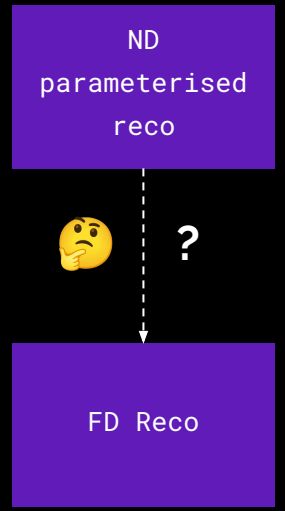
NDFD translation: Paired Training Dataset Update

Colin Weber, Alex Wilkinson

Reco to reco translation

Slide from Radi Radev

- PRISM analysis currently relies on an interaction model to correct for ND and FD effects.
- These do not completely cancel out between the ND and FD due to detector differences.
- Using the paired data we can perform a data driven *unfolding* using all of the reco information.



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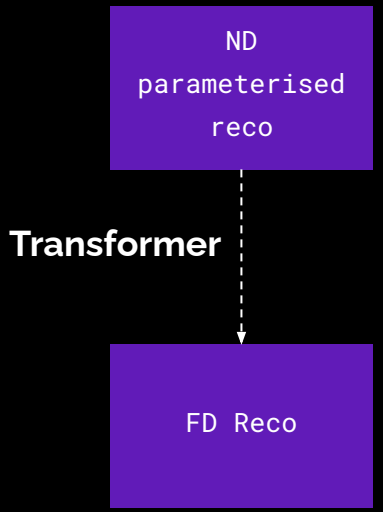

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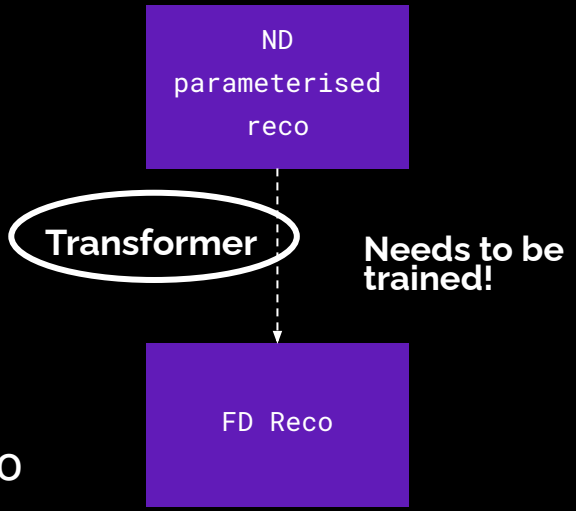
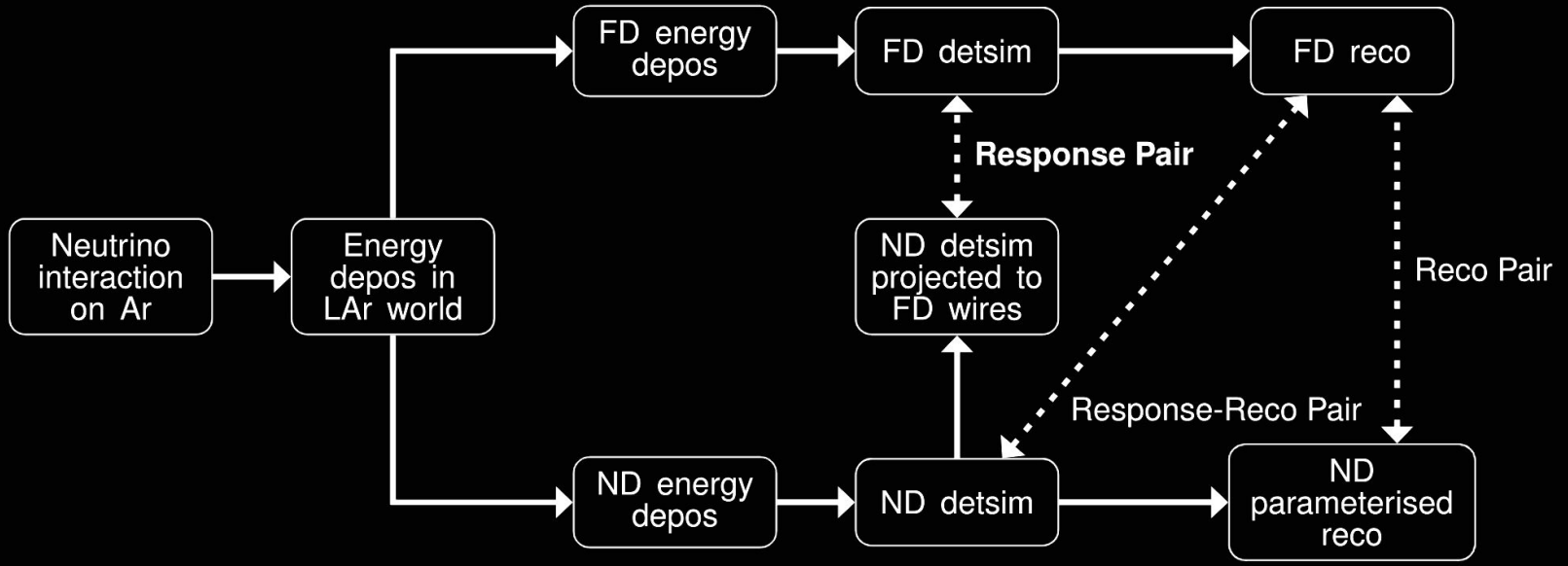


