

AVANTIX

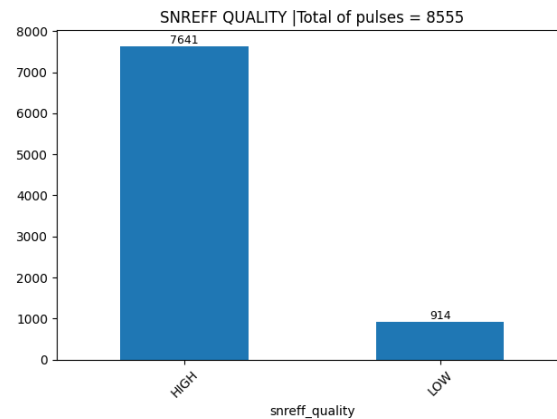
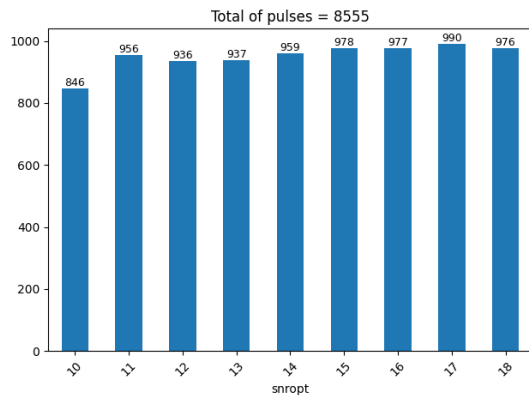
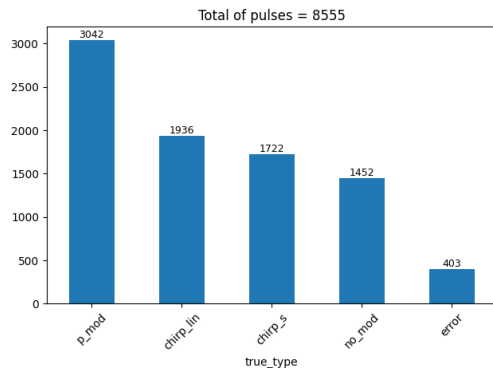
Avancement CBE

AVANTIX

Classification modulation

Jeu de données

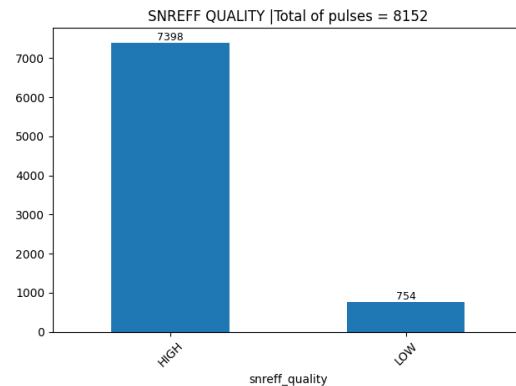
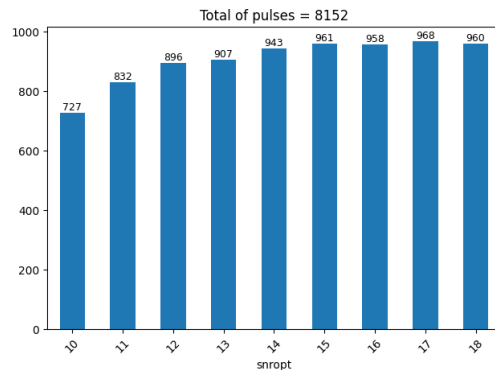
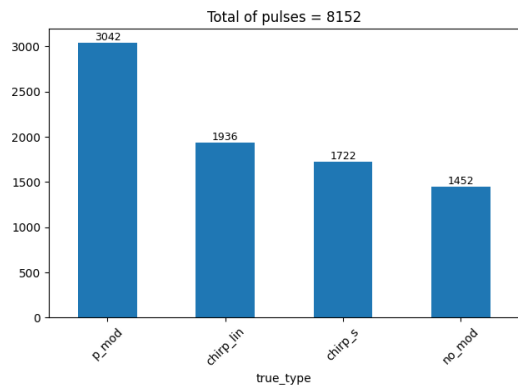
9 fichiers /data/SIGINT/FVE/LEGO_FV/long_LEGO_FV_noP124_snropt_{snropt}_iq.pkl @ 4GSps
snropt = [10, 18] dB



Jeu de données

9 fichiers /data/SIGINT/FVE/LEGO_FV/long_LEGO_FV_noP124_snropt_{snropt}_iq.pkl
snropt = [10, 18] dB

Après suppression des 403 pulses en « error »



