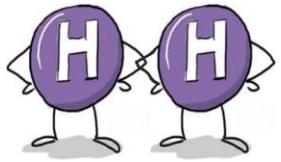
Search for resonant production of Higgs boson pairs decaying to four leptons and two b jets

Analysis status updates



Magdy Louka

Ph.D. Candidate, XXXVII Ciclo

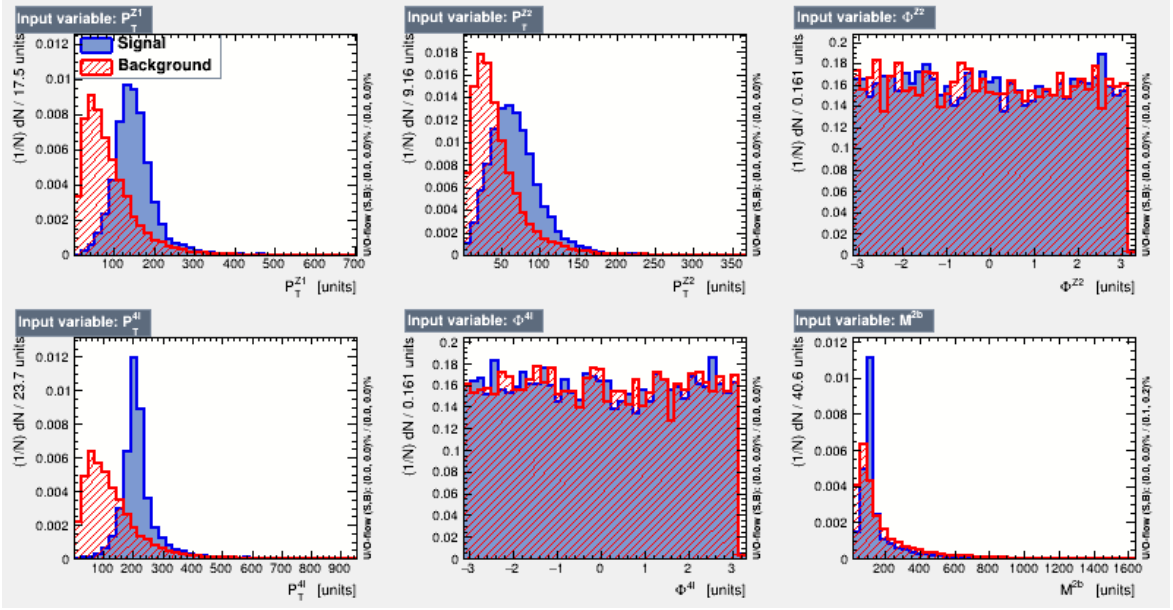
Supervisor: Prof. Nicola De Filippis

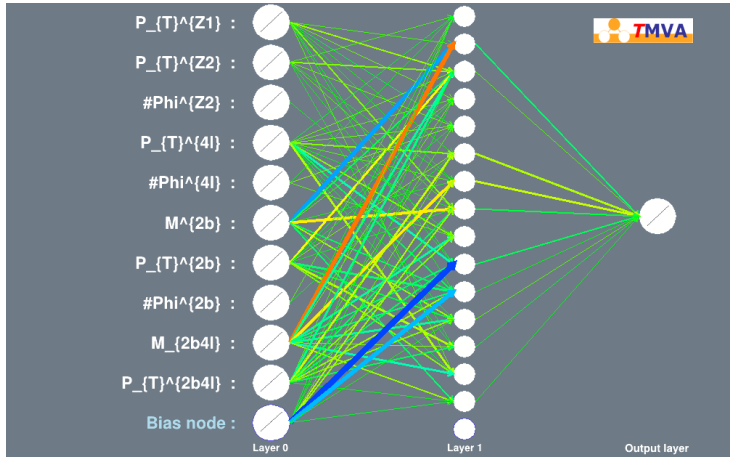
16 Jan, 2024

Updates on the MVA Analysis

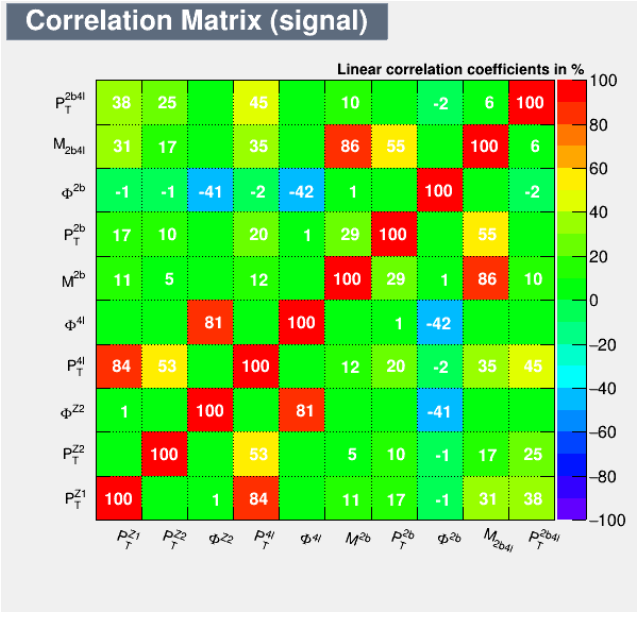
Bulk Graviton with M_G = 500 GeV

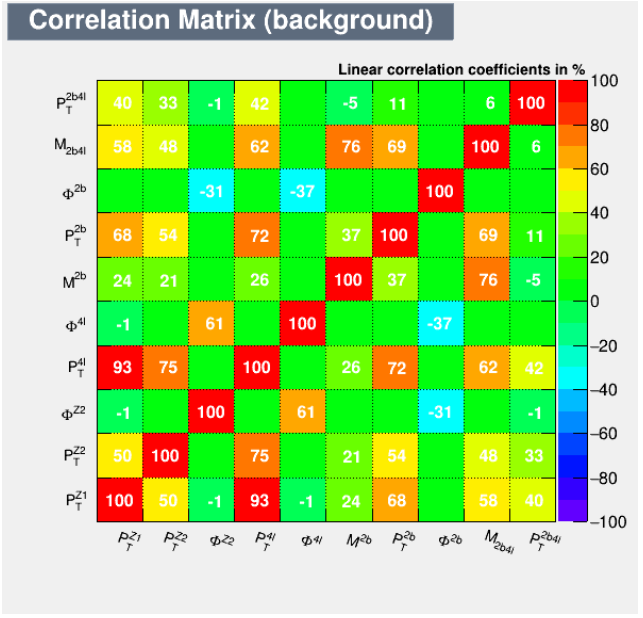
Training and classification application are done for different hypothesis





1 hidden layer
15 nodes
Activation type: ReLu
Learning epochs: 300
Learning rate: 0.01

