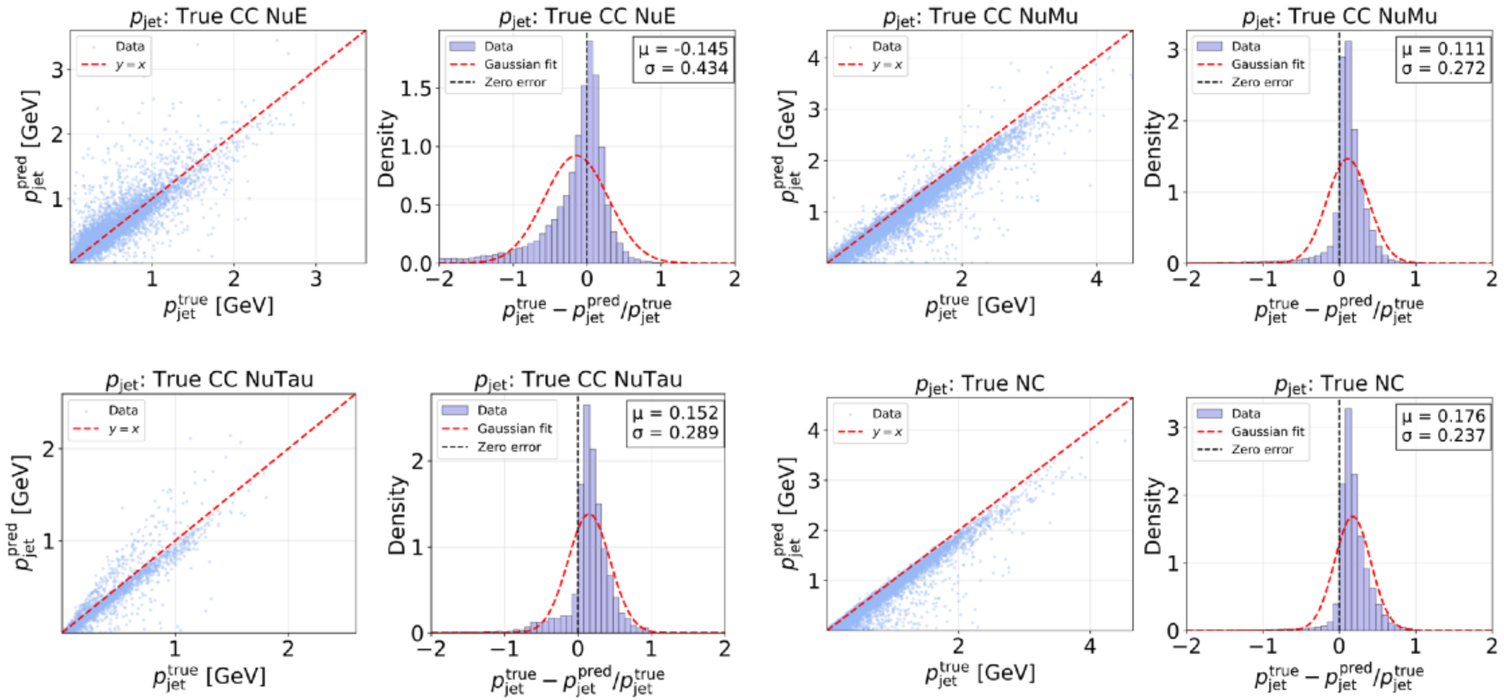
SCNN + Transformer: Jet Momentum Magnitude

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



Conclusions

Summary and Future Prospects

- FASERCal detector is significant data challenge:
  - This thesis has confronted this challenge: *developing* and *validating* a complete deep learning framework for the comprehensive reconstruction of Nu event
- Future Prospects:
  - **Apply to Real Data Prototype:** Bridge the Sim-to-Real gap and quantify systematic uncertainties.
  - **Enhance Rare Signal Searches:** Develop dedicated fine-tuning strategies to mature the initial NuTau sensitivity.
  - **Advanced Applications:** Optimize the model for low-latency inference for potential use in a real-time data trigger.