Paired near-to-far dataset

Diagram from Alex Wilkinson



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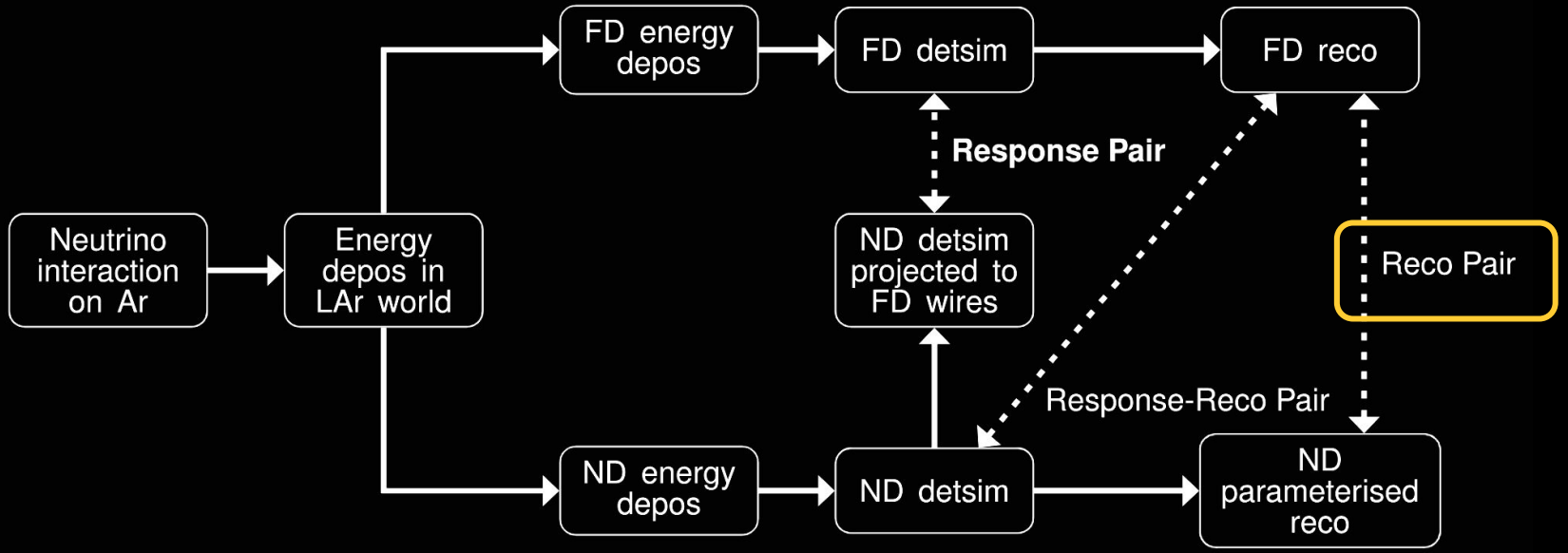
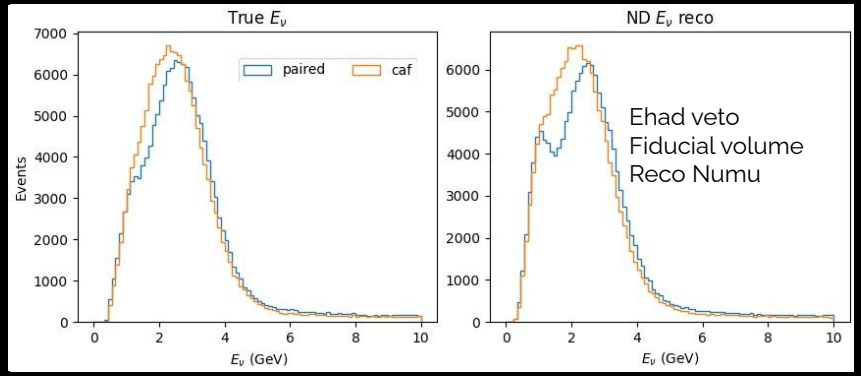
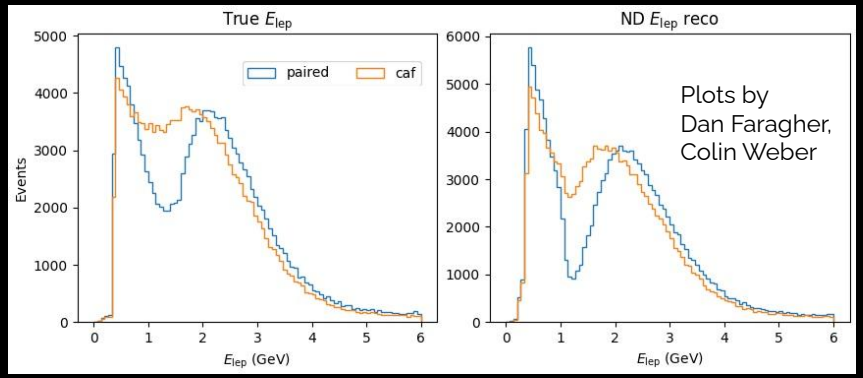