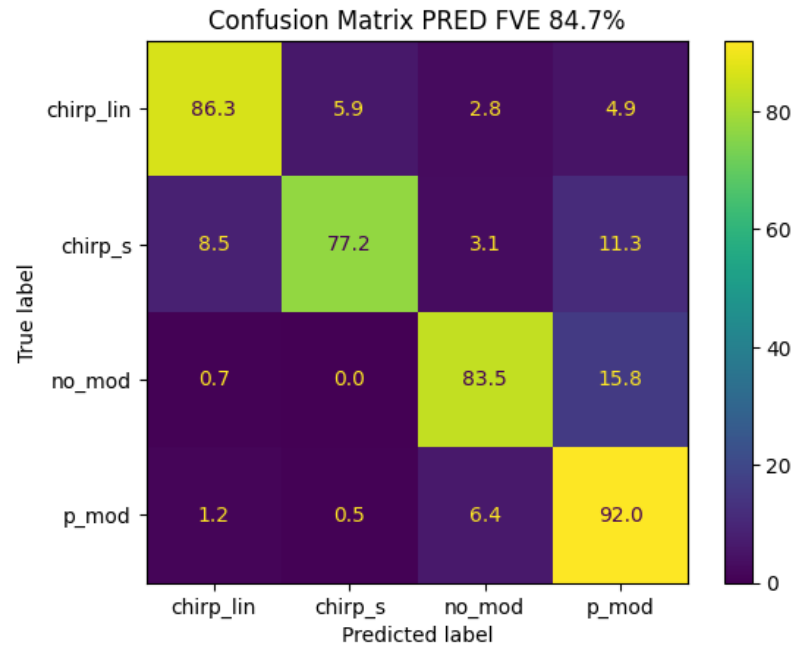
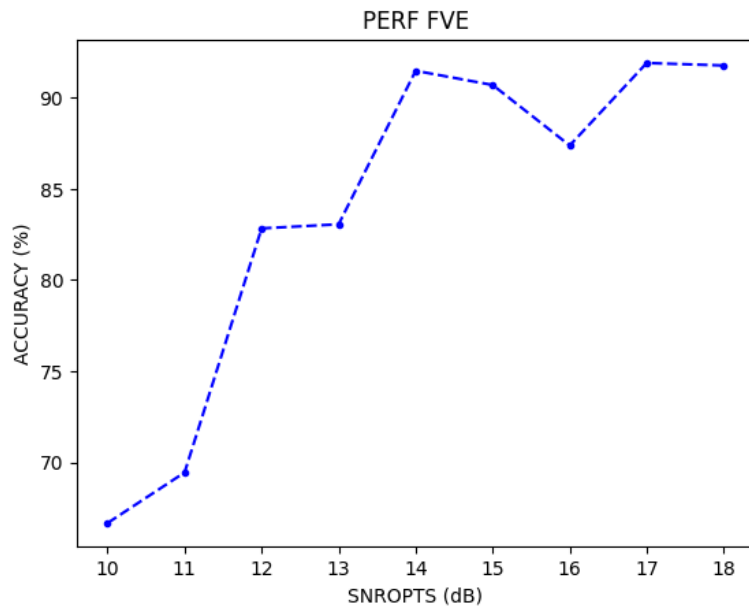
Split Train(80)/Test(20) en fct de snropt et de snreff_quality (via demod vs via tridge)

Train = 6521 pulses | Test = 1631 pulses

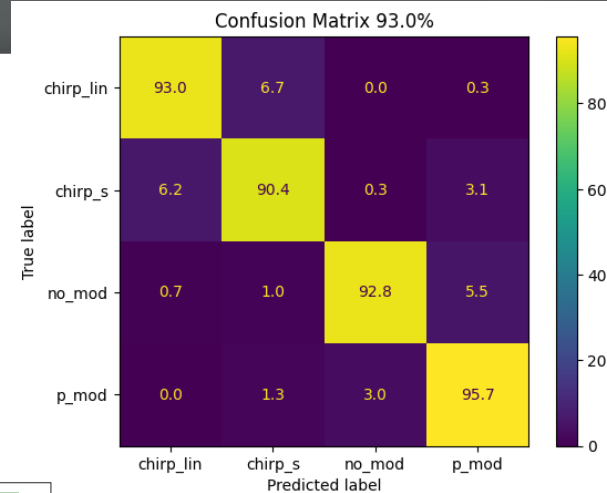
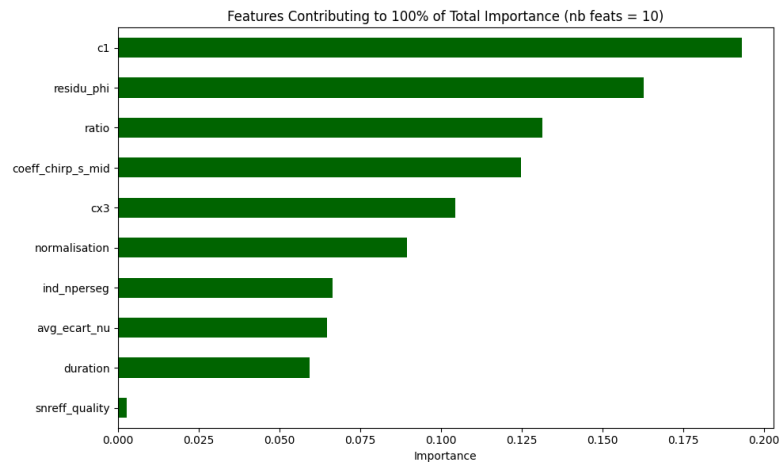
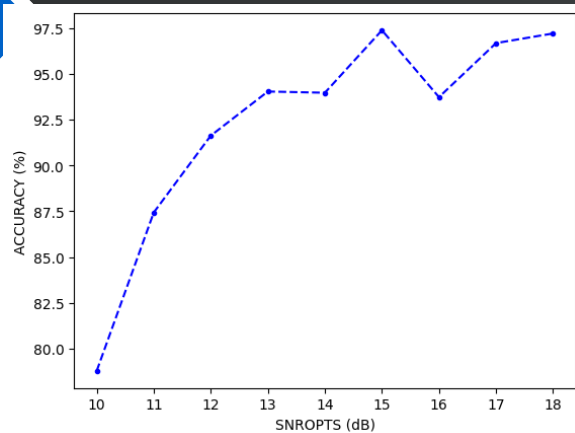
Tableau des performances

