RIPTIDE

September 2025

Gen-Z **Learner's Dictionary**

Basso chiave: *idiom. , gerg. –*

Courtesy of N. Pieretti

RIPTIDE

1) Optimal and fast threshold to discriminate signal VS noise

a) visual discrimination between singal and noise

b) parameters extraction from each image

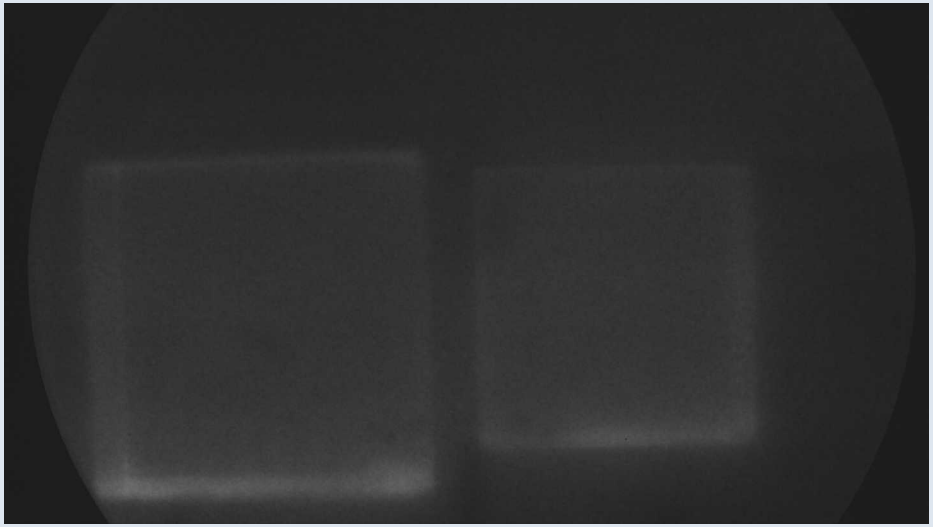
(e.g. number of white pixels, mean of all pixels, etc)

c) choice of the optimal thresholds for each parameter

1) Optimal and fast threshold

i.e. fast enough to be runned in framegrabber

Mask



Used for reference to check where the signal is expected to be

Example of Signal

Setup CsI + mirror at 45° + optics + Hicam

Framerate = 64 fps

1) Optimal and fast threshold

i.e. fast enough to be runned in framegrabber

a) visual discrimination of noise VS signal

All the images with a signal, i.e. a surplus of photons both in the scintillator region and in the mirror region was tagged as signal,

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a) visual discrimination of noise VS signal

All the images with a signal, i.e. a surplus of photons both in the scintillator region and in the mirror region was tagged as signal,

Counted 39 muons out of 13676 frames

CERN, 1965

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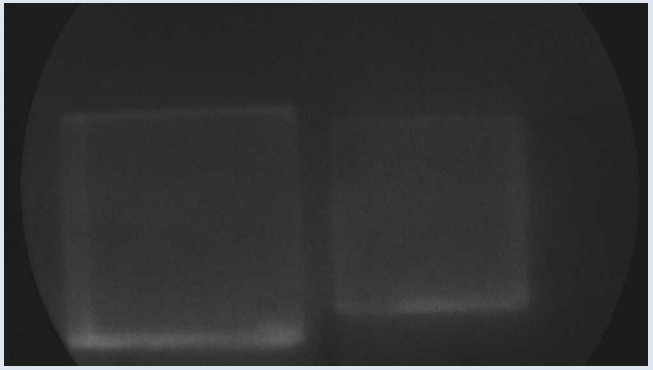
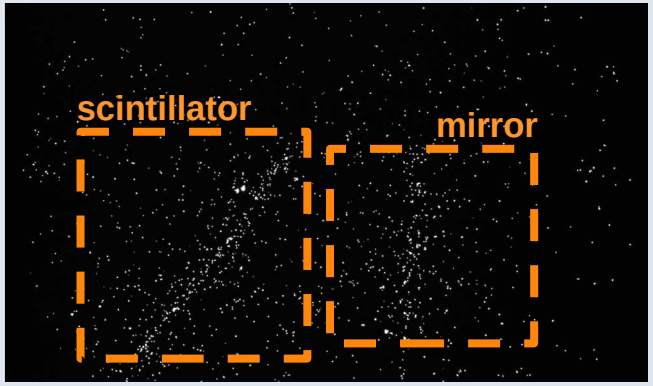
a) visual discrimination of noise VS signal
b) parameters extraction from each image