Initial validation showed discrepancies between ND simulation, paired data

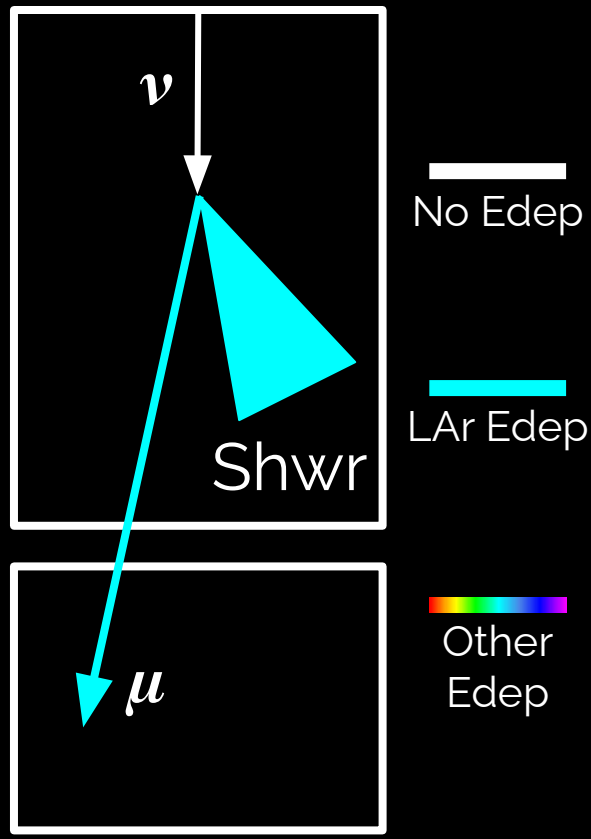
Unexpected features in paired data



ND-Lar



TMS



DEEP UNDERGROUND NEUTRINO EXPERIMENT

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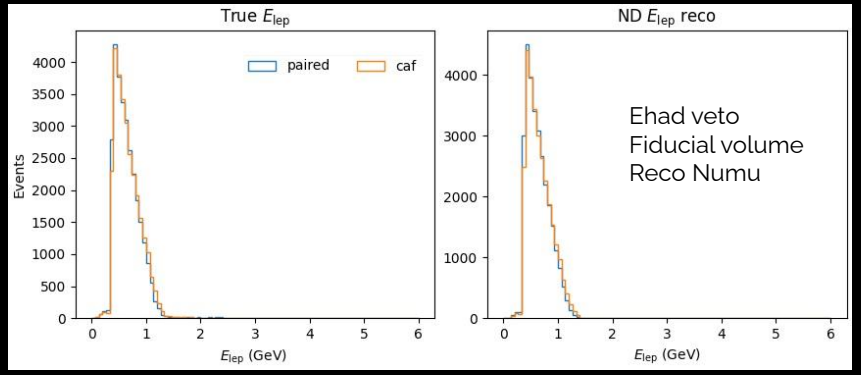
Paired Dataset Update
30 October 2024

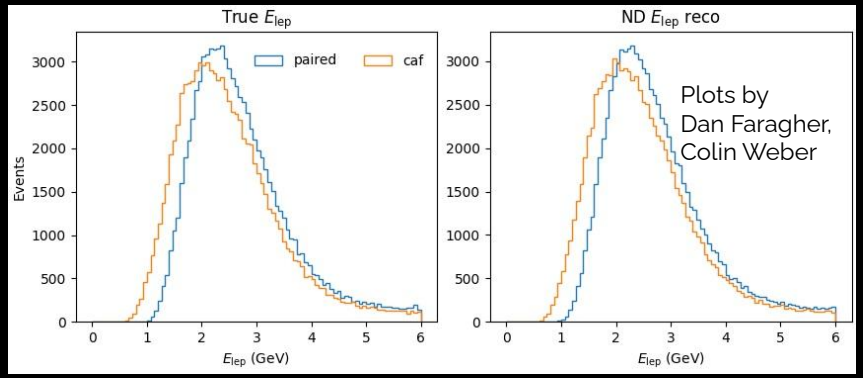
Likely solution: resimulate muon

Muon contained



ND-Lar

Muon tracker-matched



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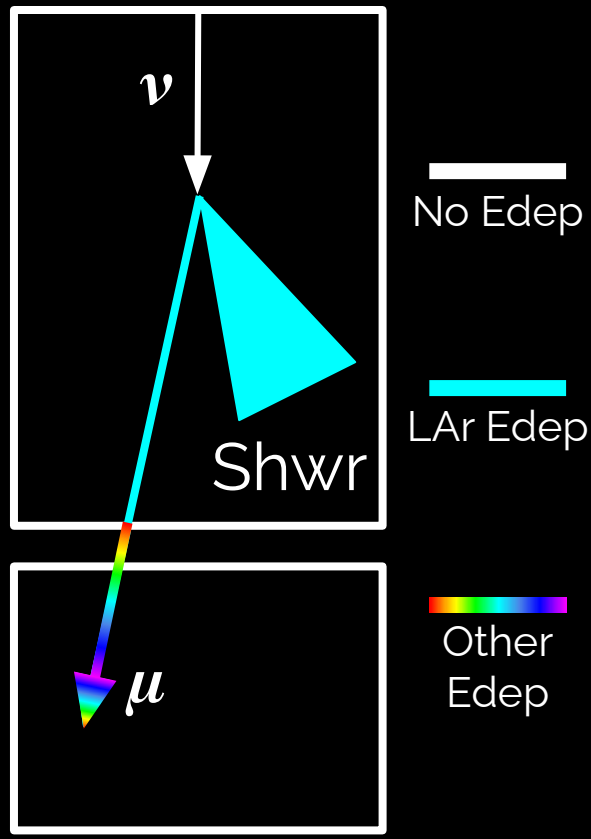