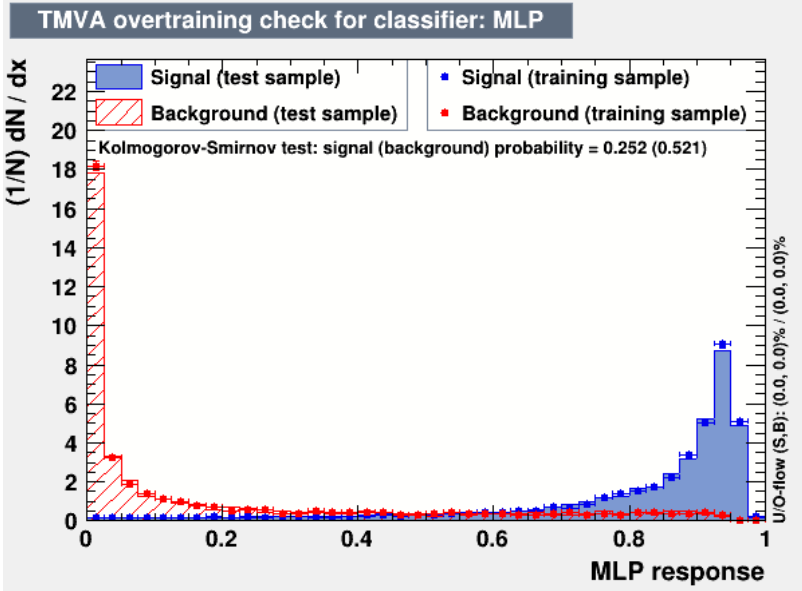


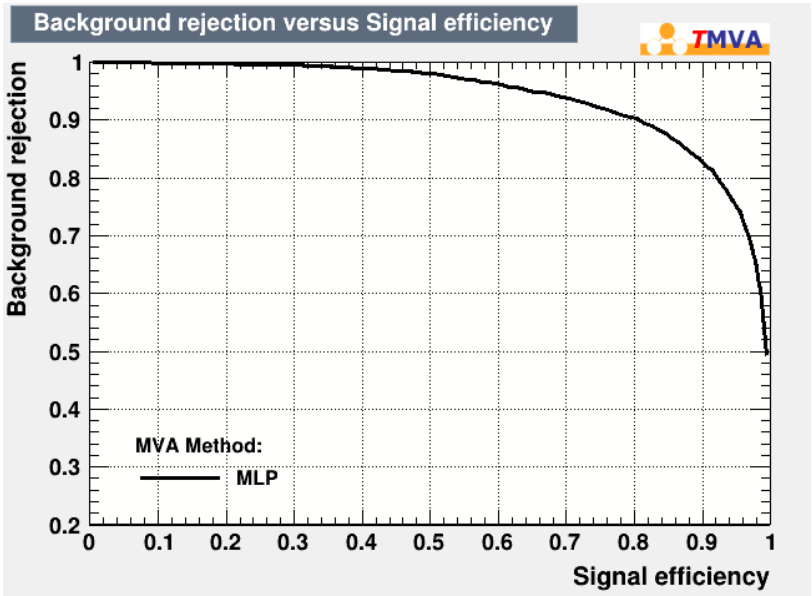


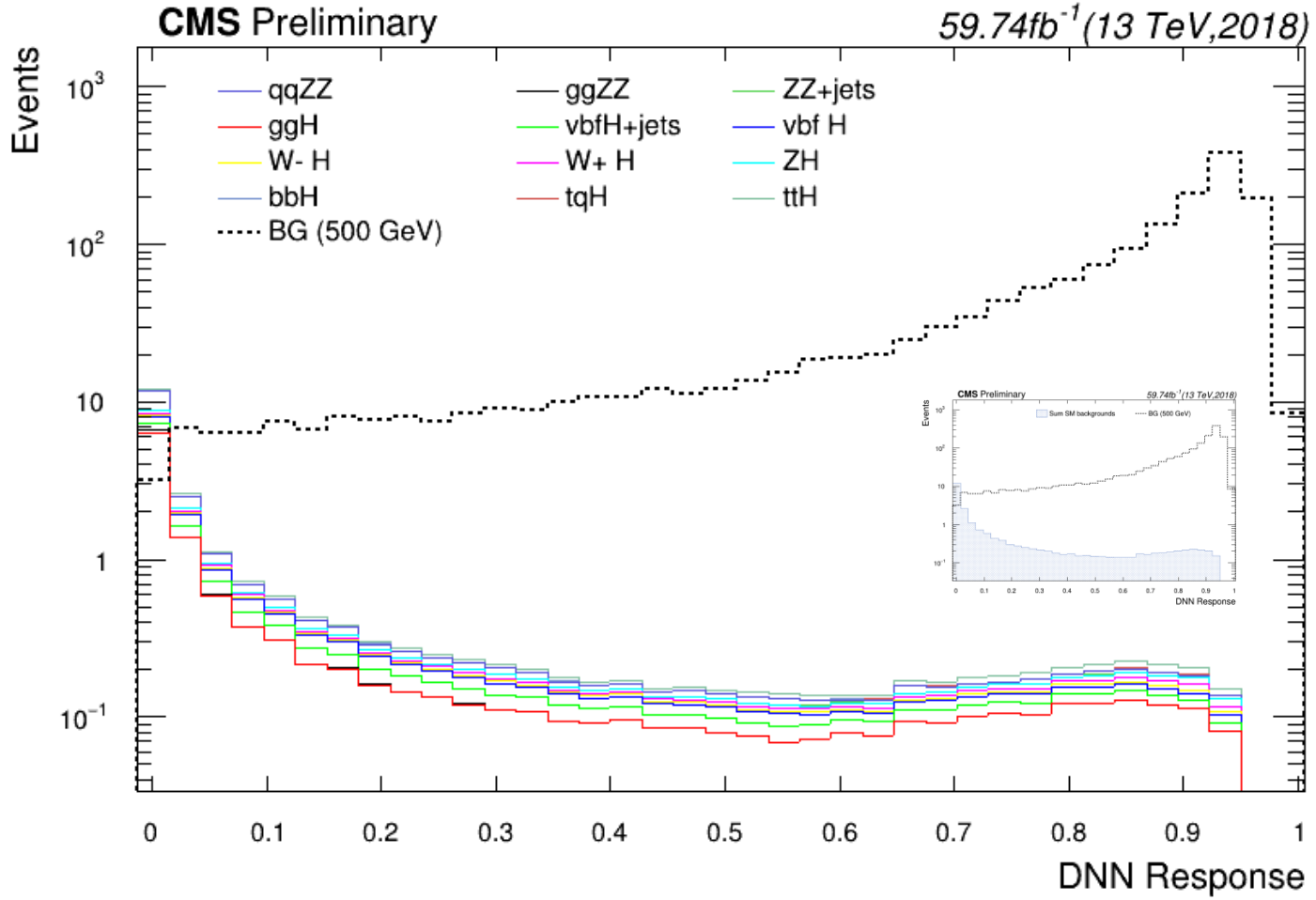
Updates on the MVA Analysis

Bulk Graviton with M_G = 500 GeV

Training and classification application are done for different hypothesis



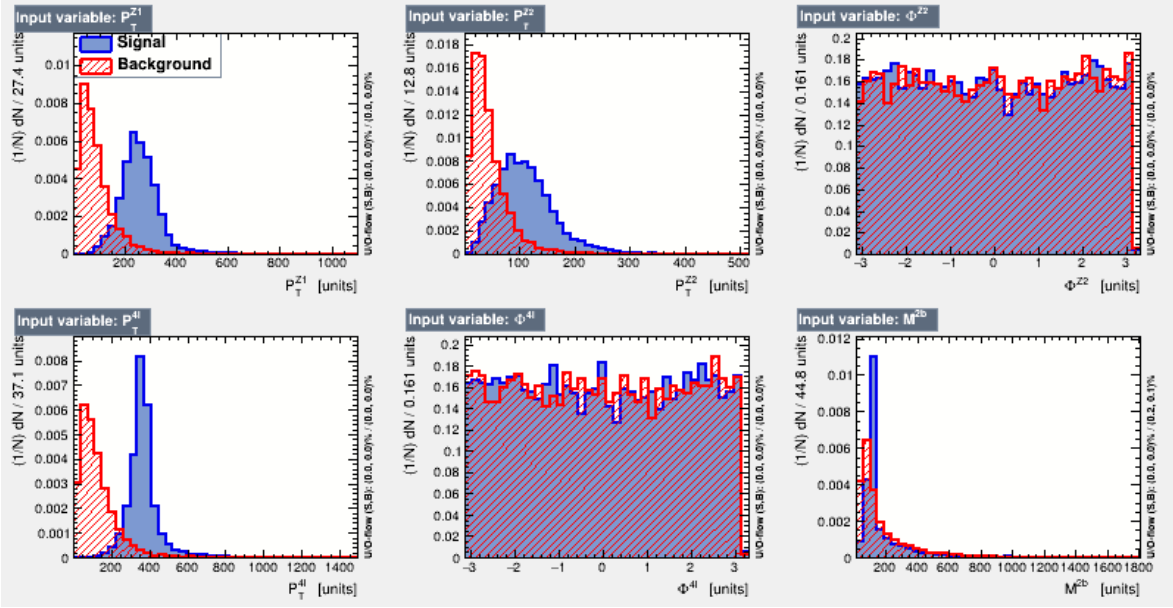


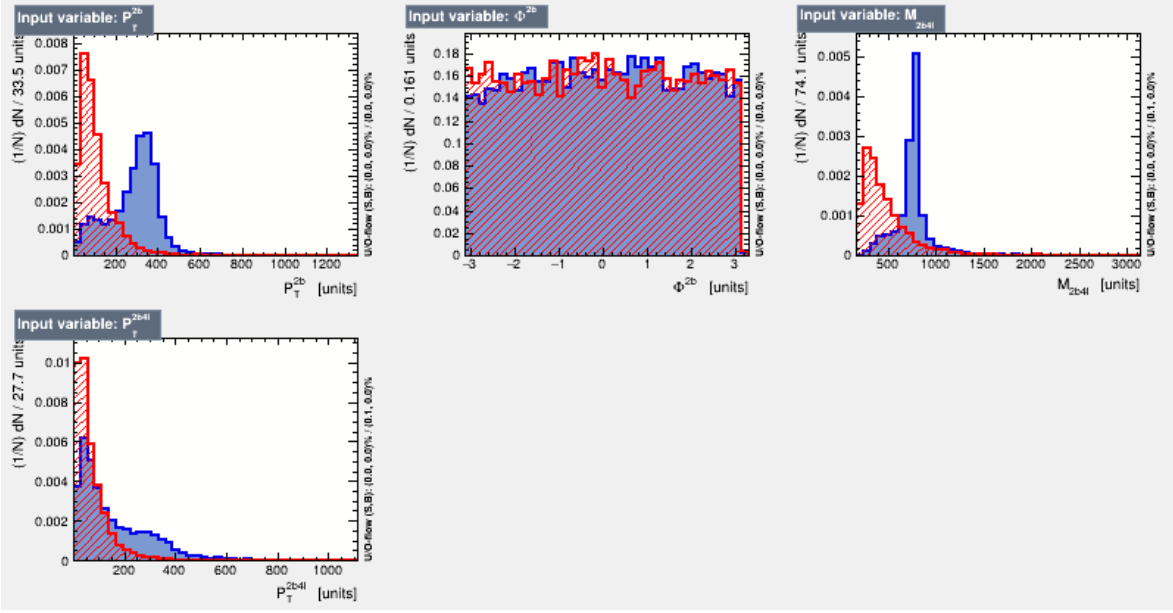