Features	Modèle	Acc % on test	Commentaires
FVE ratio = res_lin/res_s residu_phi = res_no_mod / duration coeff_chirp_s_mid normalisation avg_ecart_nu c1 duration ind_nperseg cx3 = c1 + c2 snreff_quality : demod vs tridge	DecisionTree FVE max-depth = 5 min_impurity_decrease=0.012	84,7	Deux DecisionTree entraînés par FVE : 1 pour les low et un pour les high snr
	RF	93,0	Borne supérieure
	DecisionTree max-depth = 8	91,3	DecisionTree entraîné via grid-search
FVE + Custom features 'std', 'skewness', 'kurtosis', 'max_value', 'argmax_index', 'zero_crossings', 'mean_value', 'diff_std', 'symmetry_error', 'duration', 'peak_width_half_max', 'slope_asymmetry', 'derivative_energy', 'quad_fit_error', 'second_deriv_mean', 'cusum_slope_change', 'signal_entropy', 'normalized_auc', 'median_position', 'fft_energy_ratio', 'autocorr_lag1', 'dominant_frequency', 'spectral_centroid'	RF	94,6	Borne supérieure
	DecisionTree max-depth = 60 (49 feats)	91,3	
	DecisionTree max-depth = 11 TOP 10	91,6	0,3 point de % d'amélioration → on abandonne

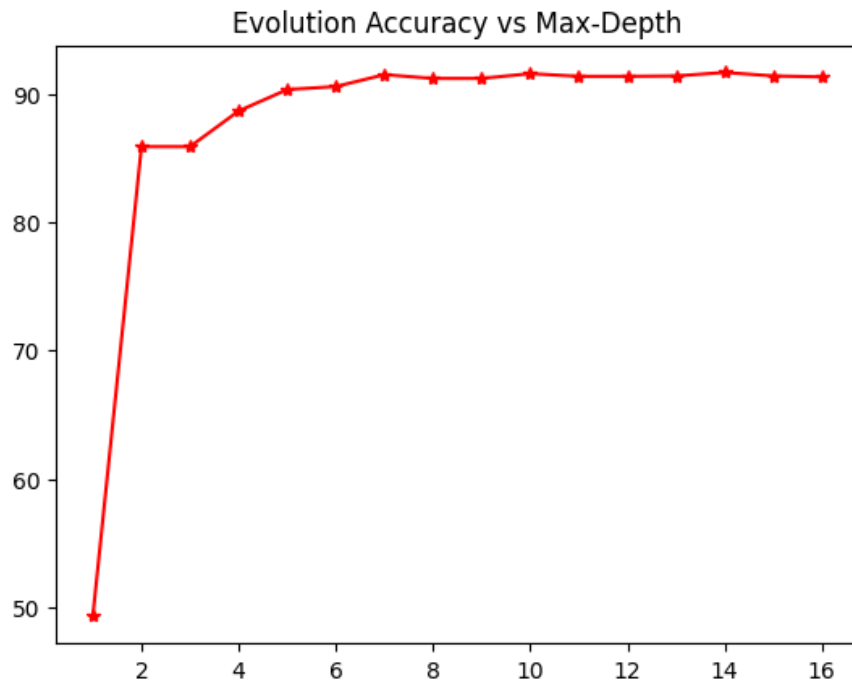
Perf FVE - Baseline



Perf FVE + RF

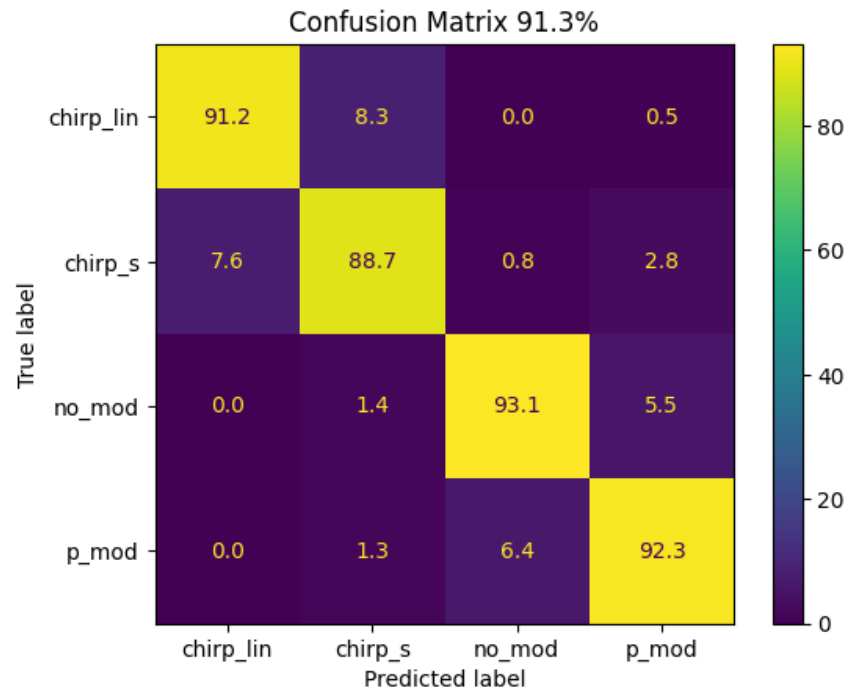
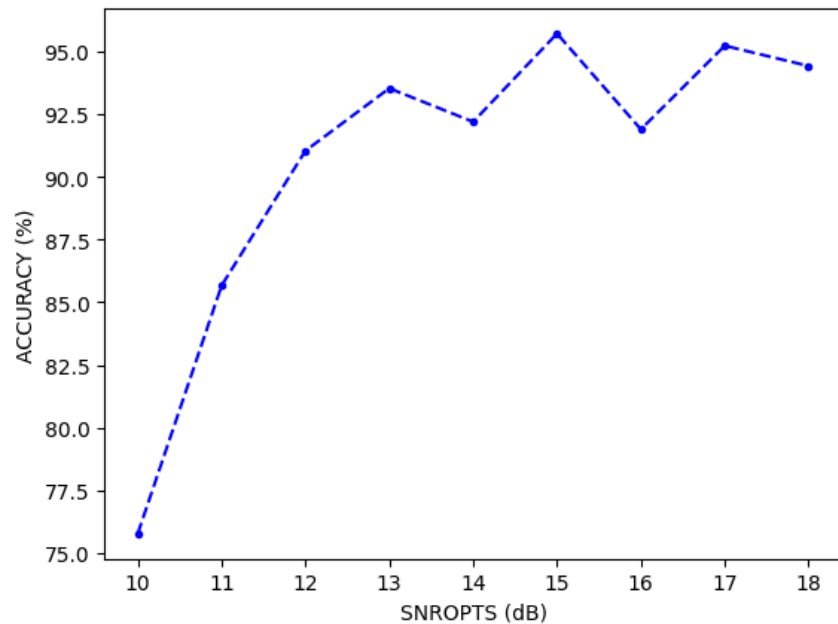


