# Event-types based analysis for LST-1

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# Introduction

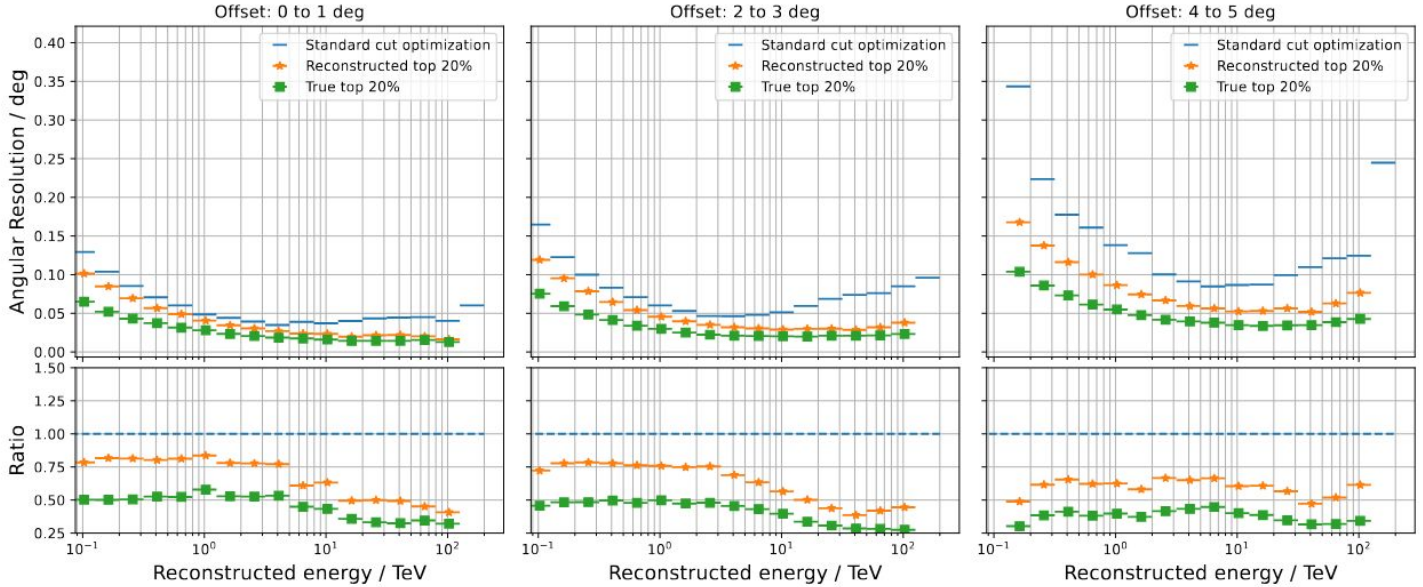
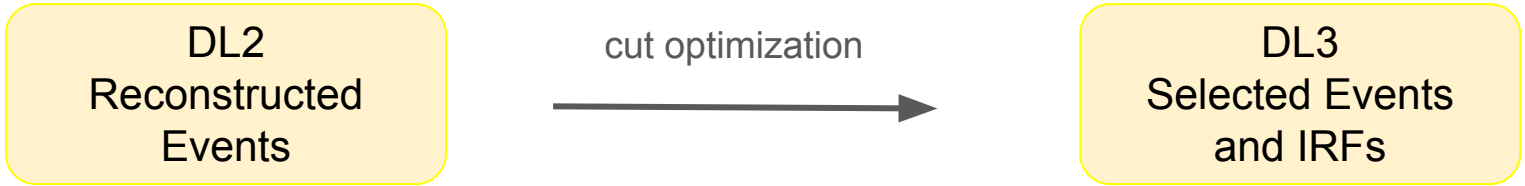



**Figure 2:** Angular resolution for a 50 hours observation, comparison between the standard cuts case, the reconstructed top 20% events and the true top 20%. Repeated for different offset ranges.