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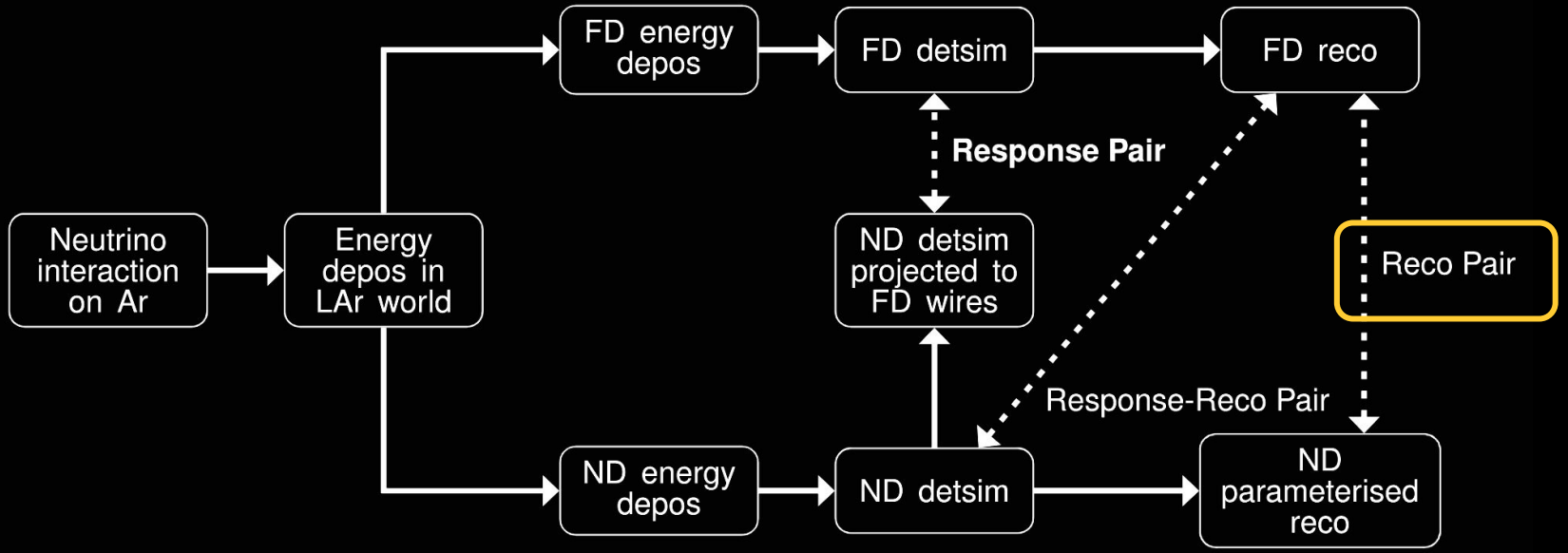