Perf DecisionTree en fct de max-depth



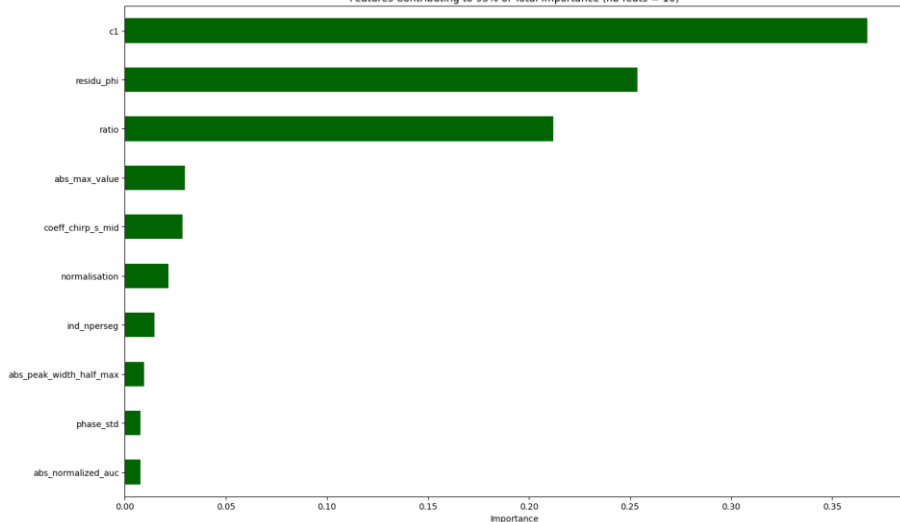
On fixe max-depth à 8

Perf DecisionTree - max_depth=8

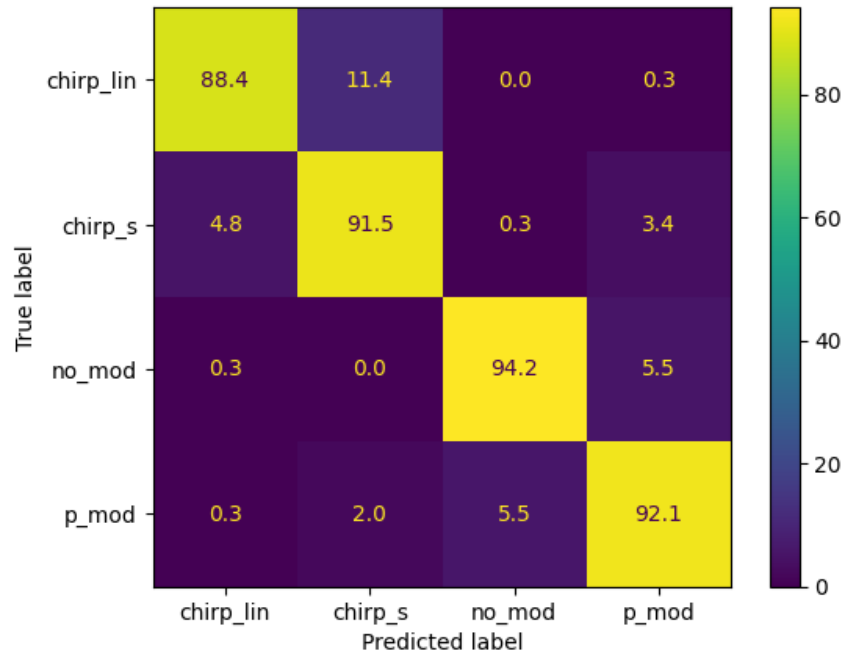


Perf FVE + CBE + RF

Features Contributing to 95% of Total Importance (nb feats = 10)