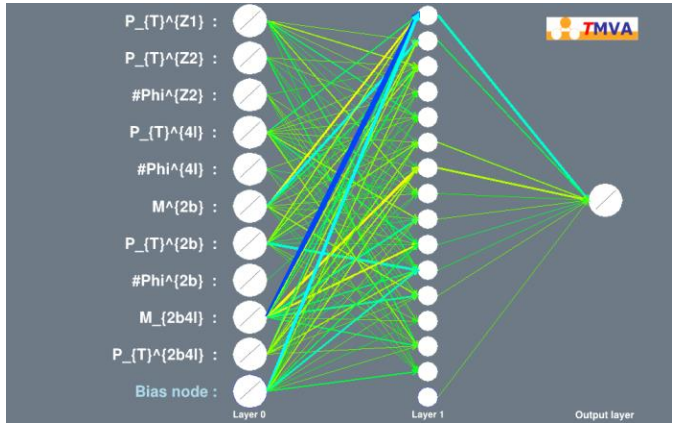
Updates on the MVA Analysis

Bulk Graviton with M_G = 800 GeV

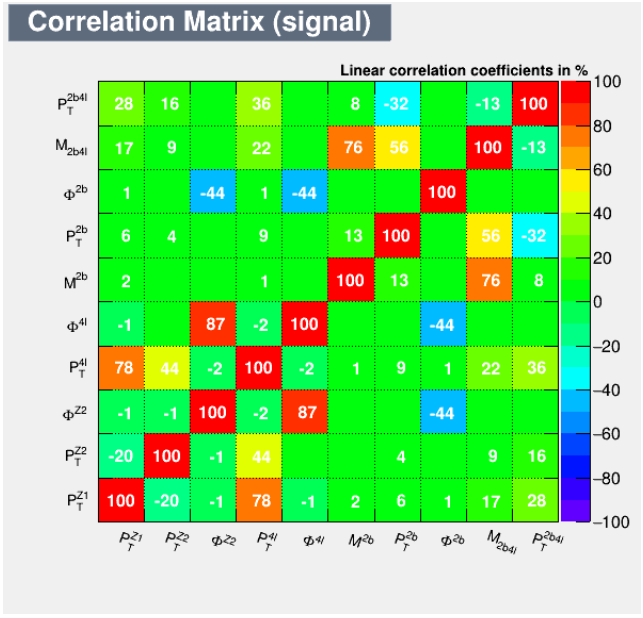
Training and classification application are done for different hypothesis

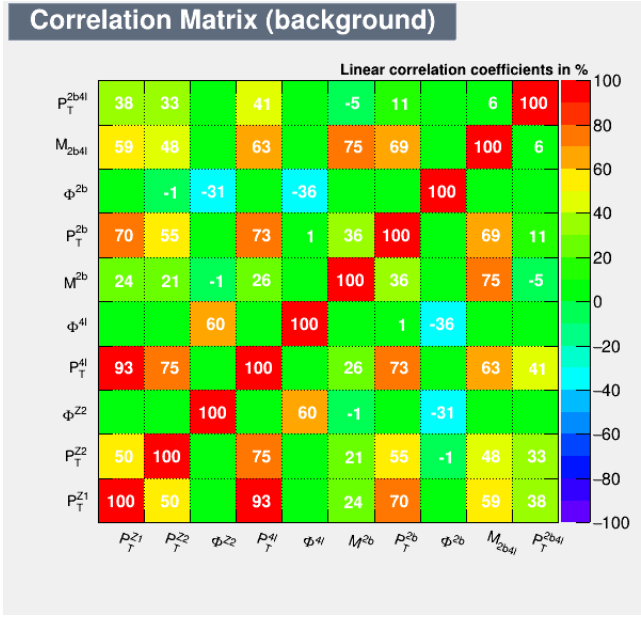






1 hidden layer
15 nodes
Activation type: ReLu
Learning epochs: 300
Learning rate: 0.01