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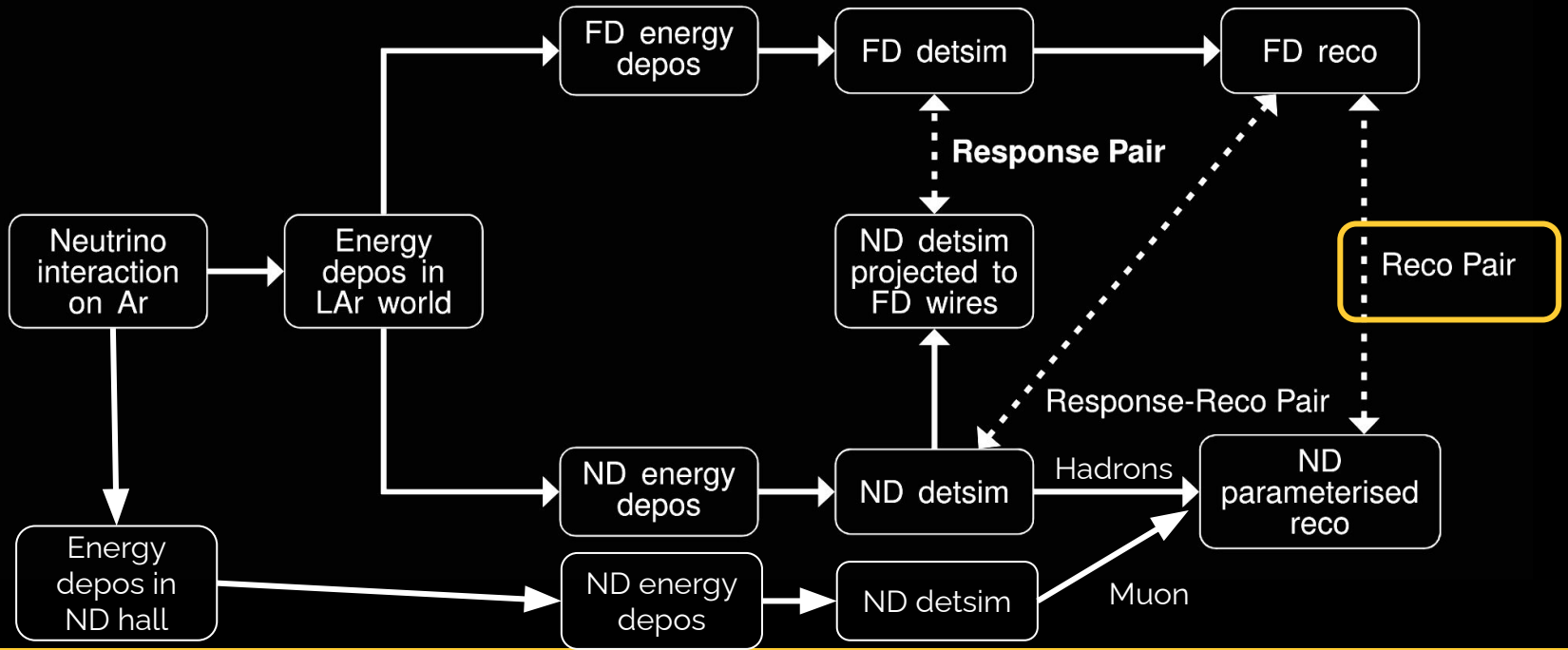
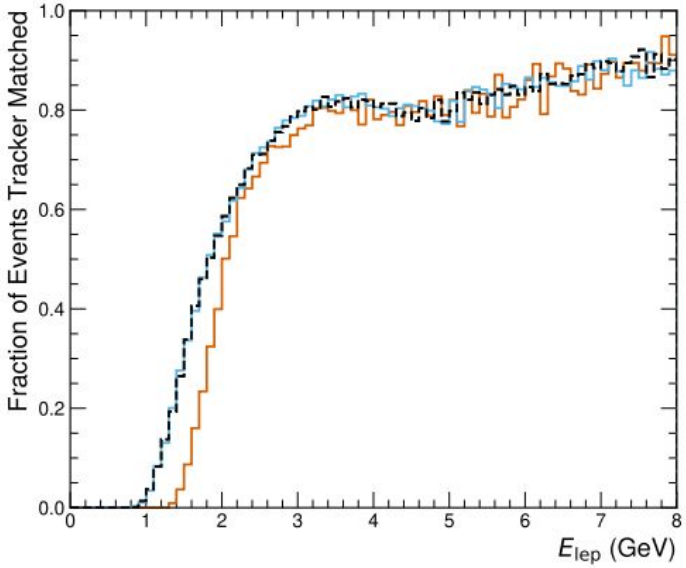
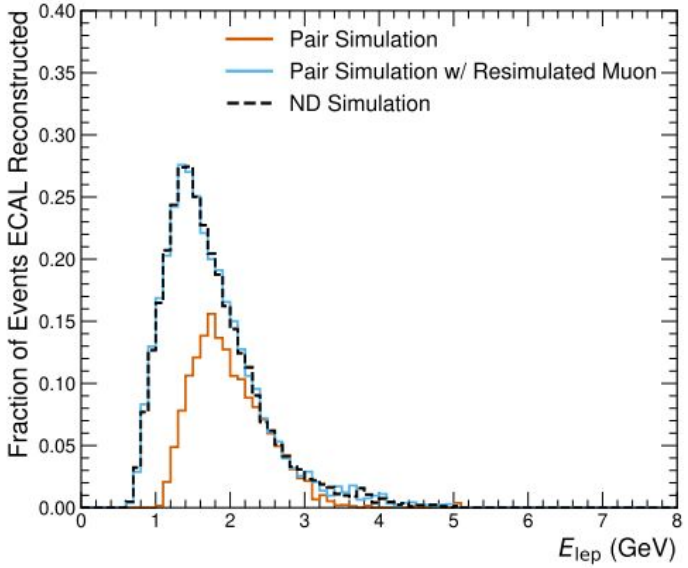


