MLP Efficiency Updates

Rebecca Barsotti

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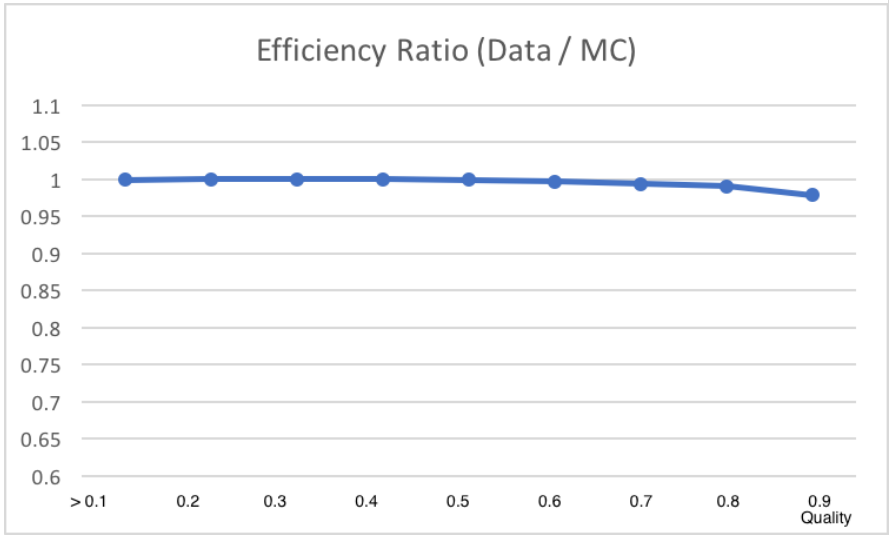
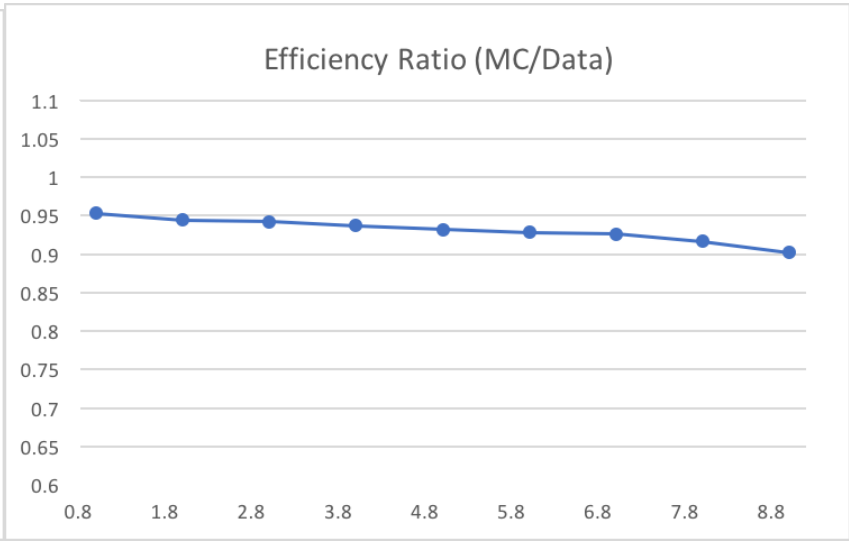
Background

- Neural net (MLP) differentiates between signal photon showers and split-off background showers
- MLP assigns each photon candidate a quality score between 0 (not a photon) and 1 (definitely a photon)
- Currently performing tests to confirm that it performs roughly the same on Monte Carlo as on data and determine systematic errors
- Efficiency calculated as $\frac{\#\text{ of signal events after cut}}{\#\text{ of signal events for quality} > 0}$
- We then compare the ratio of the efficiency from Monte Carlo and the efficiency from the data