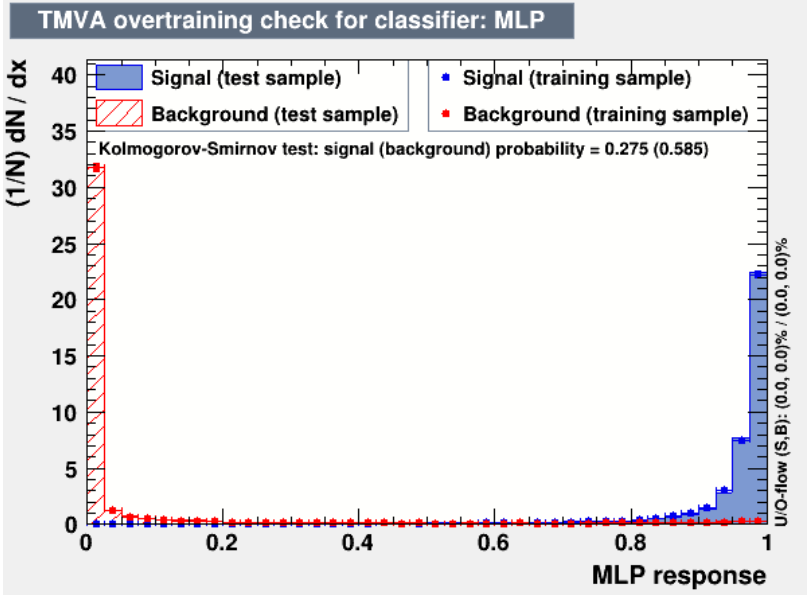


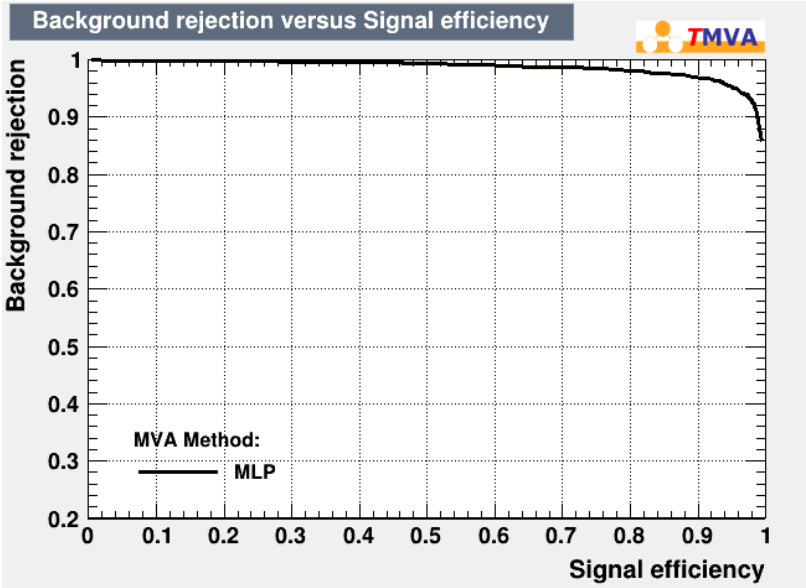


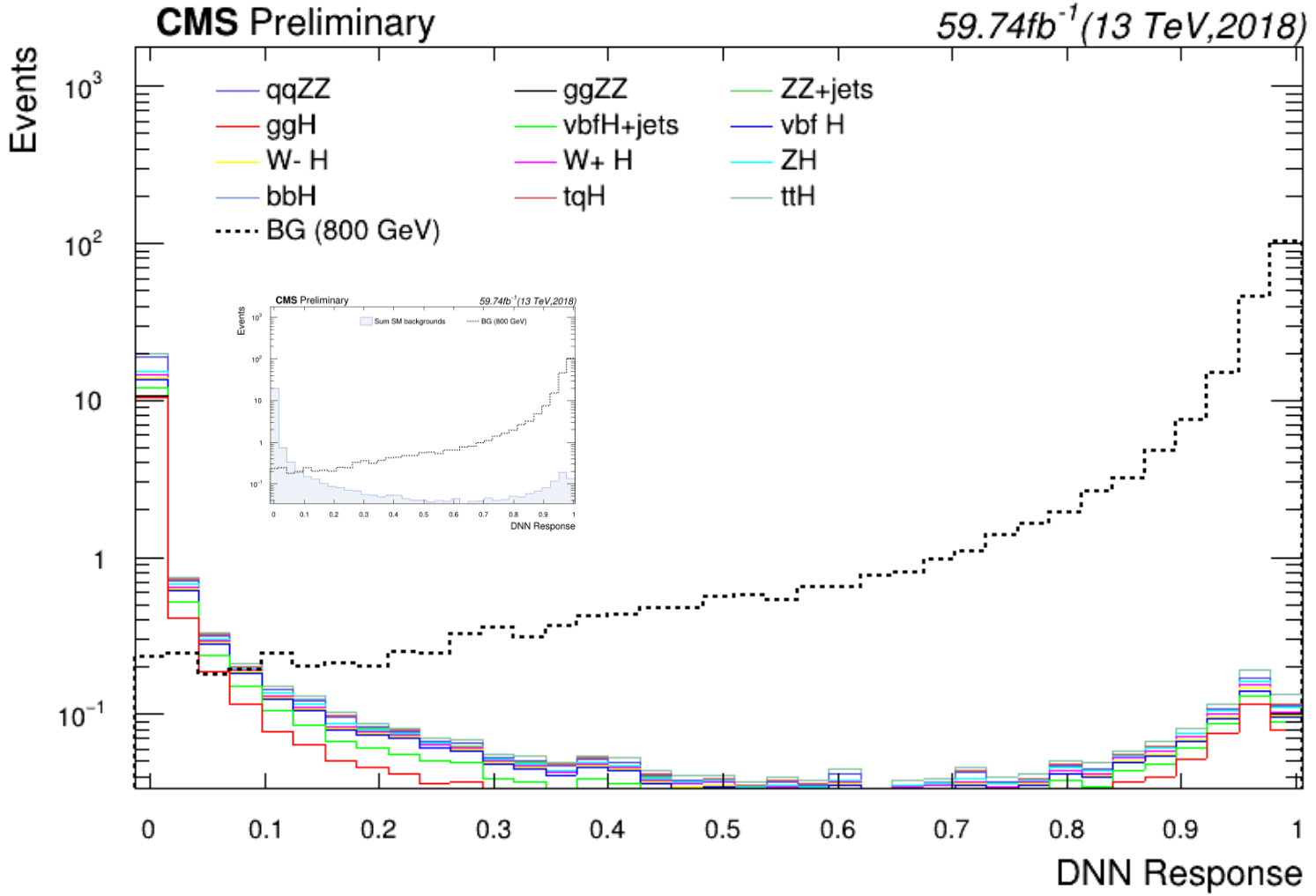
Updates on the MVA Analysis

Bulk Graviton with M_G = 800 GeV

Training and classification application are done for different hypothesis



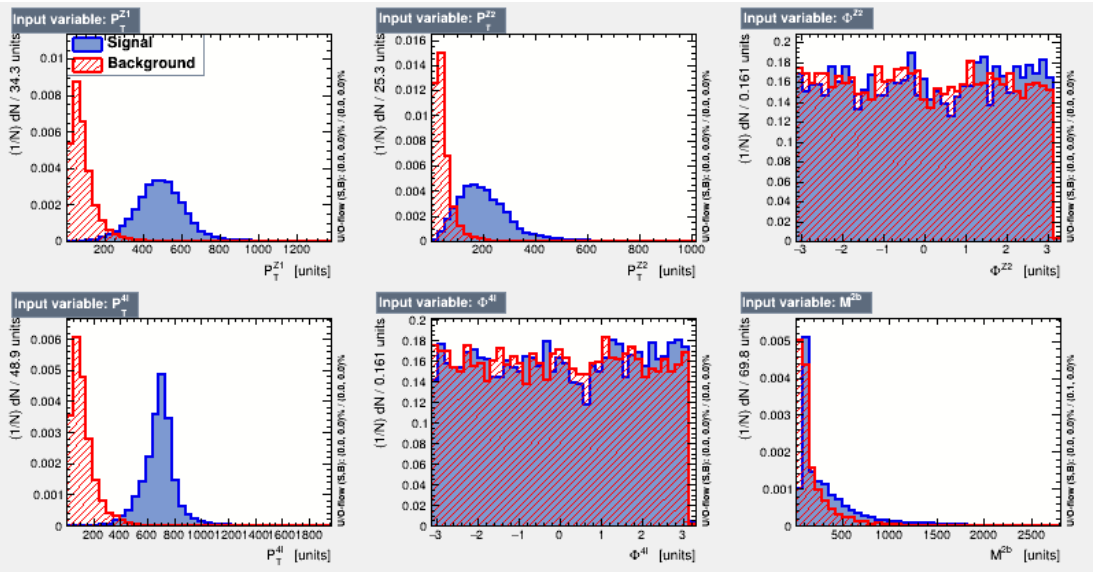


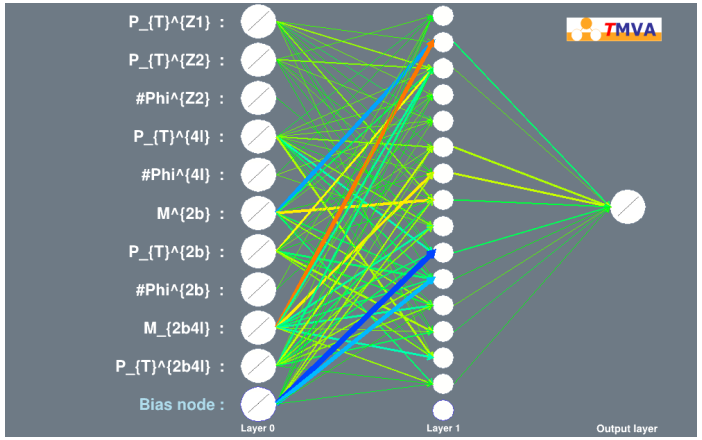


Updates on the MVA Analysis