Re-validating paired dataset w/ resim. Muon: ND

Effect of Muon Resimulation

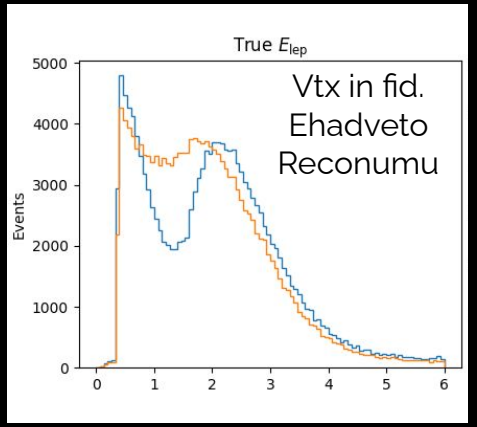


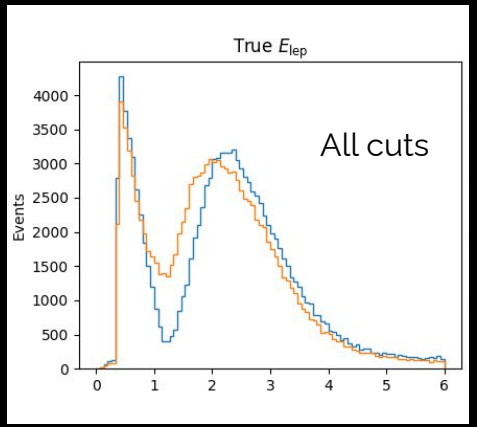


Slide from Alex Wilkinson

New Paired Data Validation 2/9

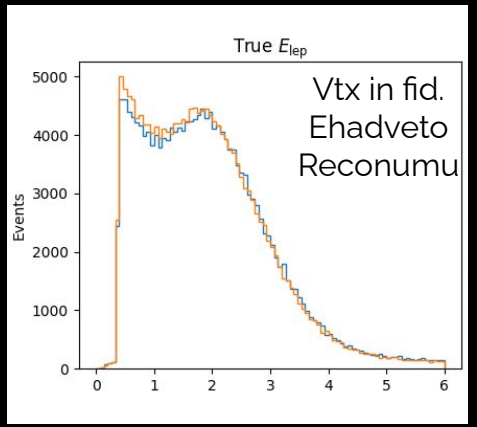
Old simulation

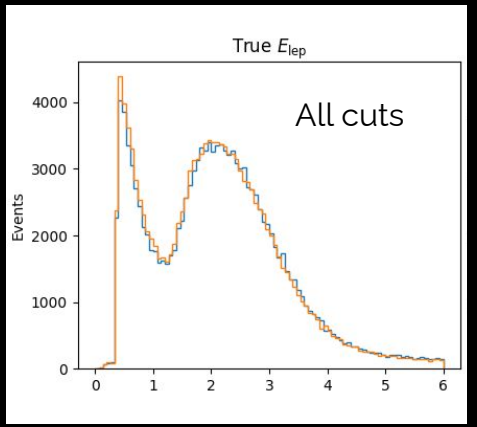




Elep
True

Muon
resimulation





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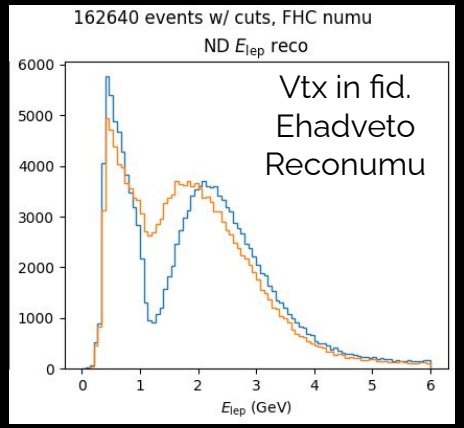
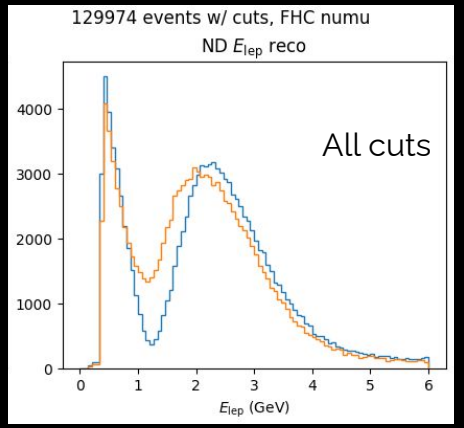
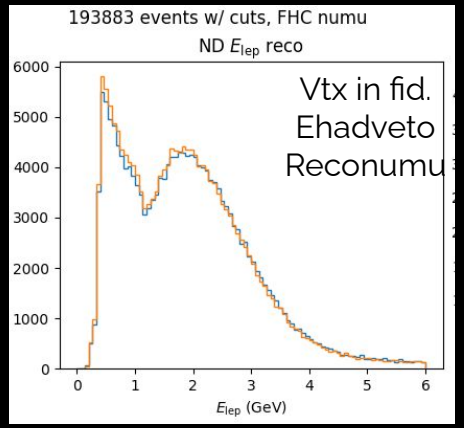
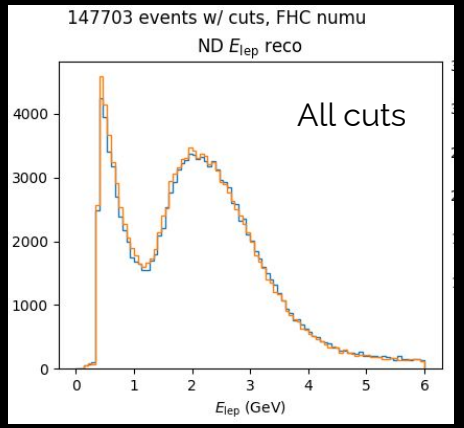




