p_T^{miss} Distribution by Neutrino Class
Neutrino Class
CC nue
CC numu
CC nutau
NC
Events (Log Scale)
10^4
10^3
10^2
10^1
10^0
10^{-3}
10^{-2}
10^{-1}
10^0
10^1
p_T^{miss} [GeV] (Log Scale)

BDT: p_T^{miss}

Regression Results

- **The BDT's Failure:** The model performs poorly on **all** classes.
  - Massive Over-prediction for low p_T^{miss} events.
  - Poor Resolution for high p_T^{miss} events.
- **The Problem:** p_T^{miss} distribution is bimodal.





Limitations of BDTs are clear: need a paradigm shift in modeling