Bulk Graviton with M_G = 1.5 TeV

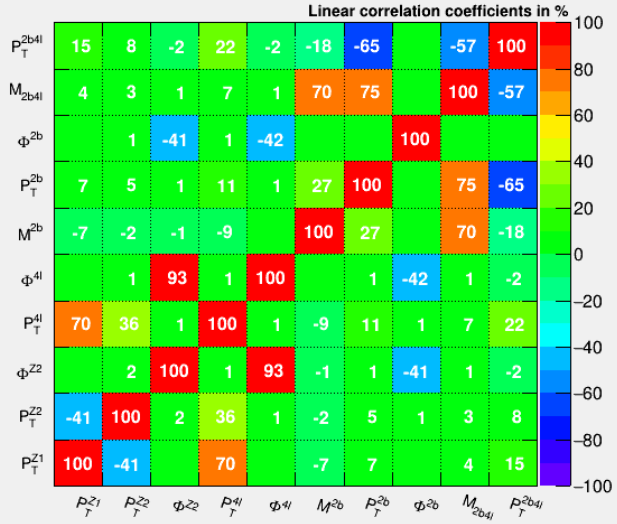
Training and classification application are done for different hypothesis



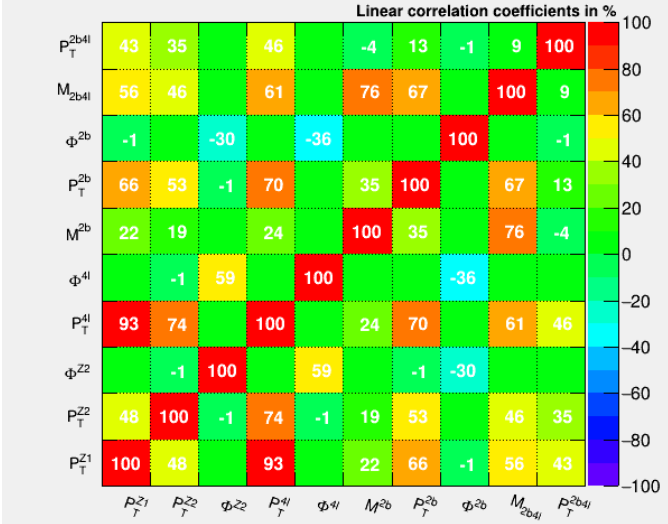


1 hidden layer
15 nodes
Activation type: ReLu
Learning epochs: 300
Learning rate: 0.01

Correlation Matrix (signal)



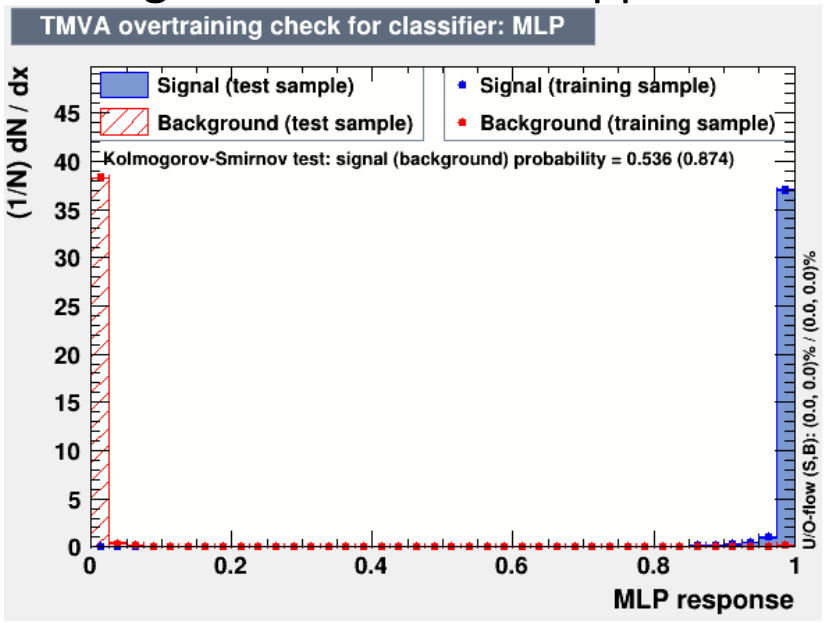
Correlation Matrix (background)