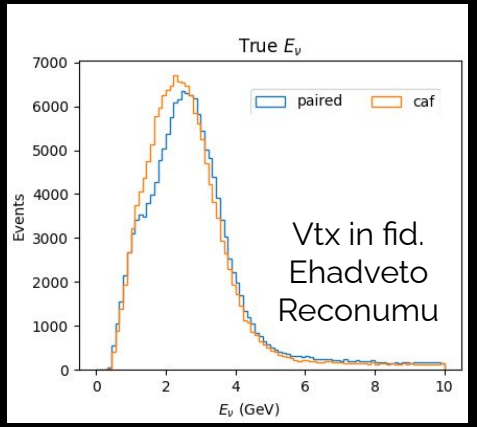
Muon resimulation

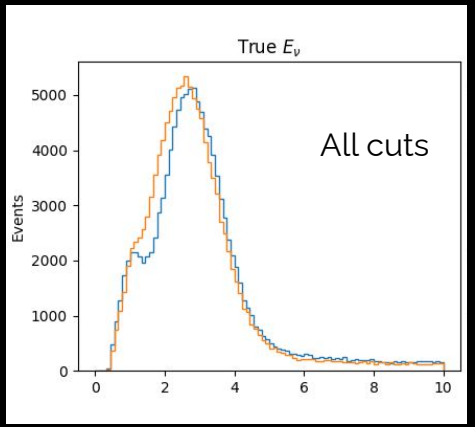




Elep Reco

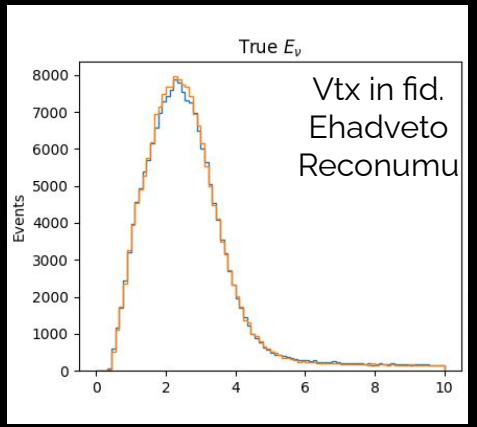
Old simulation

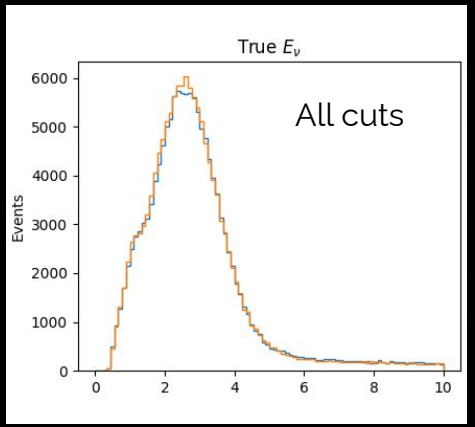




Enu True

Muon resimulation





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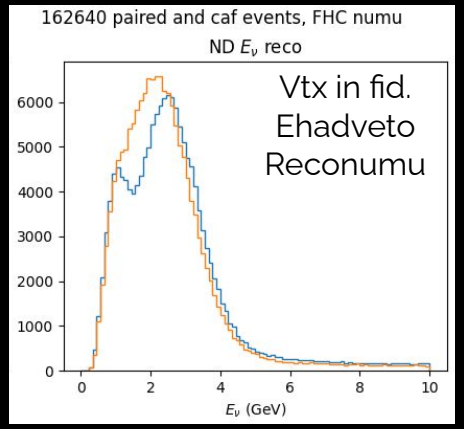
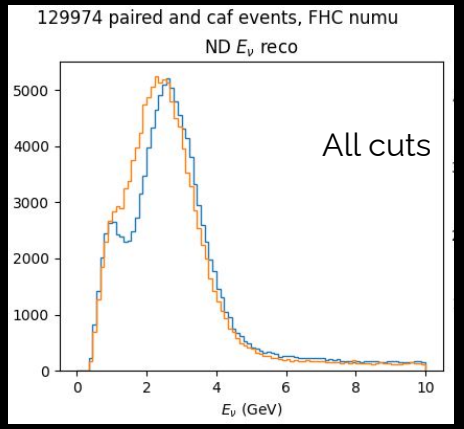
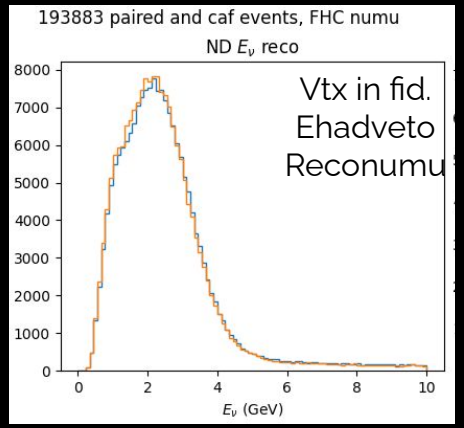
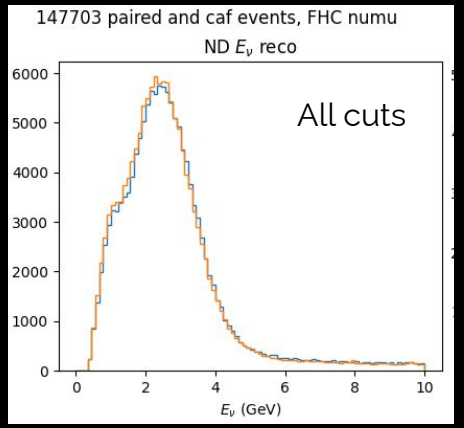