Efficiency Ratio: ω Production

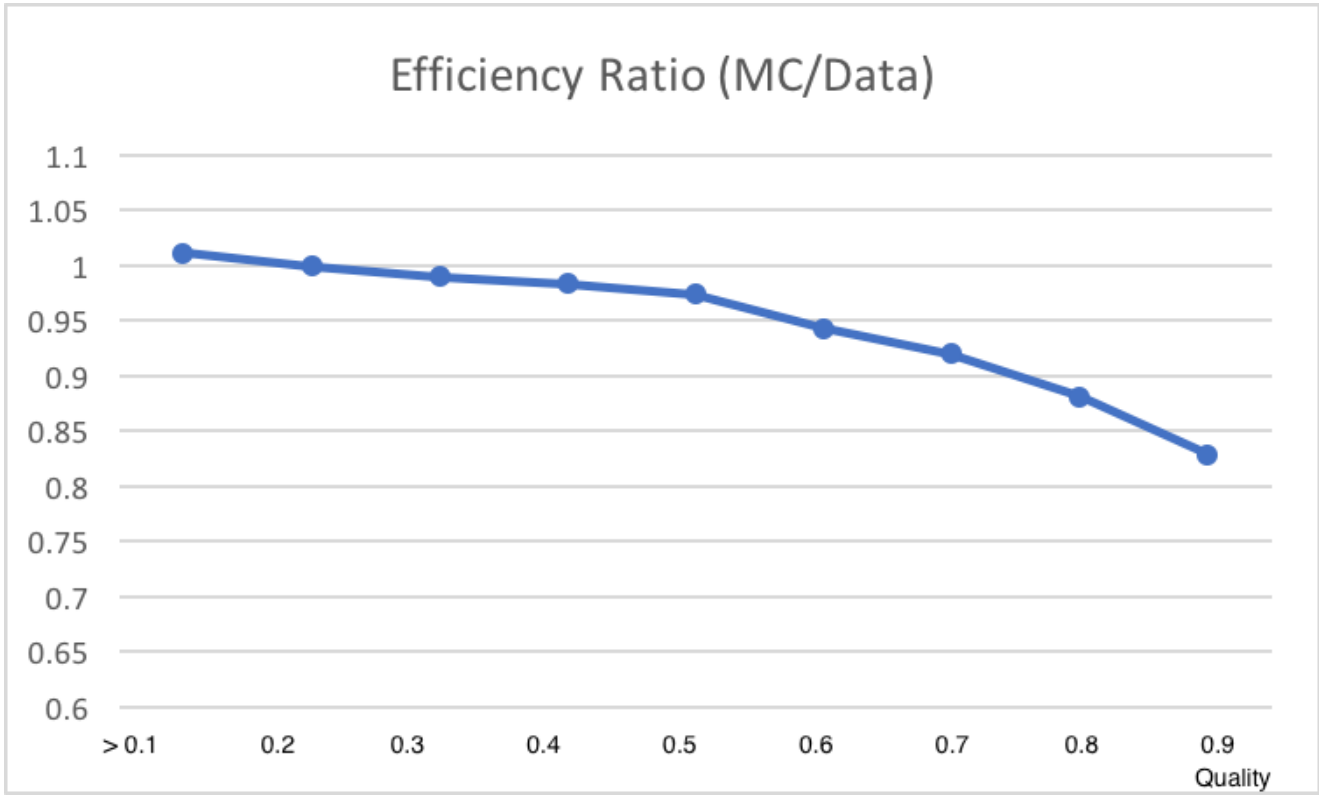
- Efficiency ratio for training data (clean omega sample) vs. signal Monte Carlo
  - Method 1: Taking training sample to be pure (Left)
  - Method 2: Fitting and integrating signal component of the π^0 (Right)