Parameters:

- mean grey level of all pixels
- mean grey level in the region of interest of the scintillator
- mean grey level in the region of interest of the mirror
- number of white spots in the entire image



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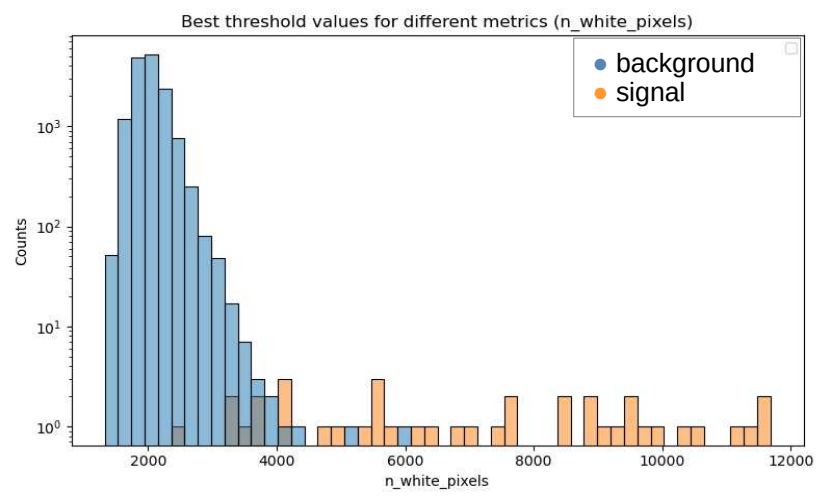

