Machine learning based background rejection for Baikal-GVD neutrino telescope

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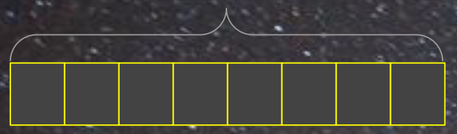
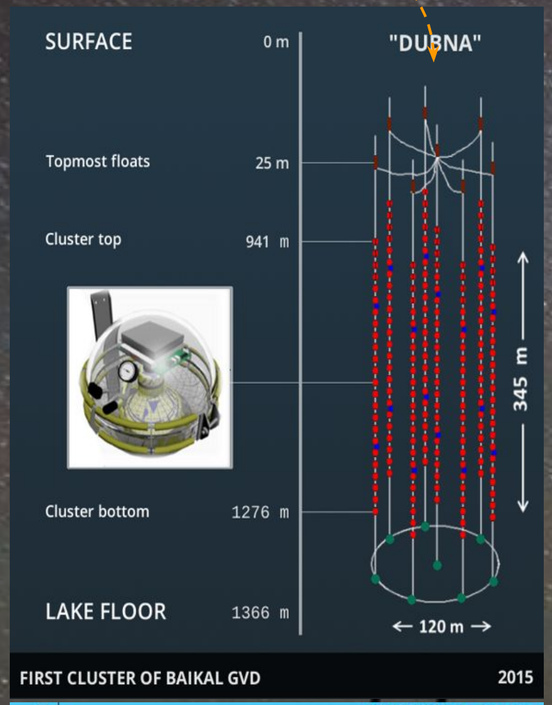
112 “optical module cells”

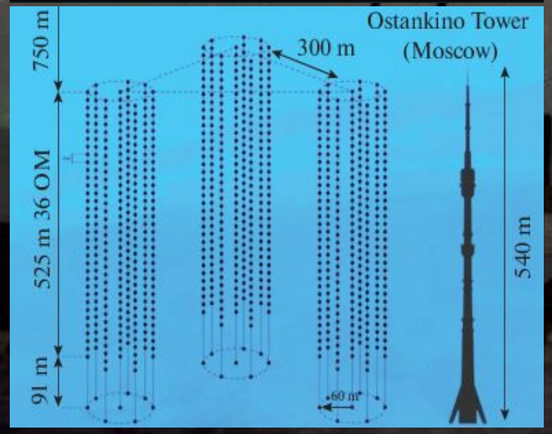


Time-ordered data

Data in an optical module cell:
1-3) x, y, z coordinates
4) integral signal of the optical module
5) activation time
6) mask (real or dummy)

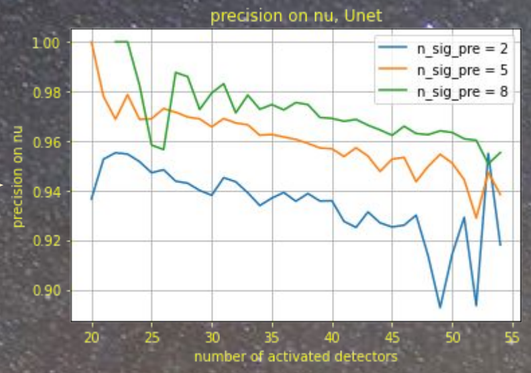


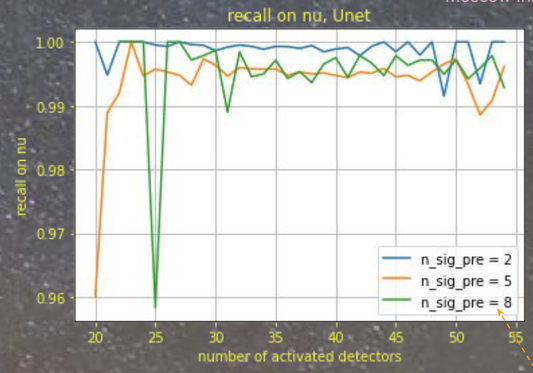
FIRST CLUSTER OF BAIKAL GVD 2015



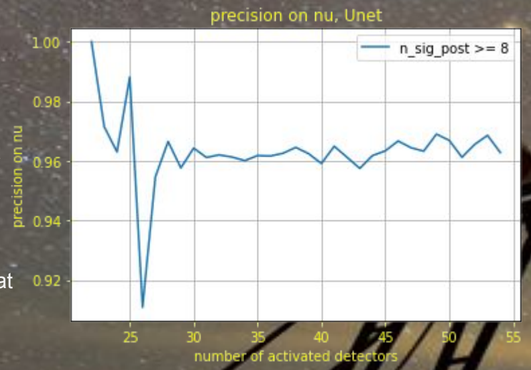
Results for nn trained on all events.

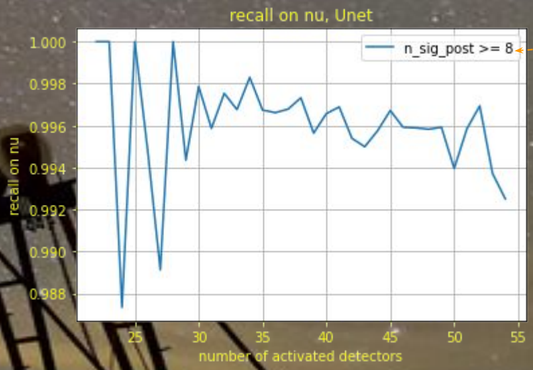
prec = t_s/(t_s+f_s)
rec = t_s/(t_s+f_n)
(t_s - true signal,
f_n - false noise)





Two-step filtering:
1) nn on all events
2) nn on events with at least 5 signal hits
~1% improvement





n_sig_pre/post:
number of signal hits defined from labels/predictions

Problem: high fraction of noise hits in registered events

Goal: given the data of optical modules for a registered event, identify activations due to the background

ML perspective: segmentation problem - for each cell, predict the corresponding binary label (signal or noise)

Set-up: Monte-Carlo simulation for 3rd cluster (out of 8)