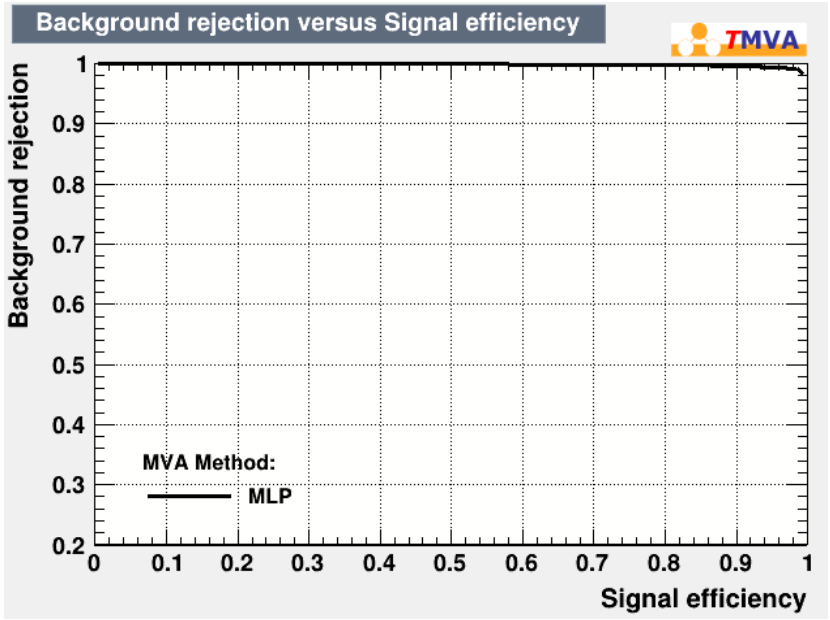


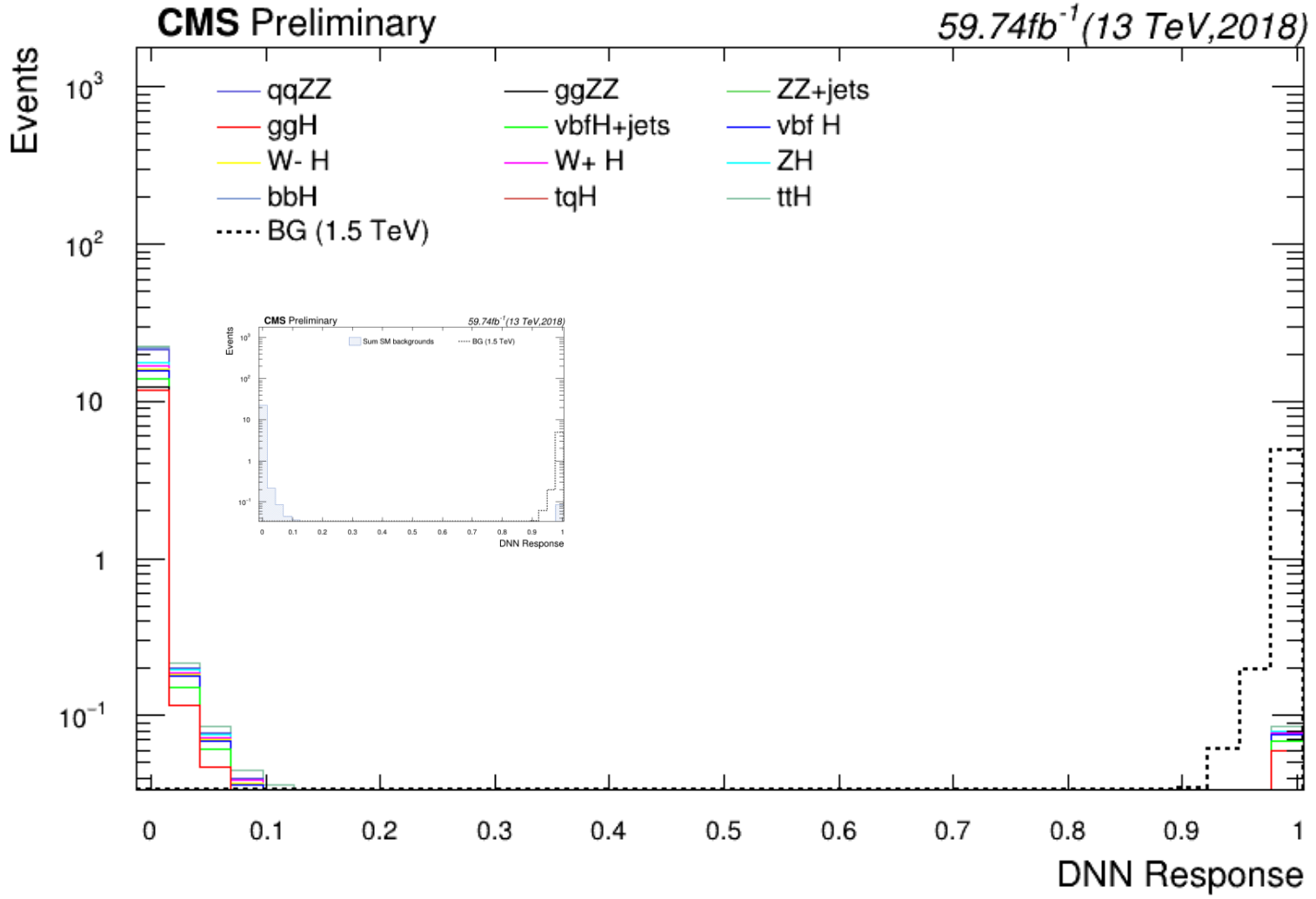
Updates on the MVA Analysis

Bulk Graviton with M_G = 1.5 TeV

Training and classification application are done for different hypothesis



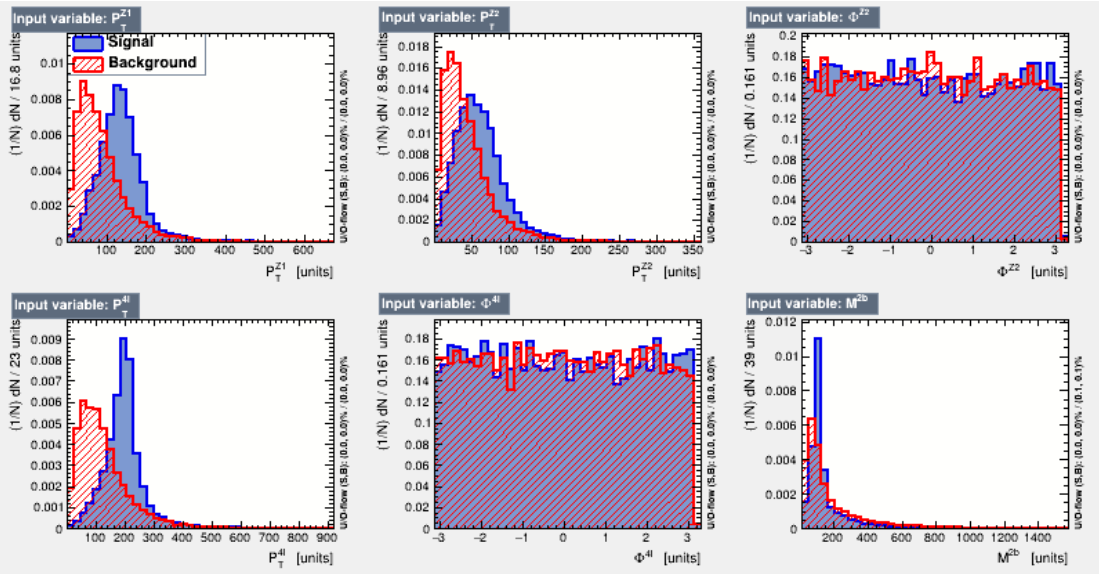


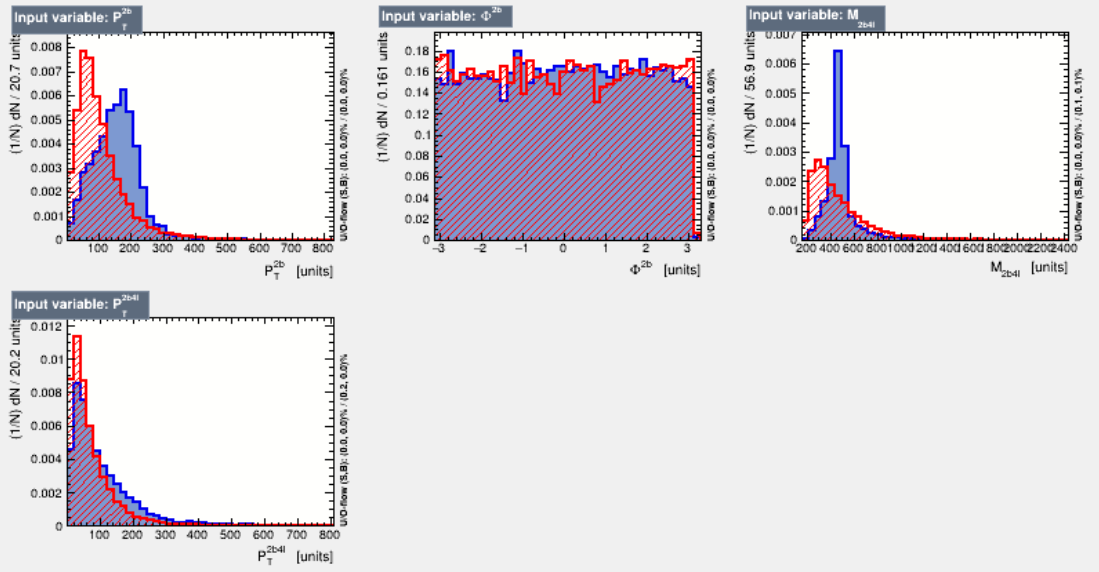


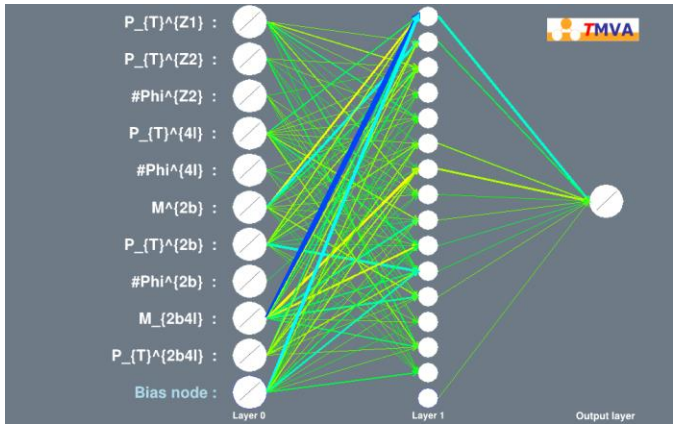
Updates on the MVA Analysis

Radion with M_R = 500 GeV

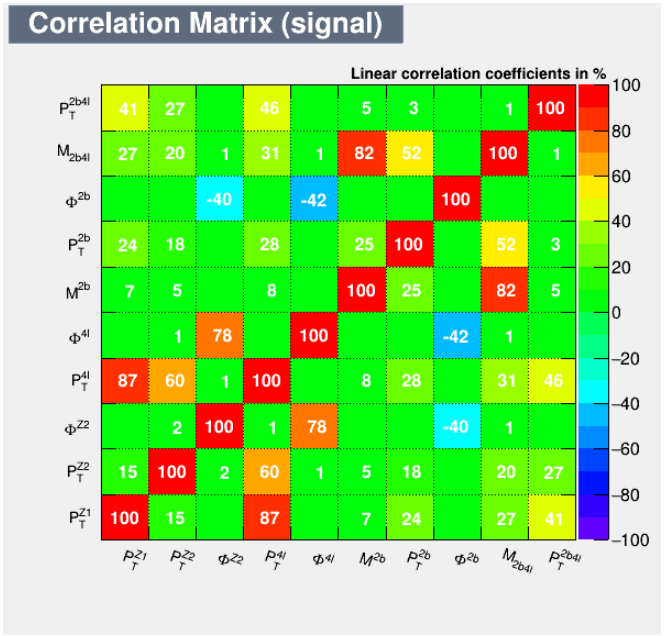
Training and classification application are done for different hypothesis

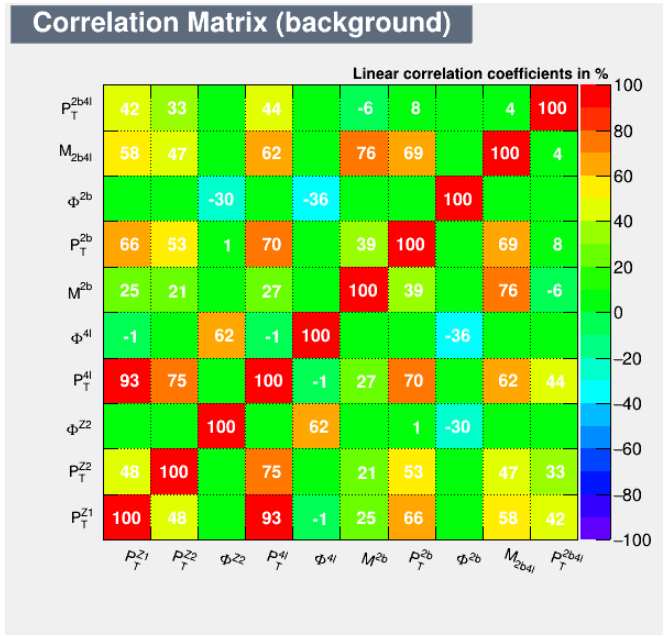






1 hidden layer
15 nodes
Activation type: ReLu
Learning epochs: 300
Learning rate: 0.01

