



ER/NR discrimination

Status Update

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Tasks

ER/NR discrimination

- Develop strategies to improve detection of events:

- Signal efficiency (NR)
- Background rejection

Machine Learning approach

- Simulations to train the models.

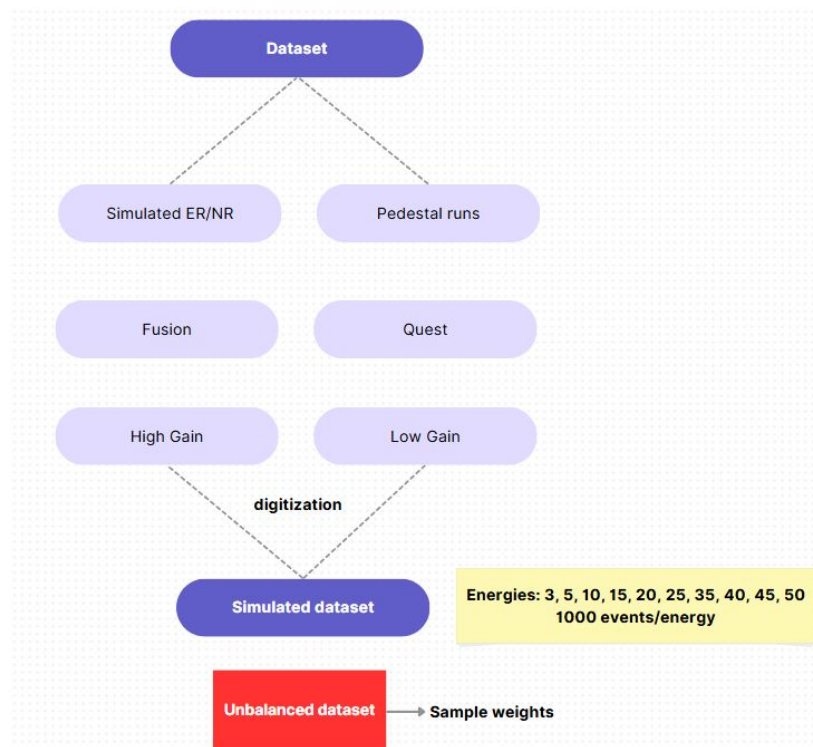
- "cnaf-storage/cygro-sim/LIME_MC_ER"
- "cnaf-storage/cygro-sim/LIME_MC_NR"

On going

- High gain
 - Fusion
- } Digitization and reconstruction finished ✓

Next steps

- Low gain + Fusion
 - Quest
- } Evaluate and compare



Tasks

Strategies

- Supervised learning
 - Binary classification ✓ (old dataset)
 - Multiclass classification → On going

On going

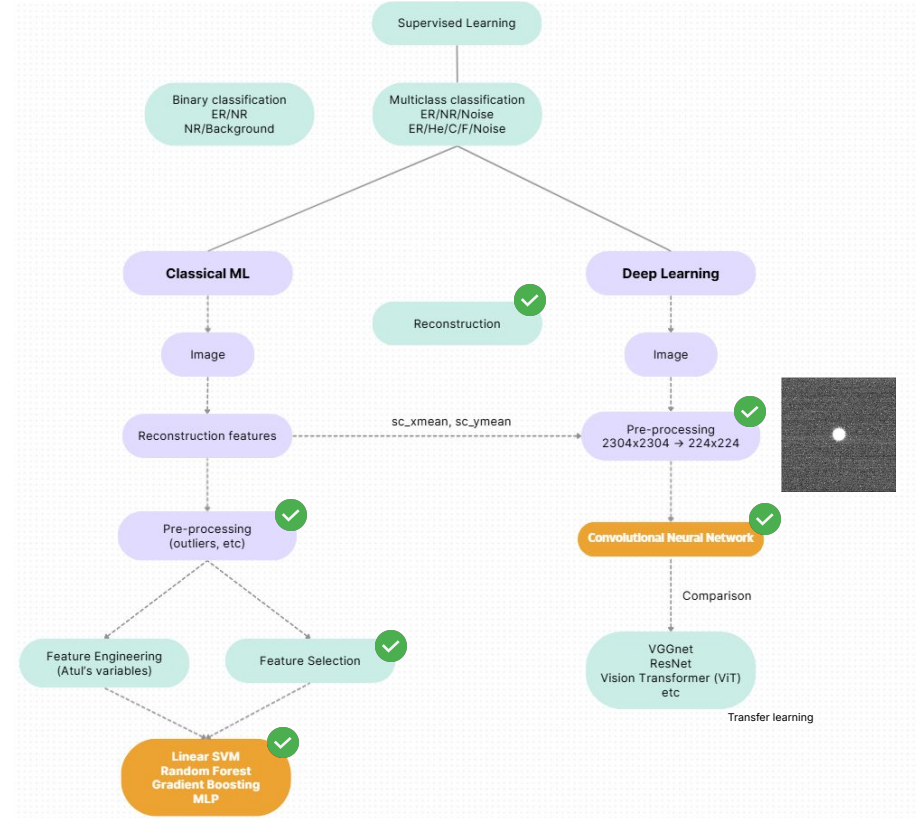
- Classical ML (Feature-based)
- Deep learning