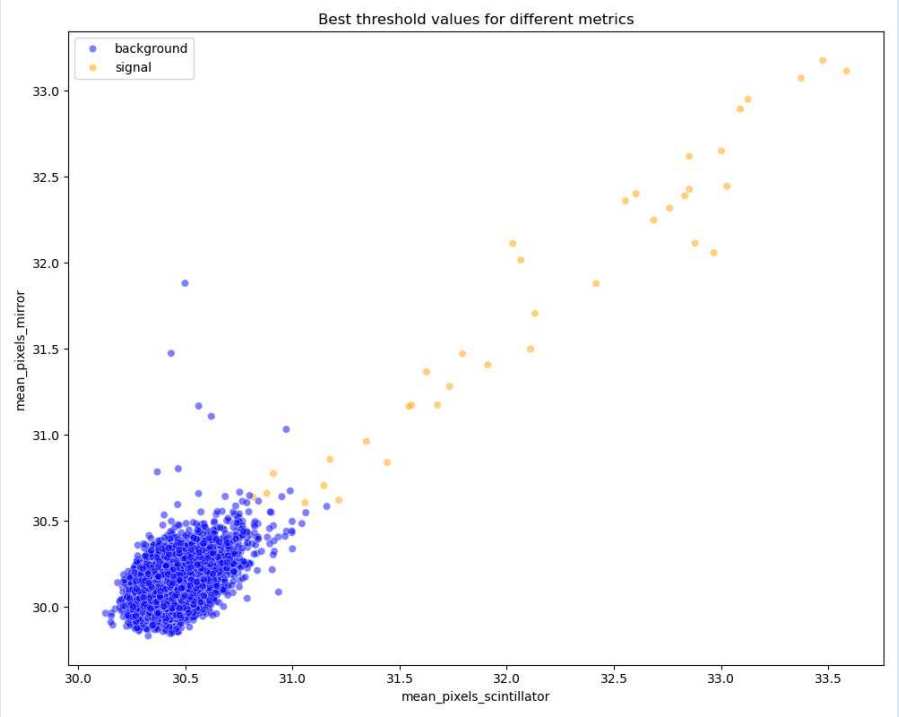

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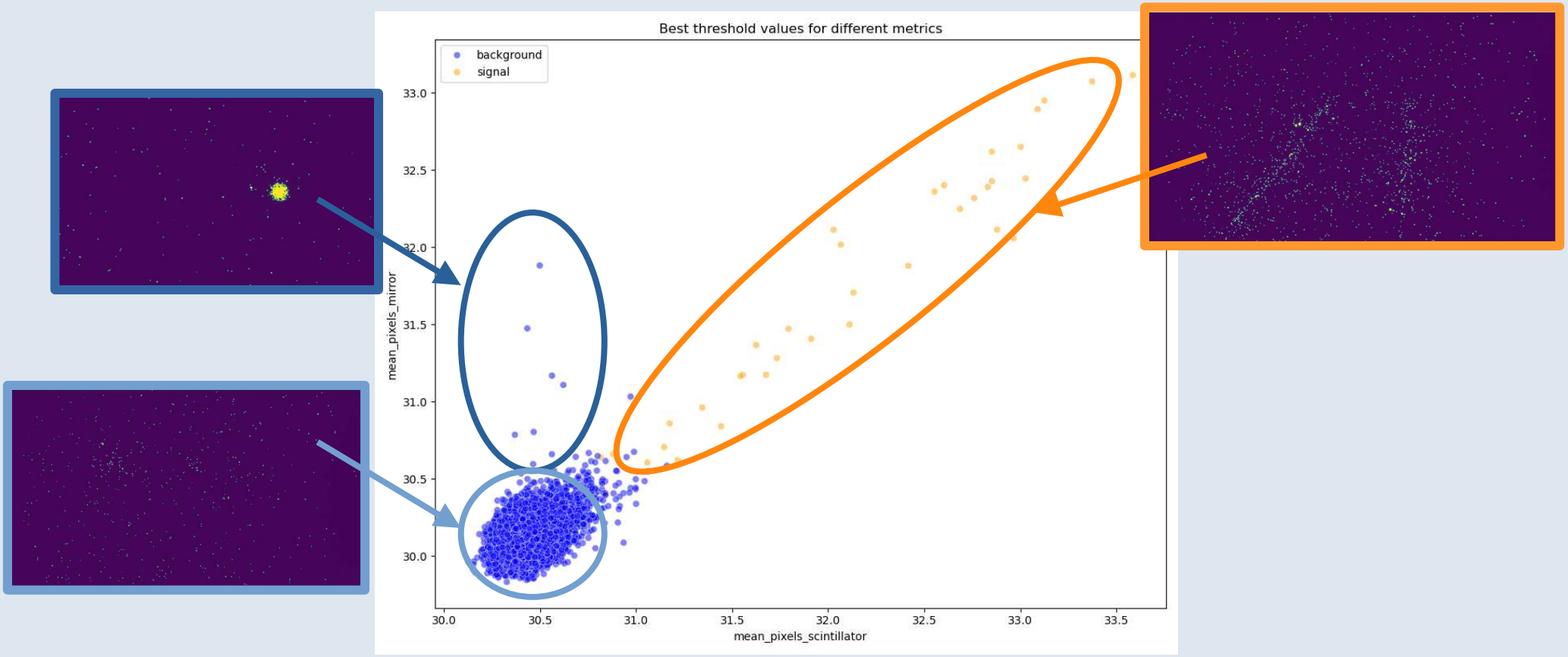

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c) choice of the optimal thresholds for each parameter

Problem: high clusters inbalance, so accuracy and precisions doesn't work.

Used metrics that take in acocunt the cluster imbalance

- **Balanced Accuracy:** gives equal weight to both classes, regardless of imbalance.

$$BA = \frac{1}{2}\left(\frac{TP}{TP+FN} + \frac{TN}{TN+FP}\right)$$

-**F1-score:** Focuses on how well you recover signal events, at the cost of possibly misclassifying some noise.