From J.Bernete et al. [https://arxiv.org/abs/2309.11375]

# What is an event-types based analysis?

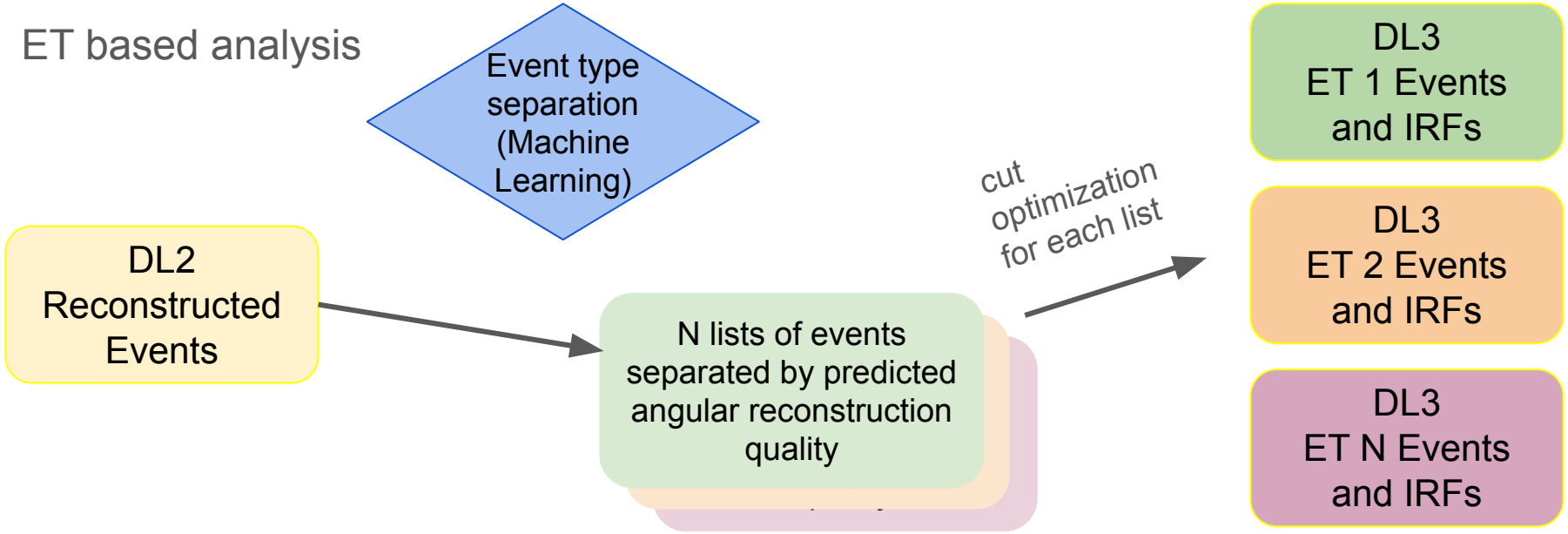
Standard analysis




➔ All selected events are treated equally as if they had the same quality

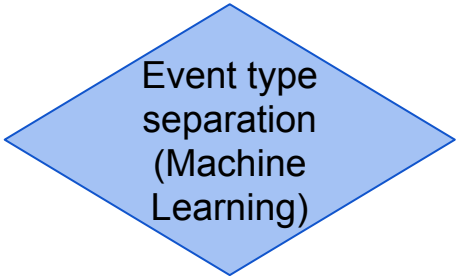
Is there an alternative? ⇢ the event types approach is already successfully used by other experiments