Confusion Matrix 91.6%

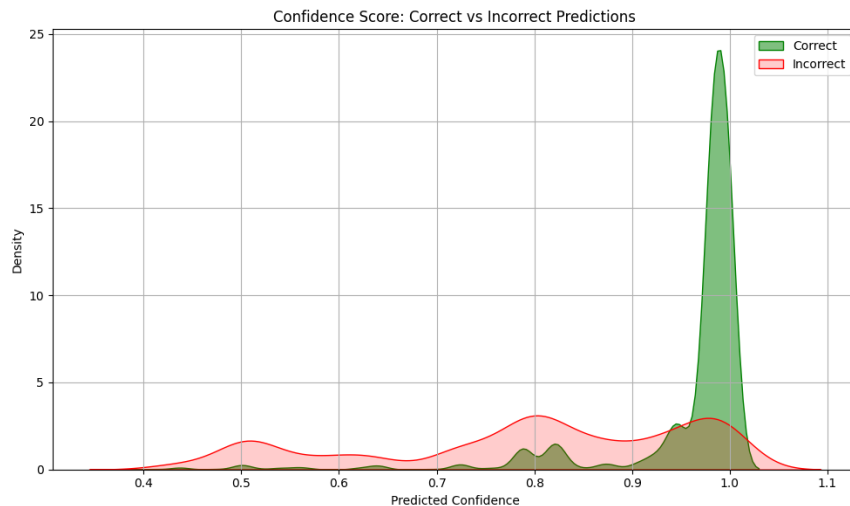


Analyse des erreurs : exemples

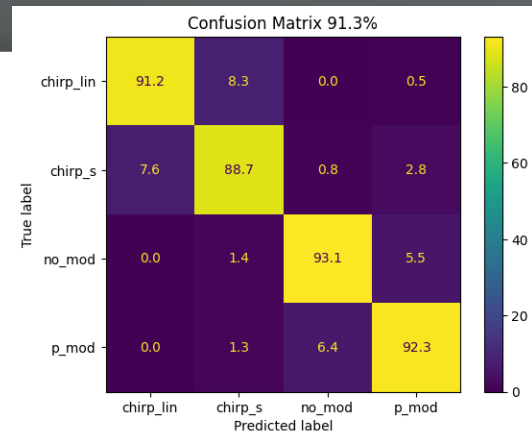
FVE features + SNREFF_QUALITY à max-depth = 8