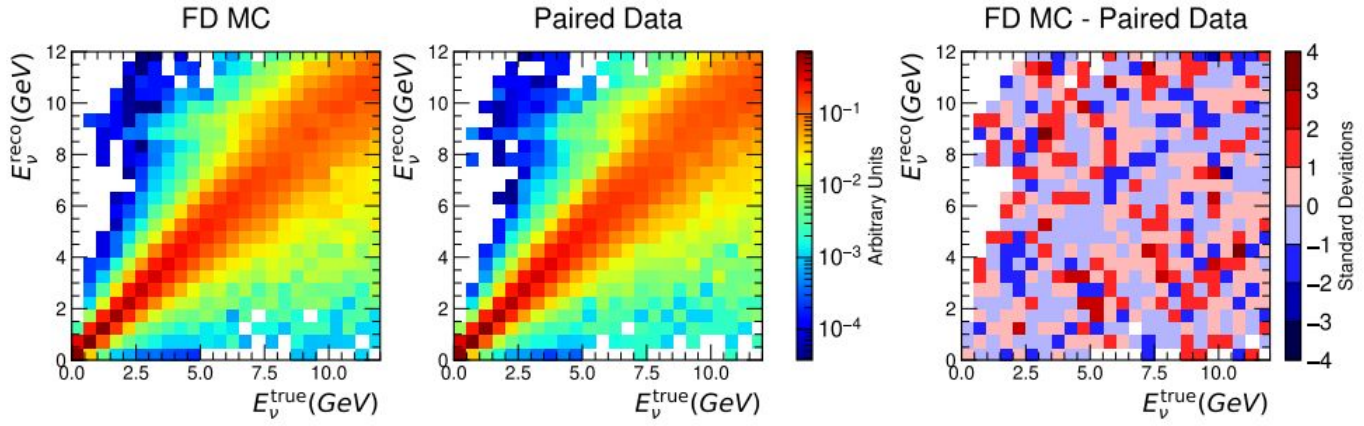


Enu True

Re-validating paired dataset w/ resim. Muon: FD

FD Validation - Nu Energy (Selected)

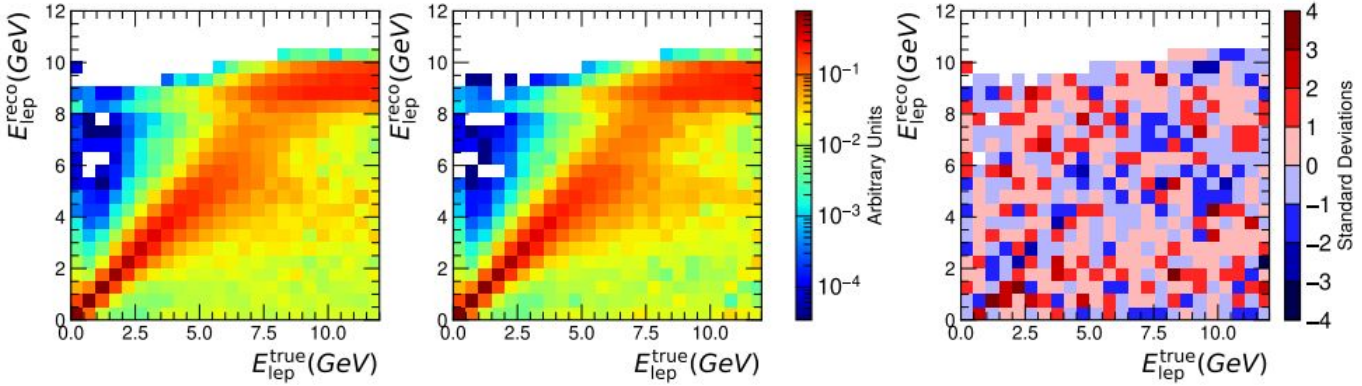
True energy bins normalised to 1



Slide from Alex Wilkinson

FD Validation - Lep Energy (Selected)

True energy bins normalised to 1



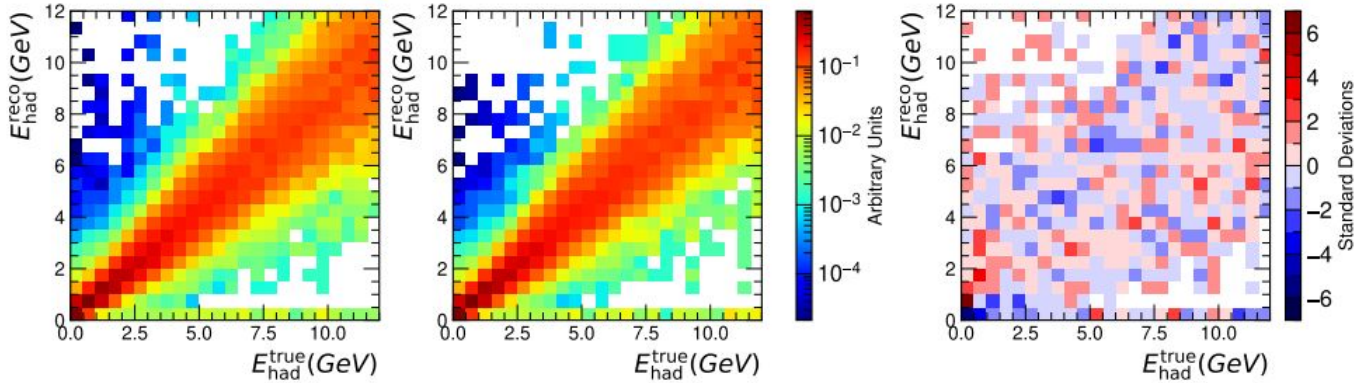
Slide from Alex Wilkinson

New Paired Data Validation

7 / 9

FD Validation - Had Energy (Selected)

True energy bins normalised to 1



Slide from Alex Wilkinson

Next steps

- Retrain transformer on new paired dataset
  - Check how robust transformer is to changes in input data
- Repeat for RHC numubar events
- Start exploring paired datasets with oscillations
  - Simulate “tripled” or “paired-paired” datasets with numu and nue