# What is an event-types based analysis?

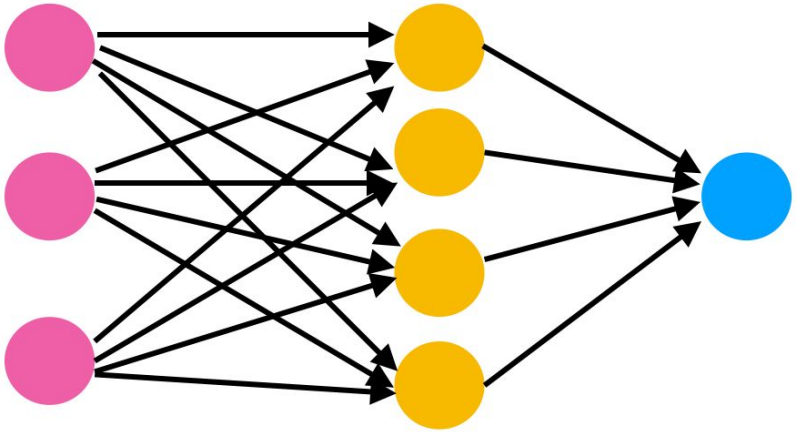



**Event-types analysis**: separate events in subsamples according to their expected reconstruction quality and generate event-type wise IRFs

# The event-types based analysis




We train a Neural Network with MC data to predict the angular reconstruction quality of the events and define a threshold per energy bin to do the separation



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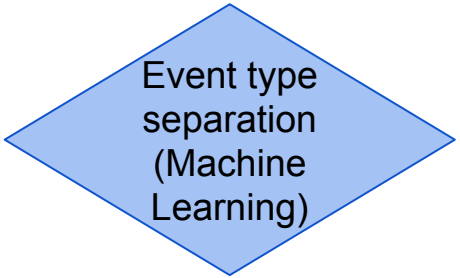


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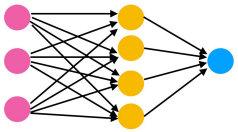
- Multi-Layer Perceptron **regressor**