Accuracy = 91,3%

140 impulsions mal classées / 1631

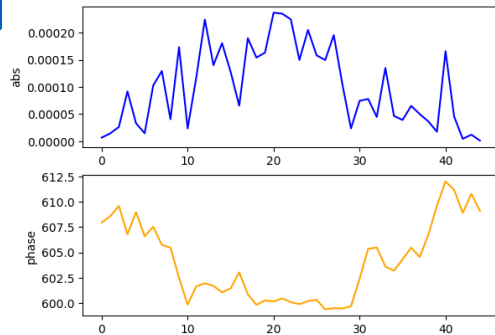


Pas de possibilité de
détecter les erreurs de
classification

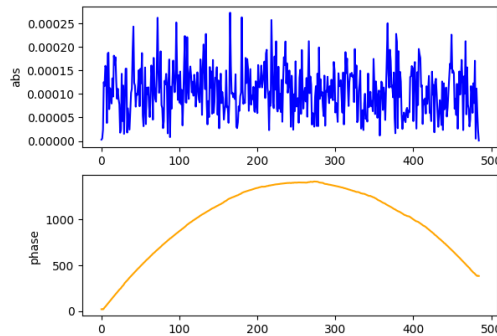


Analyse des erreurs : exemples

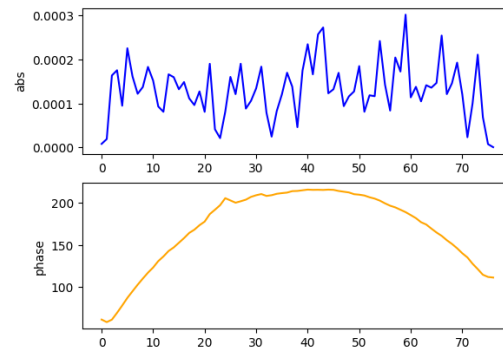
GT = no_mod | PRED = p_mod



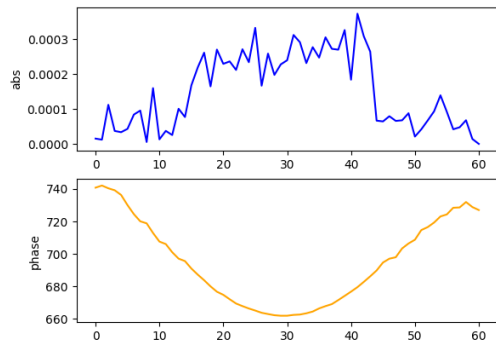
GT = chirp_lin | PRED = chirp_s



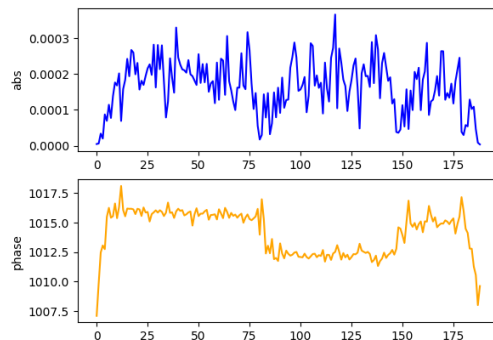
GT = chirp_s | PRED = chirp_lin



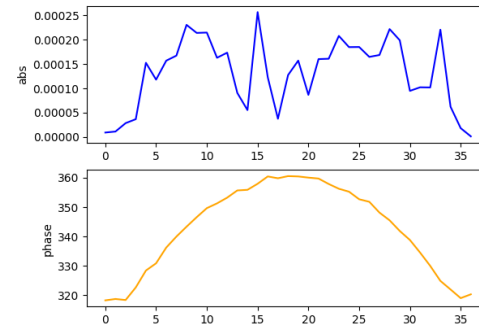
GT = chirp_lin | PRED = chirp_s



GT = p_mod | PRED = no_mod

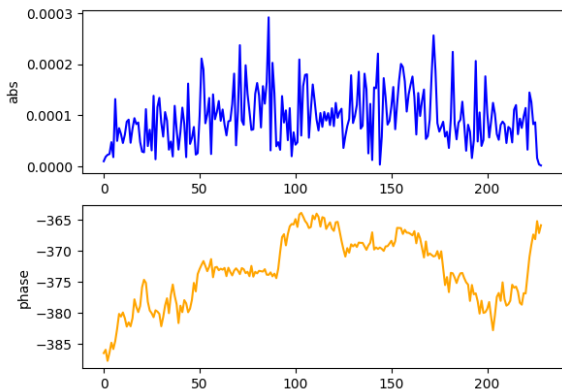


GT = chirp_lin | PRED = chirp_s

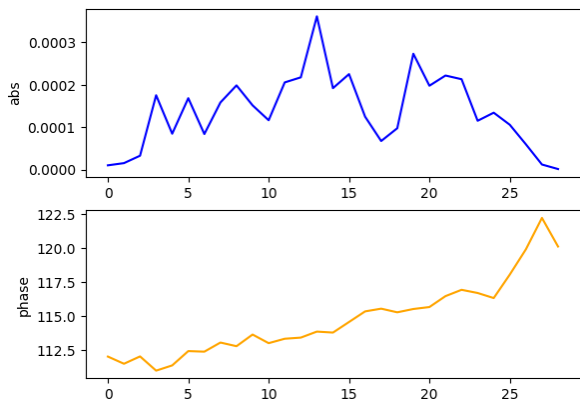


Analyse des erreurs : exemples

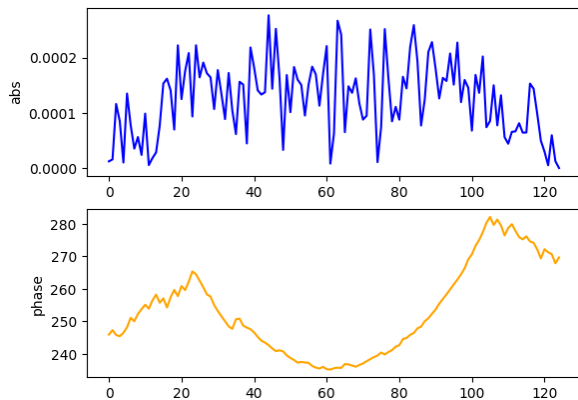
GT = p_mod | PRED = chirp_s



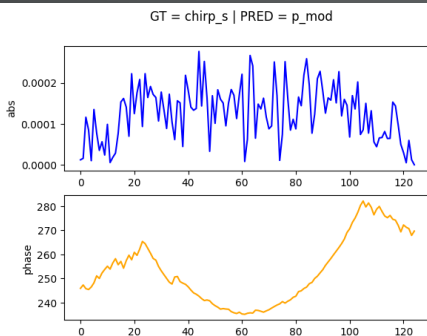
GT = no_mod | PRED = chirp_s



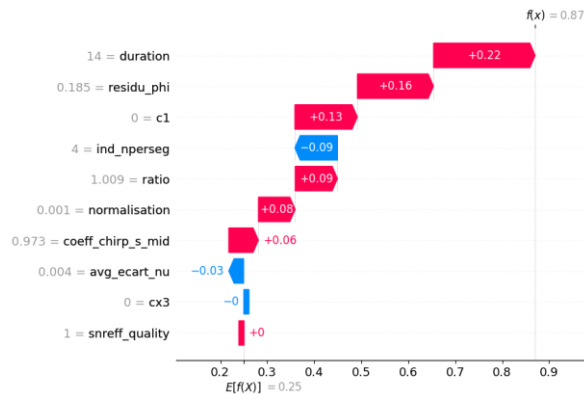
GT = chirp_s | PRED = p_mod



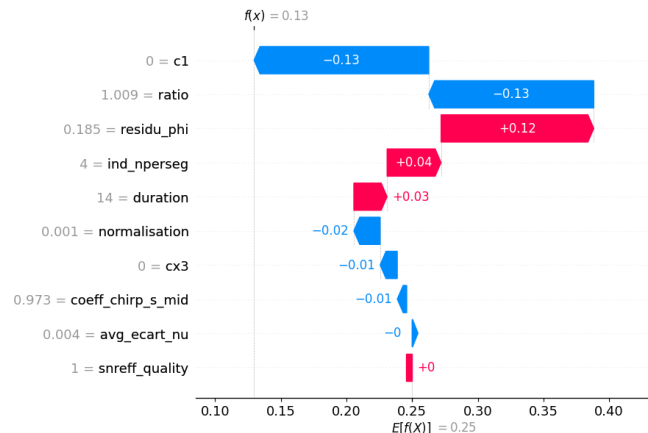
Analyse des erreurs : exemples



Explanation on pred_type choosed by model



Explanation on true_type not choosed by model



AVANTIX

IQ2PDW CPU plugin PHX2

List des NPERSEGS

```
def get_NPERSEGS(fs):
    NPERSEGS_4GS = [64, 128, 256, 512, 1024, 4096, 16384, 131072]
    nperseg_min = 8
    def nearest_power_of_2(x):
        | return 2 ** round(torch.math.log2(x)) if x > 0 else 0

    NPERSEGS = [nearest_power_of_2(int(nperseg * fs / 4e9)) for nperseg in NPERSEGS_4GS]
    NPERSEGS = [x for x in NPERSEGS if x >= nperseg_min]

    return NPERSEGS
```

fs	NPERSEGS
100 MSps	[8, 16, 32, 128, 512, 4096]
500 MSps	[8, 16, 32, 64, 128, 512, 2048, 16384]
1 GSps	[16, 32, 64, 128, 256, 1024, 4096, 32768]
2 GSps	[32, 64, 128, 256, 512, 2048, 8192, 65536]
4 GSps	[64, 128, 256, 512, 1024, 4096, 16384, 131072]
244 MSps	[8, 16, 32, 64, 256, 1024, 8192]
4 MSps	[16, 128]