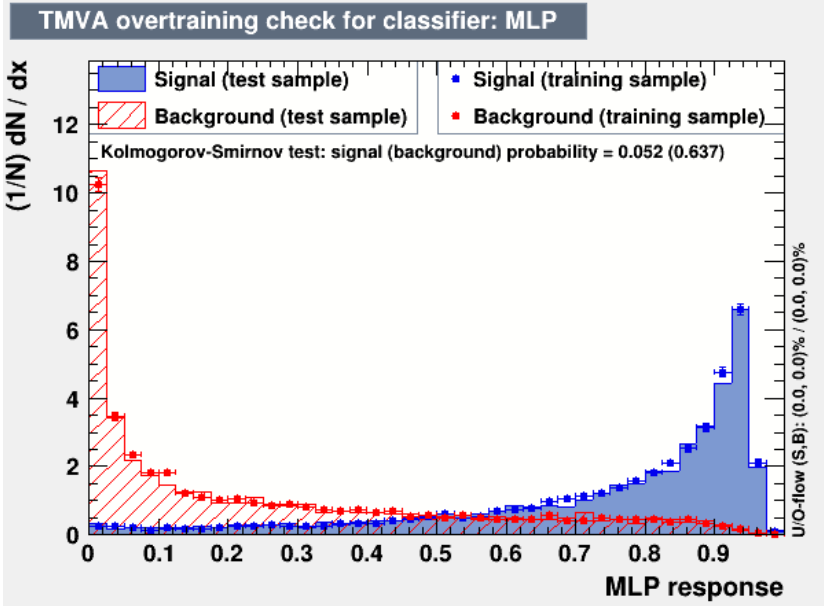


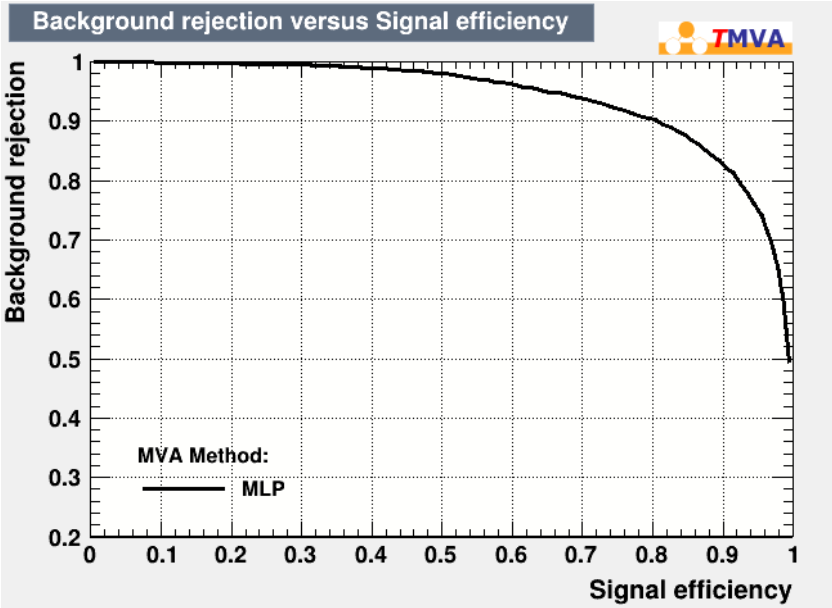


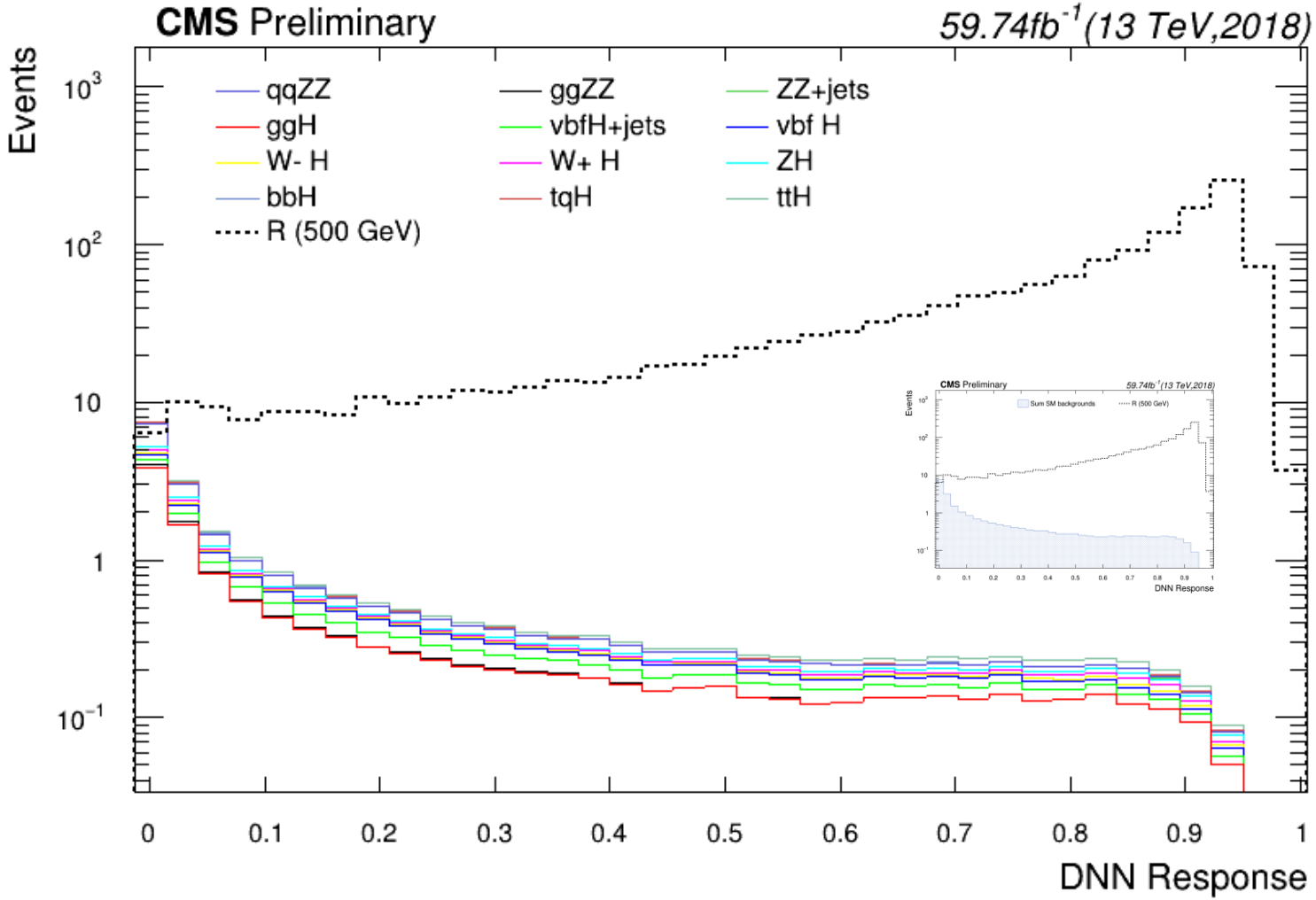
Updates on the MVA Analysis

Radion with M_R = 500 GeV

Training and classification application are done for different hypothesis



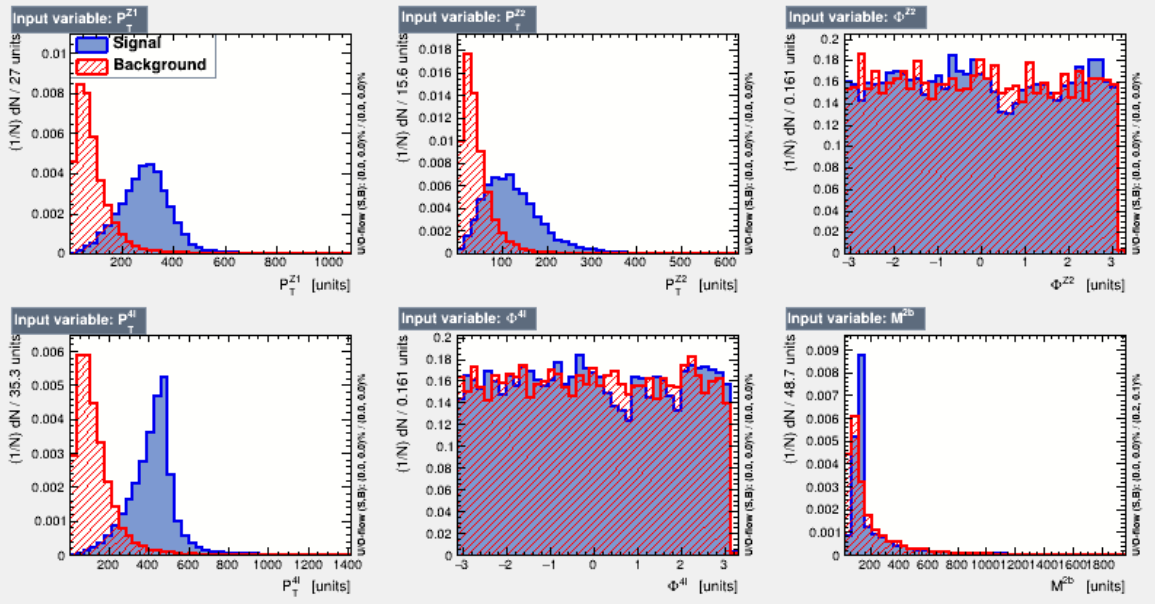


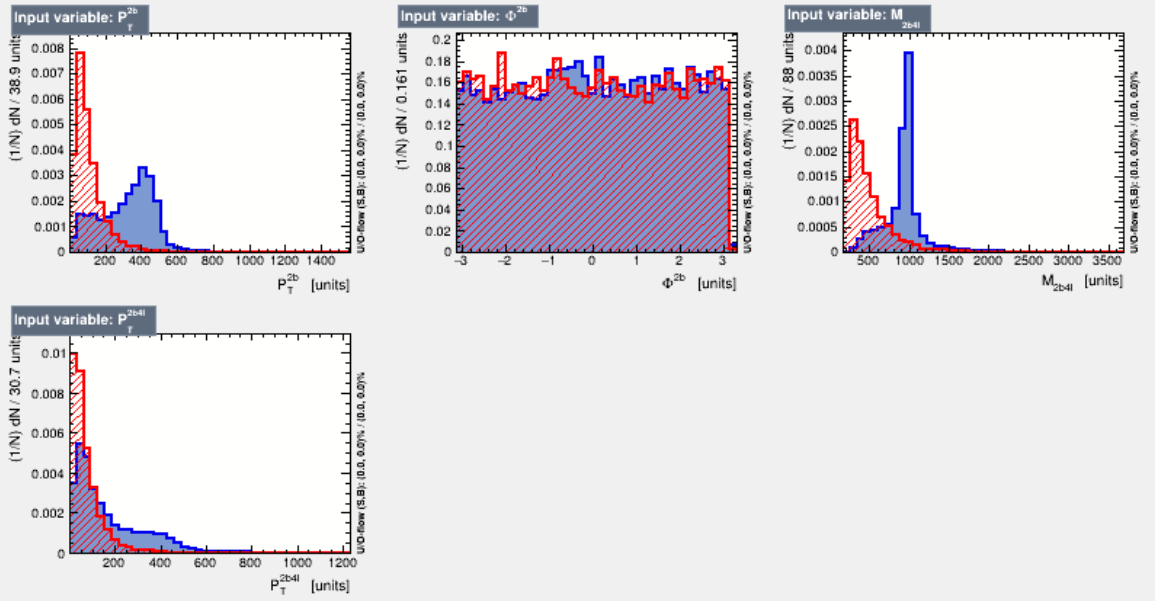


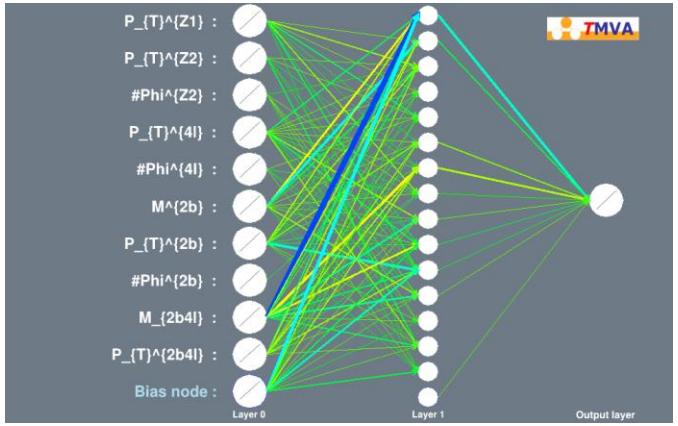
Updates on the MVA Analysis

Radion with M_R = 1 TeV

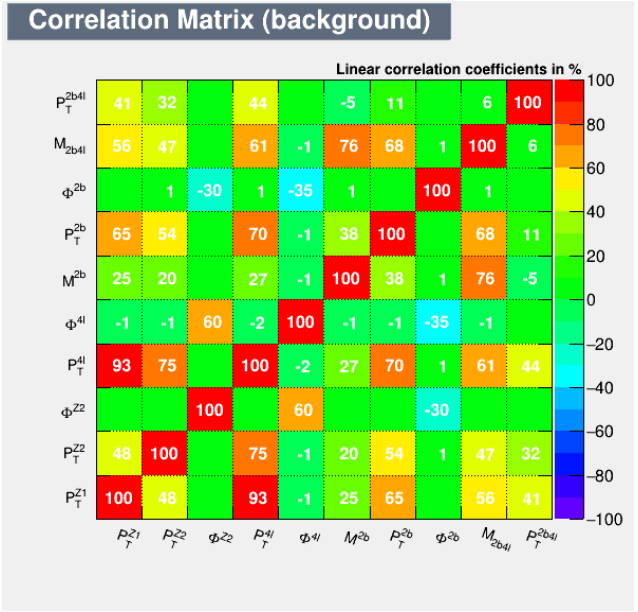
Training and classification application are done for different hypothesis