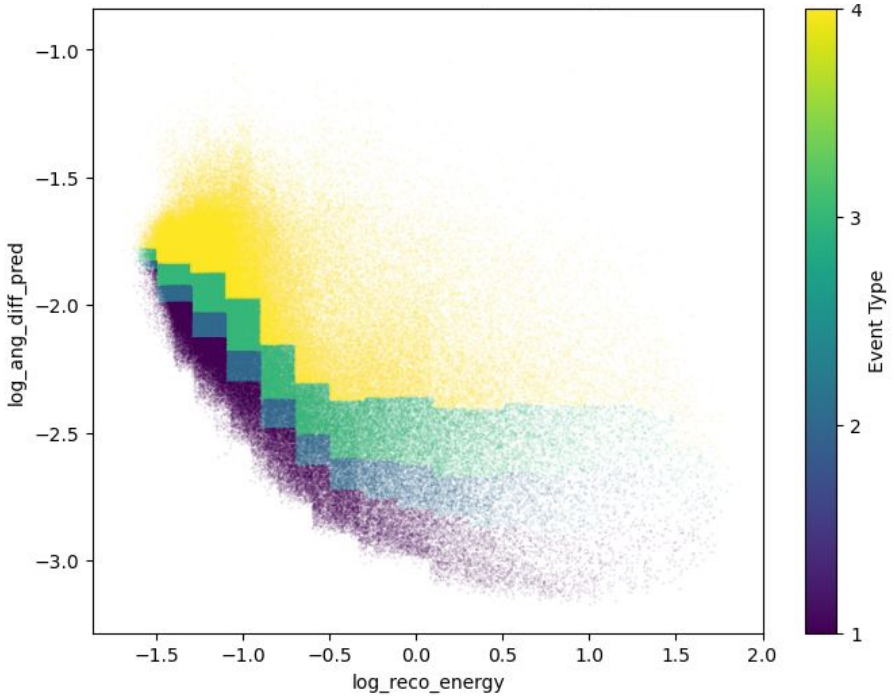


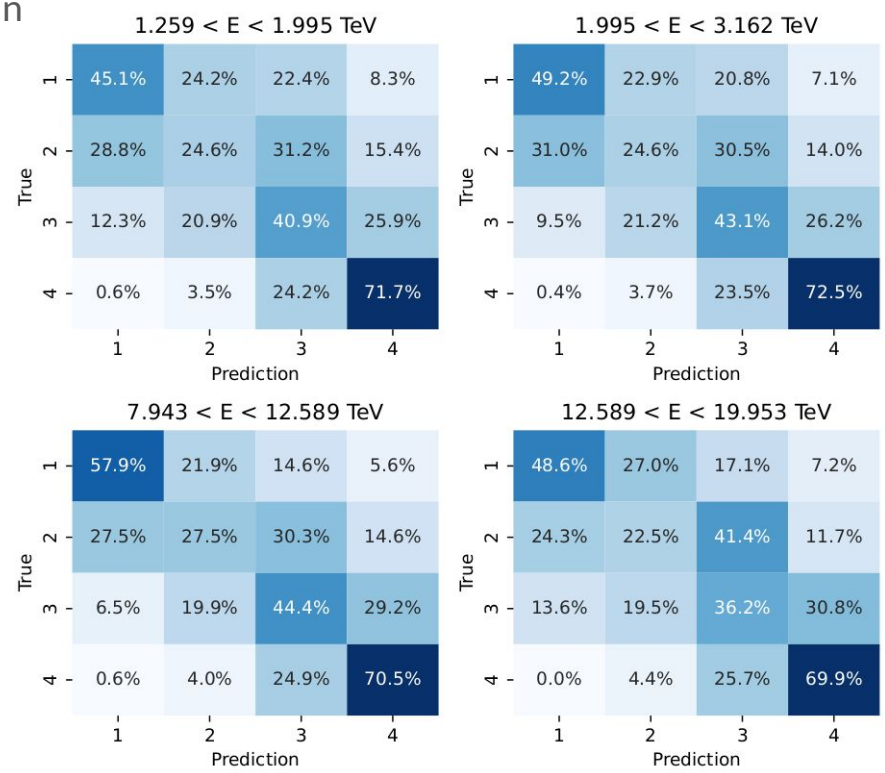
- Activation function: tanh
- Normal output distribution
- Two hidden layers with 36 and 6 neurons respectively
- Input: all DL1 and DL2 reconstructed parameters