Training pipeline is done. ✓

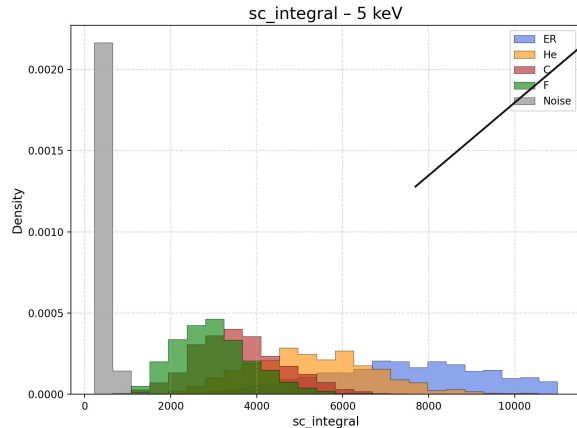
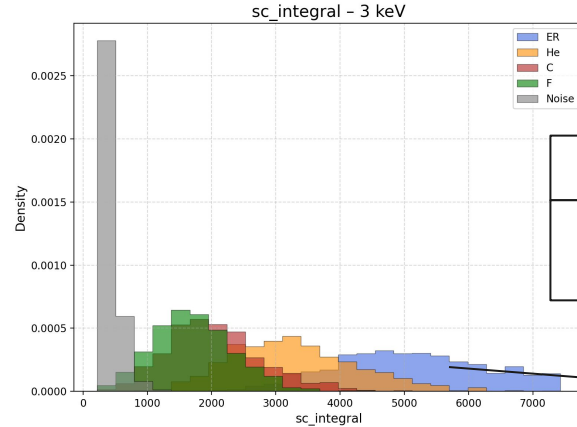
Just need to change the dataset and rerun the code.

Next steps

- Evaluation and comparison between all strategies.
- Evaluation on real data.



Current challenge



3, 5, 10, 15, 20, 25, 35, 40, 45, 50

Currently, discrete energy levels

Multiclass classification problem:

Noise, **ER**, **NR**

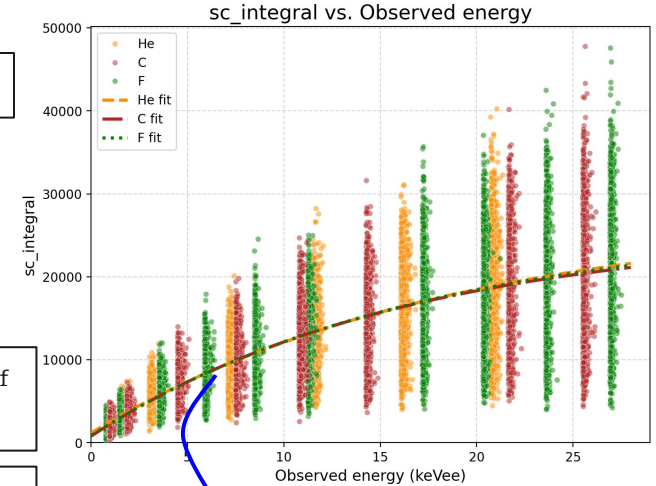
From the histograms, we could think of discriminating between **He**, **C**, **F**

But we should compare the distributions with the same observed energy (keV_{ee})

X events/energy :

3, 5, 10, 15, 20, 25, 35, 40, 45, 50 keV

X events uniformly distributed from 3 to 50 keV



The features distribution and shape would be the same in continuous energies?

if same_distribution:

num_classes = 3

labels = ['Noise', 'ER', 'NR']

else:

num_classes = 5

labels = ['Noise', 'ER', 'He', 'C', 'F']

reduce
computational cost

GPU **not** available
in the cloud

**Thank you
for your attention!**

Questions, suggestions?