Tc_iq2pdw : Plugin PHX

```
PROBLEMS  PORTS 3  GITLENS  OUTPUT  DEBUG CONSOLE  TERMINAL  JUPYTER

[2025-06-27 13:25:12.914] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:13.917] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:14.919] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:15.921] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:16.923] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:17.925] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:18.927] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:19.929] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:20.932] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:21.934] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:22.936] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:23.938] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:24.940] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:25.941] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:26.943] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:27.945] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:28.947] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:29.949] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-INIT avancement=0 0/0
[2025-06-27 13:25:30.950] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-DONE avancement=100 0/0
[2025-06-27 13:25:31.952] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-DONE avancement=100 0/0
[2025-06-27 13:25:32.954] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-DONE avancement=100 0/0
[2025-06-27 13:25:33.956] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-DONE avancement=100 0/0
[2025-06-27 13:25:34.958] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-DONE avancement=100 0/0
[2025-06-27 13:25:35.960] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid=w plug
inGuiD= etattraitemt-DONE avancement=100 0/0
```

Test Démarrage OK

Tc_iq2pdw : Plugin PHX

```
inGuid-p: etattraitemnt-DONE avancement-100 0/0
p

Actions for w / p
0: >>> main menu
1: Start
2: Stop
3: Cancel
4: Pause
5: Resume
6: Config
7: Shutdown
[2025-06-27 13:31:34.655] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid-w plug
inGuid-p: etattraitemnt-DONE avancement-100 0/0
[2025-06-27 13:31:35.657] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid-w plug
inGuid-p: etattraitemnt-DONE avancement-100 0/0
[2025-06-27 13:31:36.659] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid-w plug
inGuid-p: etattraitemnt-DONE avancement-100 0/0
[2025-06-27 13:31:37.661] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid-w plug
inGuid-p: etattraitemnt-DONE avancement-100 0/0

Sent action to the subscriber with this work GUID

Actions for w / p
0: >>> main menu
1: Start
2: Stop
3: Cancel
4: Pause
5: Resume
6: Config
7: Shutdown
[2025-06-27 13:31:37.997] [MockCServer] [info] [ServiceImpl.cpp:96] Remove writer 0x7f4884001b50
[2025-06-27 13:31:38.663] [MockCServer] [info] [ServiceImpl.cpp:233] Status received: workGuid-w plug
inGuid-p: etattraitemnt-STOPPED avancement-100 0/0
[]

[root@53a7c47b502a bin]# cd /pkg/tc_iq2pdw/data/
[root@53a7c47b502a data]# ls
data_for_FE
[root@53a7c47b502a data]#
exit
(sigint) (base)
/data/SIGINT/CBE/phenix_plugin 15:21:08
$ docker run --rm -it --entrypoint /bin/bash -v ./vol_cfg:/srv/plugin/cfg:ro -v ./vol_data:/data --n
etwork=phenix phx2/iq2pdw-plugin:latest
[root@60c7c1ba5b1e bin]#
exit
(sigint) (base)
/data/SIGINT/CBE/phenix_plugin 15:21:40
$ docker run --rm -it -v ./vol_cfg:/srv/plugin/cfg:ro -v ./vol_data:/data --network=phenix phx2/iq2p
dw-plugin:latest -c "/srv/plugin/cfg/traitemnt.json"
JSON config file loaded
pdw2H5 started
pushFileMetaData done.
Init mc output file: 0
/pkg/tc_iq2pdw/iq2pdw/demod.py:70: UserWarning: ComplexHalf support is experimental and many operators
don't support it yet. (Triggered internally at /pytorch/aten/src/ATen/EmptyTensor.cpp:56.)
  v_exp = torch.exp(-1j*torch.linspace(0, 2*torch.pi, 2**16)).to(device).to(torch_complex)
/pkg/tc_iq2pdw/iq2pdw/merging.py:685: UserWarning: Sparse CSR tensor support is in beta state. If you
miss a functionality in the sparse tensor support, please submit a feature request to https://github.c
om/pytorch/pytorch/issues. (Triggered internally at /pytorch/aten/src/ATen/SparseCSRTensorImpl.cpp:53.)
  intersections = torch.sparse.mm(intersections, intersections)
/pkg/tc_iq2pdw/iq2pdw/demod.py:137: UserWarning: To copy construct from a tensor, it is recommended to
use sourceTensor.detach().clone() or sourceTensor.detach().clone().requires_grad_(True), rather than
torch.tensor(sourceTensor).
  points = torch.hstack((virtual_sampling_ridge, torch.tensor(sum_durations, device=device).view(-1)))
sensor ELIT & voie V1 processed. Progress = 100%
Received 1 action. Stopping the process.
(sigint) (base)
/data/SIGINT/CBE/phenix_plugin 15:31:39
$ !
```

Test Arrêt OK

Input / Output OK

```
in_filename = "InputFile.mc"
out_filename = "OutputFile.mc"

with h5py.File(os.path.join("vol_data", in_filename), 'r') as mc_file:
    print_hdf5_structure(mc_file)

print('-----')

with h5py.File(os.path.join("vol_data", out_filename), 'r') as mc_file:
    print_hdf5_structure(mc_file)
```