# Event-types based analysis for LST-1

MC: 20240918_v0.10.12_allsky_nsb_tuning_0.22, dec line 2276

*We need to adapt the methodology to work with lstchain

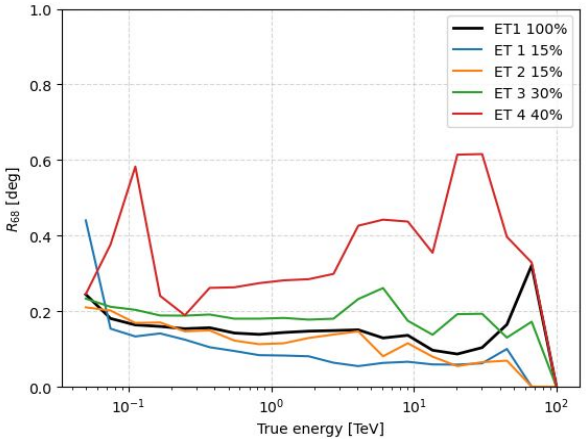


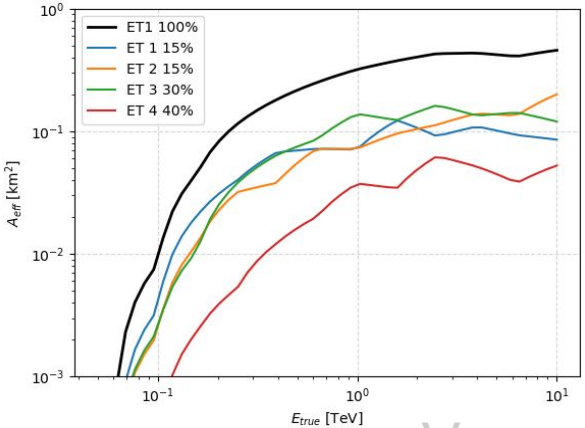



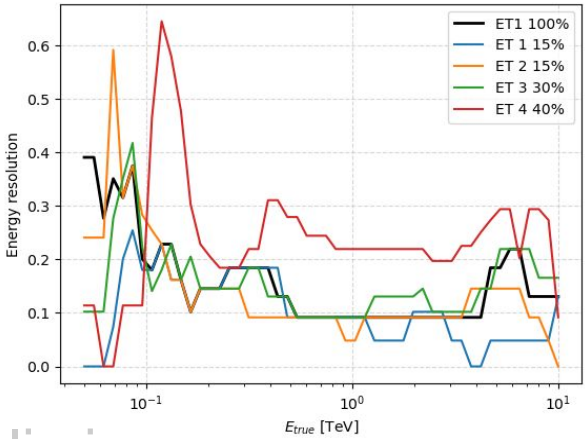
# Event-types based analysis for LST-1 using real data

→ Using `lstchain_create_irf_files` and a Event Type partition of 15,15,30 and 40%

* Decide how to generate bkg IRF
* Need to copy the simulation configuration from the original MC file into the ET-wise MC with the correct format for lstchain
* Also, correct n_showers by the fraction used in the testing (in this case train/test 0.25/0.75)

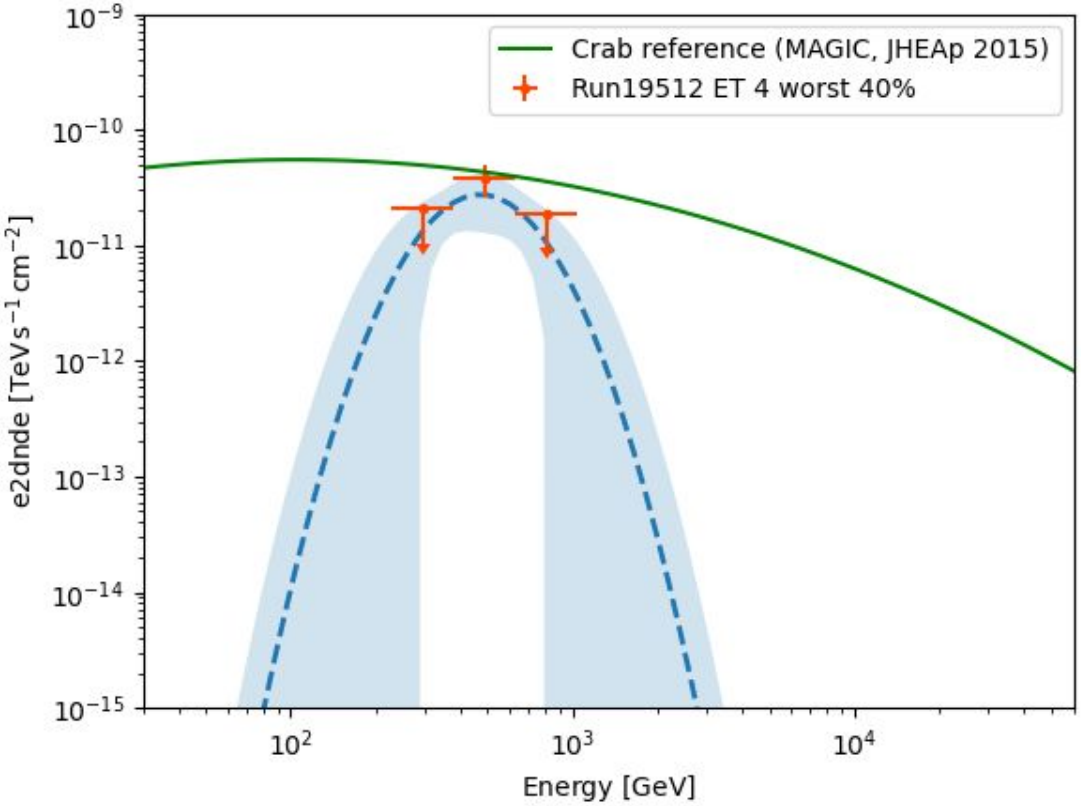



Very preliminary results!!