$$F1 = \frac{TP}{TP + 0.5\,FP + FN}$$

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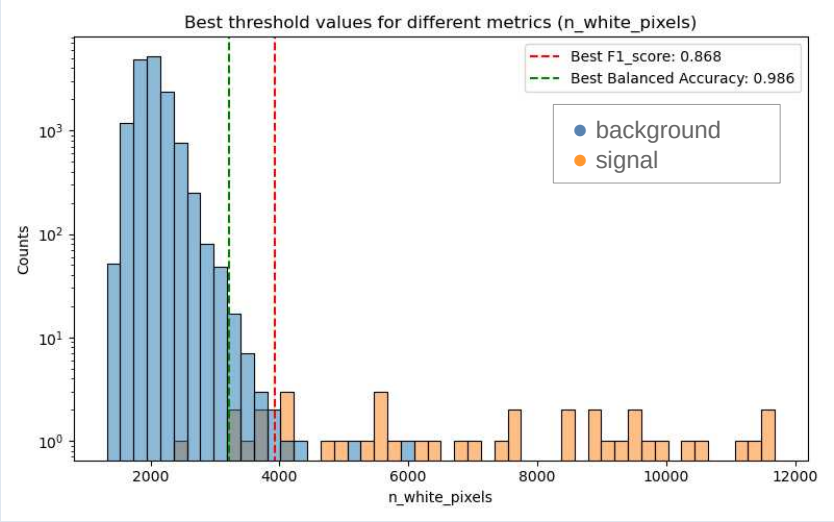
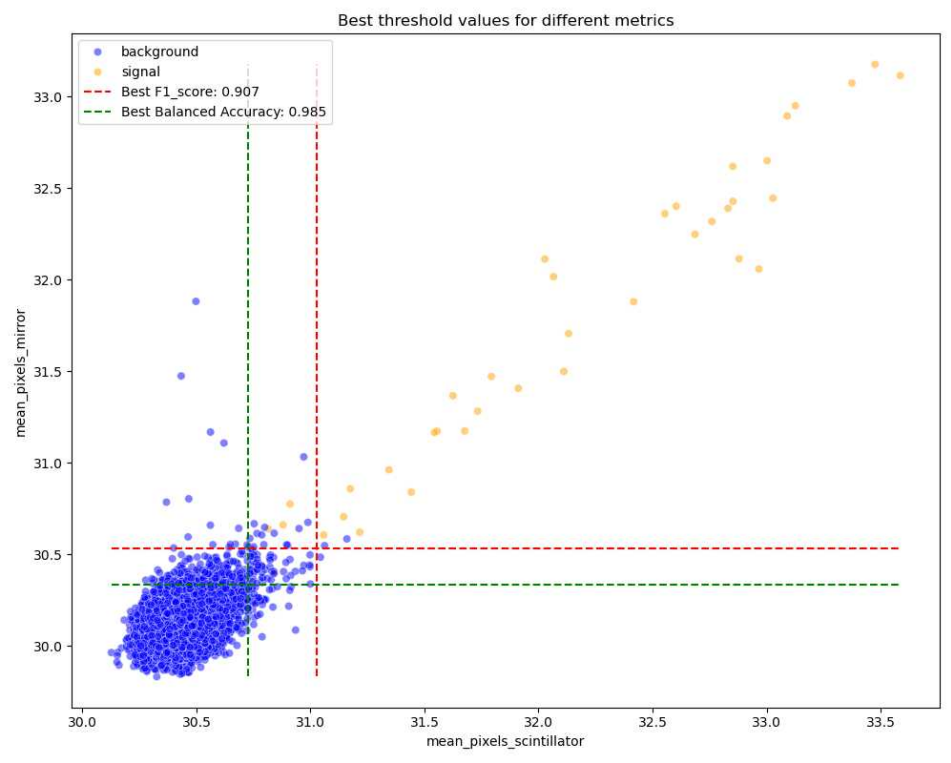
Using BA and F1 metrics, it is possible to fint the optimal parameters to separate signal and background





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	F1-score		Balanced Accuracy	
	True Positives	False Positives	True Positives	False Positives
Mean pixels on mirror	31	5	38	343
Mean pixels on scintillator	33	1	38	110
Mean pixels on entire image	30	0	38	56
Mean pixels on both scintillator and mirror	34	2	38	70
Number of saturated pixels	33	4	38	28

SLOW

Signal = 39 // Noise = 13676

CONCLUSIONS

a) Few events (39)

b) discrimination between signal and background using simple methods is sufficiently fast to discriminate with a framegrabber

c) now? We are waiting for computer and the MCP

THE END