✓ 0.0s

```

Capteurs -> <class 'h5py_hl.dataset.Dataset'>
ELIT -> <class 'h5py_hl.group.Group'>
  V1 -> <class 'h5py_hl.group.Group'>
    Configurations -> <class 'h5py_hl.dataset.Dataset'>
    IQ -> <class 'h5py_hl.dataset.Dataset'>
    SignauxAcquisOuEmis -> <class 'h5py_hl.dataset.Dataset'>
    SignauxIQ -> <class 'h5py_hl.dataset.Dataset'>
    VoiesAcquisitions -> <class 'h5py_hl.dataset.Dataset'>
  -----
Captures -> <class 'h5py_hl.dataset.Dataset'>
ELIT -> <class 'h5py_hl.group.Group'>
  V1 -> <class 'h5py_hl.group.Group'>
    Configurations -> <class 'h5py_hl.dataset.Dataset'>
    IQ -> <class 'h5py_hl.dataset.Dataset'>
    ProduitsInterceptionsRadar -> <class 'h5py_hl.group.Group'>
    DescripteursIntrapulses -> <class 'h5py_hl.dataset.Dataset'>
    Intrapulses -> <class 'h5py_hl.dataset.Dataset'>
    PDW -> <class 'h5py_hl.dataset.Dataset'>
    SynthesePDW -> <class 'h5py_hl.dataset.Dataset'>
    SignauxAcquisOuEmis -> <class 'h5py_hl.dataset.Dataset'>
    SignauxIQ -> <class 'h5py_hl.dataset.Dataset'>
    VoiesAcquisitions -> <class 'h5py_hl.dataset.Dataset'>
  OutilsAT -> <class 'h5py_hl.group.Group'>
    Liens -> <class 'h5py_hl.group.Group'>
      DescriptionsLiens -> <class 'h5py_hl.dataset.Dataset'>
      Liens_0 -> <class 'h5py_hl.dataset.Dataset'>

```

```
with h5py.File(os.path.join("vol_data", out_filename), 'r') as mc_file:
    dset = mc_file['/ELT/V1/Products/InterceptionsRadar/PDM']
    # print("Shape:", dset.shape)
    # print("Dtype:", dset.dtype)
    # print("Attributes:", dict(dset.attrs))

    data = dset[()]
    df = pd.DataFrame(data)
```

dF															Python
✓ 0.0s Open 'dF' in Data Wrangler															
id	# idConfigurat...	# idSig...	# AURA	# DI	# frequency	# niveau	# niveauInt	# RSB	# DTOA	# typeImpulsion	# precisionFreq	# precisionTemporelle	# idIntrapulse	# idPWGonio	# idPWLoc
0	0	0	49996	0.256	5382665	0.002749029	0.0	53.15427	0.0			0	0	0	0
1	0	0	49996	0.184	4603372	0.0108043	0.0	115.80916	3200.0			0	0	0	0
2	0	0	50000	0.16	4620444	0.010826279	0.0	115.53025	8000.0			2	0	0	0
3	0	0	50006	0.088	62773210	0.00708943	0.0	50.6766	1752000.0			0	0	0	0
4	0	0	501759	57.34425	7547350.5	0.001369382	0.0	1.8730419	998392000.0			2	0	0	0
5	0	0	1500152	0.216	4748560	0.00666142	0.0	21.80097	2400.0			0	0	0	0
6	0	0	1500176	0.048	6114053.5	0.010490020	0.0	102.12295	8000.0			2	0	0	0
7	0	0	1500184	0.432	43497193	0.003055916	0.0	5.3208	488000.0			0	0	0	0
8	0	0	1500872	7.168	4054902.0	0.006481933	0.0	43.362434	1536000.0			2	0	0	0
9	0	0	1502208	44.54425	3898798.2	inf	0.0	inf	46080000.0			2	0	0	0
10	0	0	1548288	57.344	7528358.0	0.0	0.0	0.0	95027200.0			0	0	0	0
11	0	0	2488560	121.184	4927626.0	0.0014740138	0.0	2.1972213	164000.0			0	0	0	0
12	0	0	2500224	6.064	6037007.0	0.01954071	0.0	247.345	28400.0			2	0	0	0
13	0	0	2500608	0.004	4504093.0	0.01263489	0.0	157.08076	409600.0			0	0	0	0
14	0	0	2504704	61.44825	7238959.0	0.002402287	0.0	5.903569	44032000.0			2	0	0	0
15	0	0	2548736	5.12	4005286.8	0.009343397	0.0	15.752762	43152000.0			0	0	0	0
16	0	0	2981888	5226.496	7558874.5	0.001090568	0.0	3.6759977	49352000.0			2	0	0	0
17	0	0	3031808	7862.712	7862712.0	0.0013759494	0.0	2.3116221	49456000.0			0	0	0	0
18	0	0	3032080	0.064	5773515.5	0.008450272	0.0	71.87103	263200.0			2	0	0	0
19	0	0	3033104	39.42425	4472776.5	inf	inf	inf	6041600.0			2	0	0	0
20	0	0	3561920	122.88	7332650.0	0.001679728	0.0	2.8533077	0.0			0	0	0	0
21	0	0	3561920	16.384	13749589.0	0.0045288675	0.0	20.741964	1024000.0			0	0	0	0
22	0	0	3573760	34.816	7126581.0	0.0027841153	0.0	7.8387194	102400.0			2	0	0	0
23	0	0	3574784	22.128	7235863.0	0.0032346828	0.0	6.445911	2096200.0			0	0	0	0
24	0	0	1784704	1949.6963	4028998.3	0.002177096	0.0	4.766792	71564000.0			0	0	0	0
SHELLS PORTS 3 GETLINKS OUTPUT DEBUG CONSOLE TERMINAL JUPYTER															

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