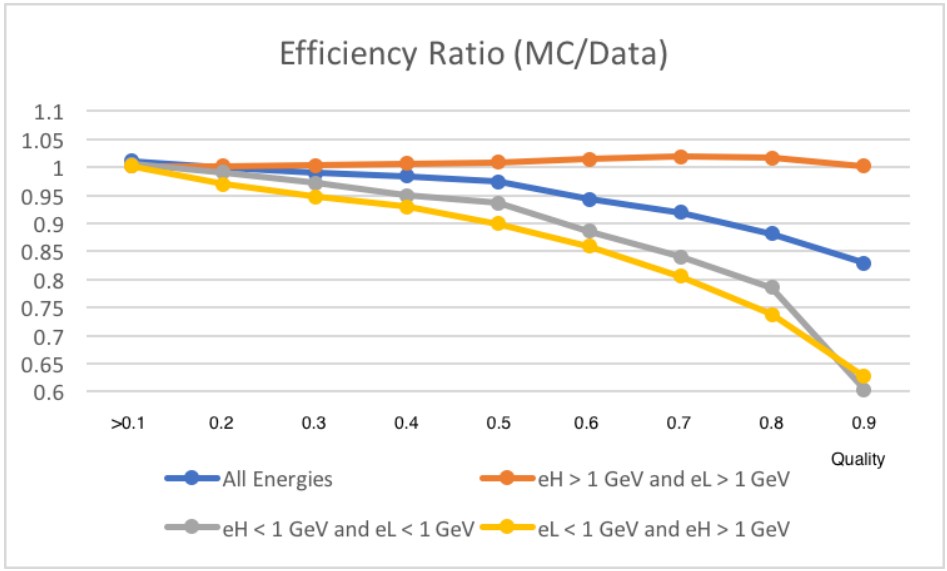
Efficiency Ratio- Inclusive π^0

- Efficiency ratio for inclusive π^0 skim vs. bggen Monte Carlo



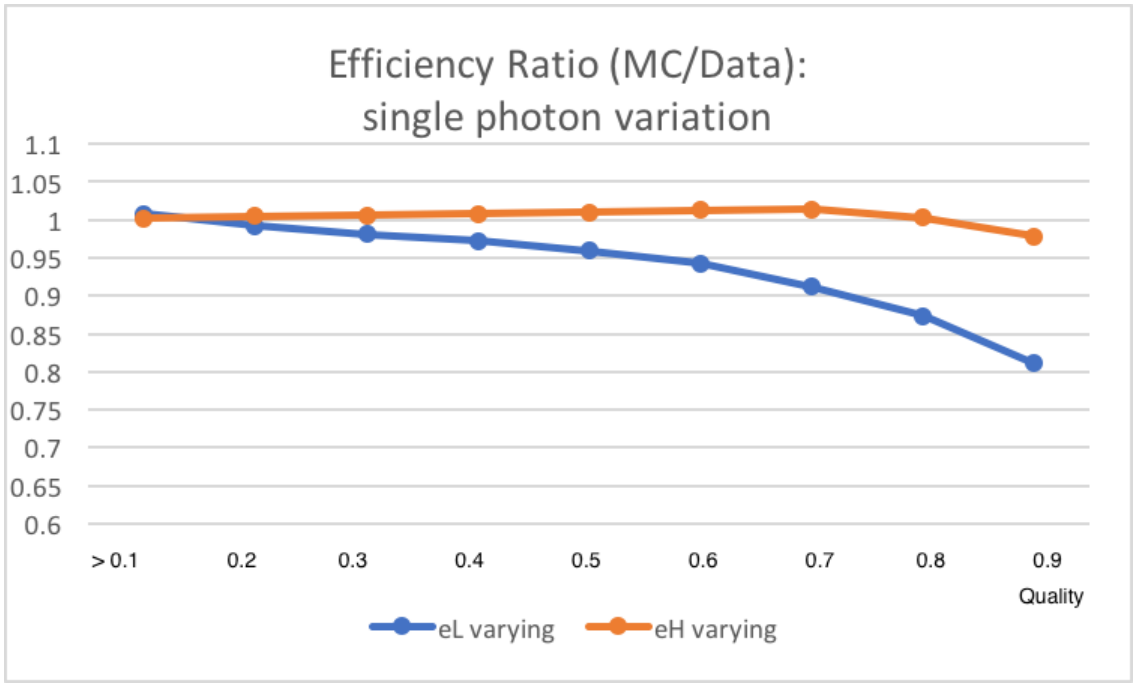
Efficiency by Energy Range

- Efficiency ratios were calculated for events with photons in different energy ranges:
  - Both have E $>$ 1 GeV (orange)
  - One is E $>$ 1 GeV, the other E $<$ 1 GeV (yellow)
  - Both are E $<$ 1 GeV (gray)
  - Photons are within any energy range (blue)



Single Photon Inclusive π^0 Studies

- eL is the lower energy photon in the reconstructed π^0
- eH is the higher energy photon in the reconstructed π^0
- In this study, one of the photons is held at a quality cut of > 0.5 while the other is varied



Next Steps

- Compare π^0 skim (data) with bggen for various requirements on the number of tracks in the event
- Conduct studies of the efficiency as a function of photon energy
- Compare MLP inputs to trace source of the discrepancy
- Goal: define suggested quality cut and the systematic error on the associated efficiency (which may be energy dependent)