# Event-types based analysis for LST-1 using real (Crab) data

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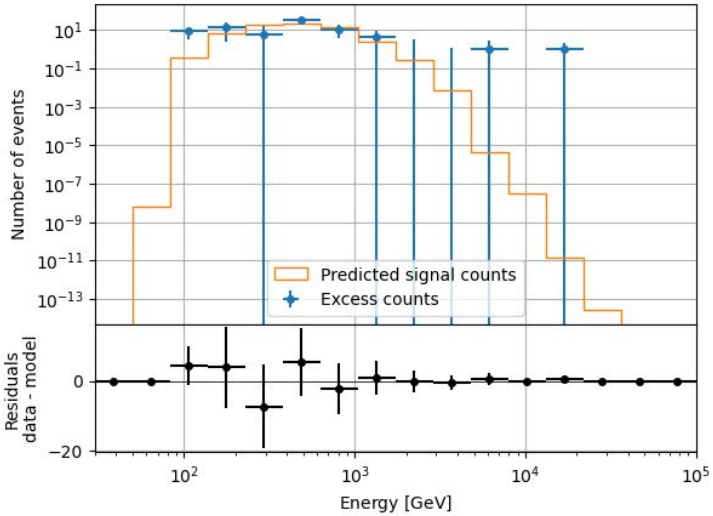

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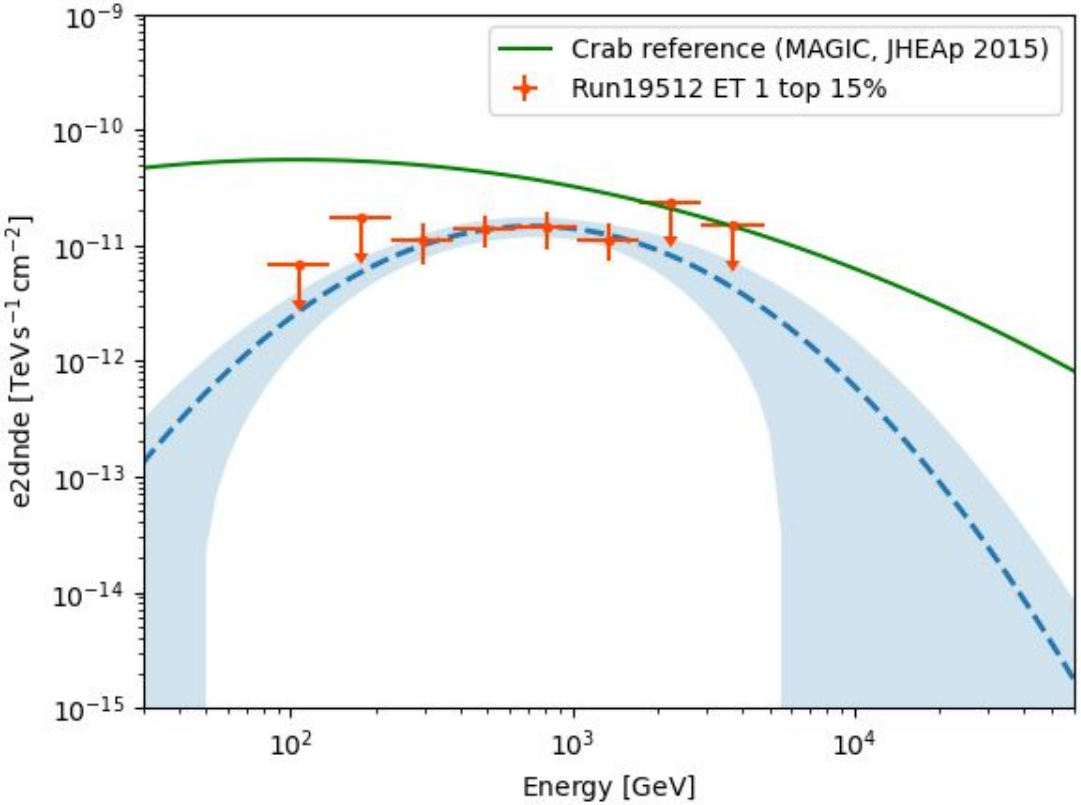


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