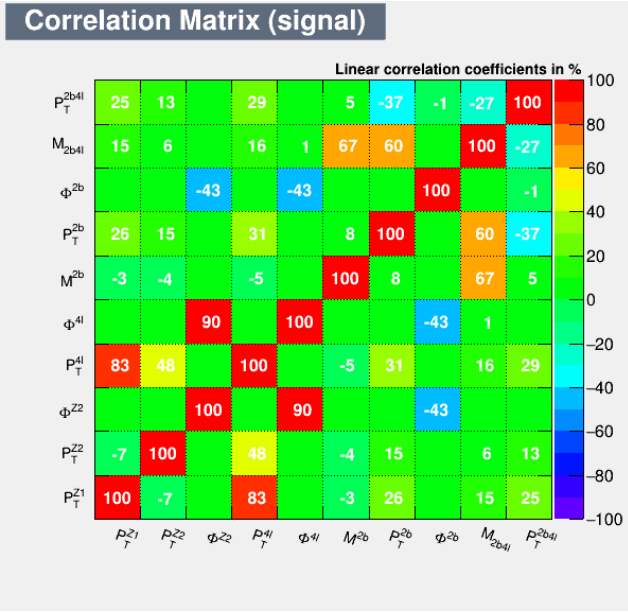






1 hidden layer
15 nodes
Activation type: ReLu
Learning epochs: 300
Learning rate: 0.01

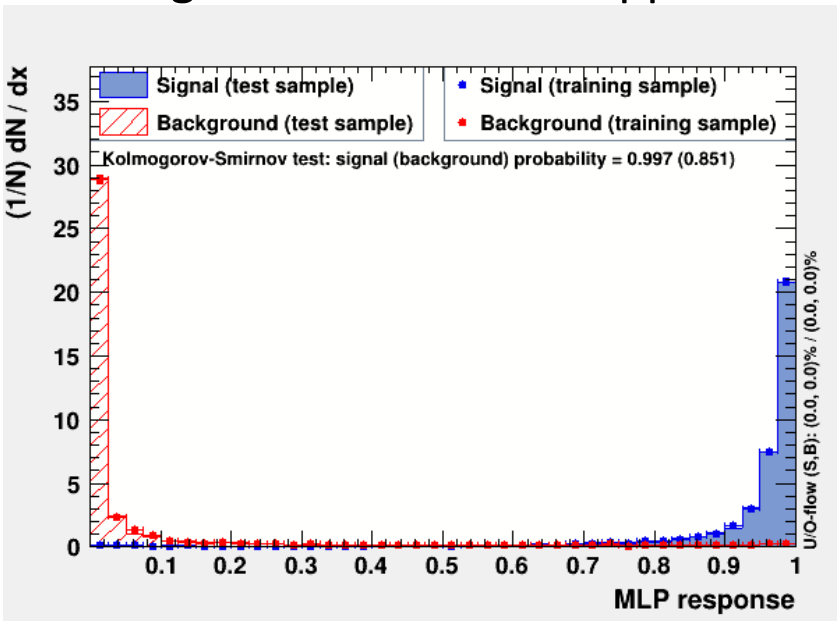


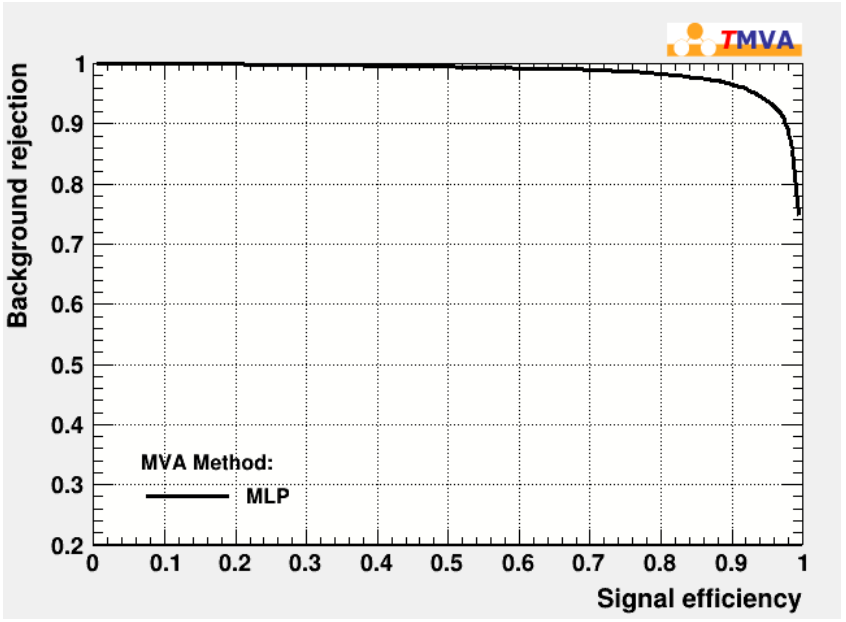


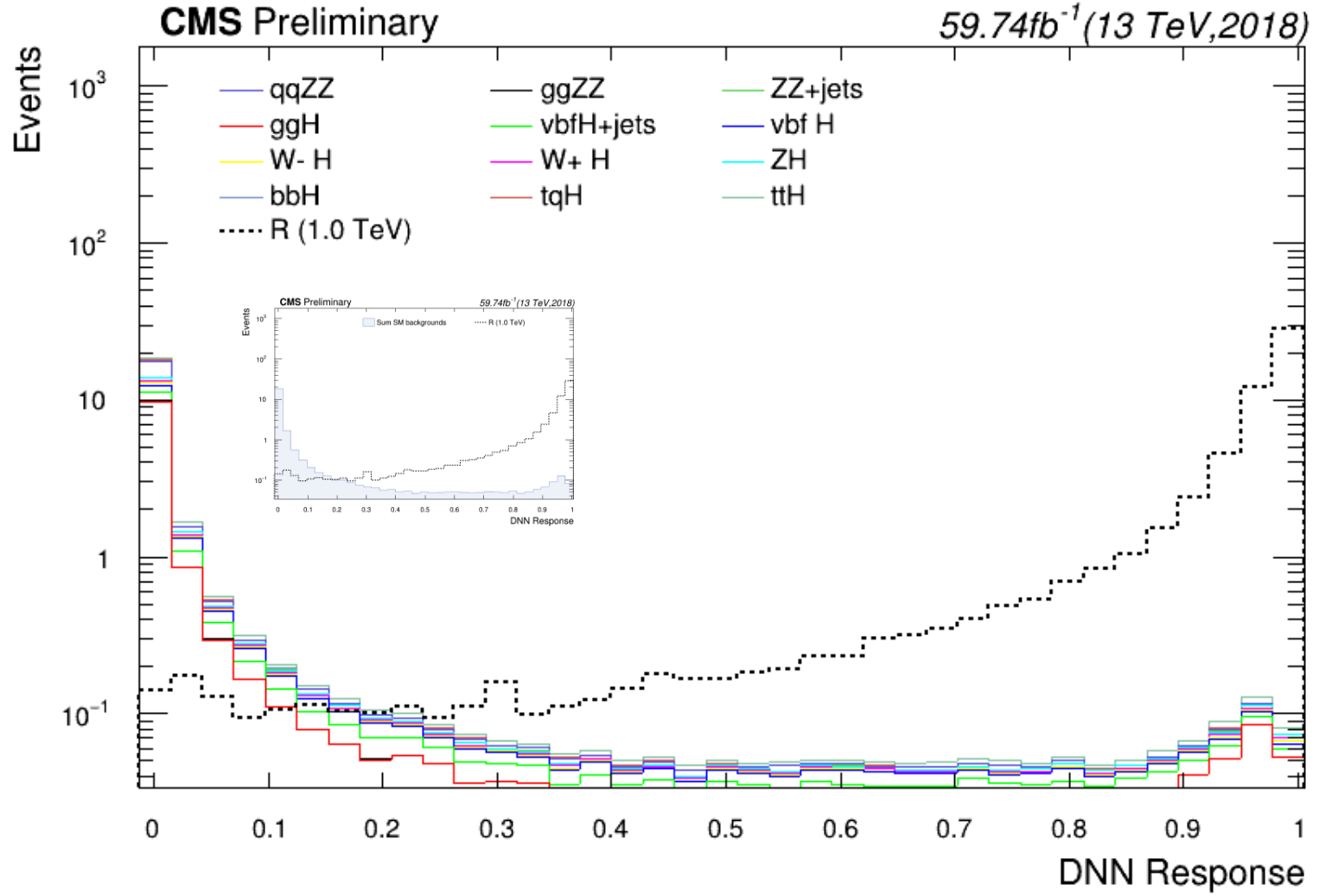
Updates on the MVA Analysis

Radion with M_R = 1 TeV

Training and classification application are done for different hypothesis



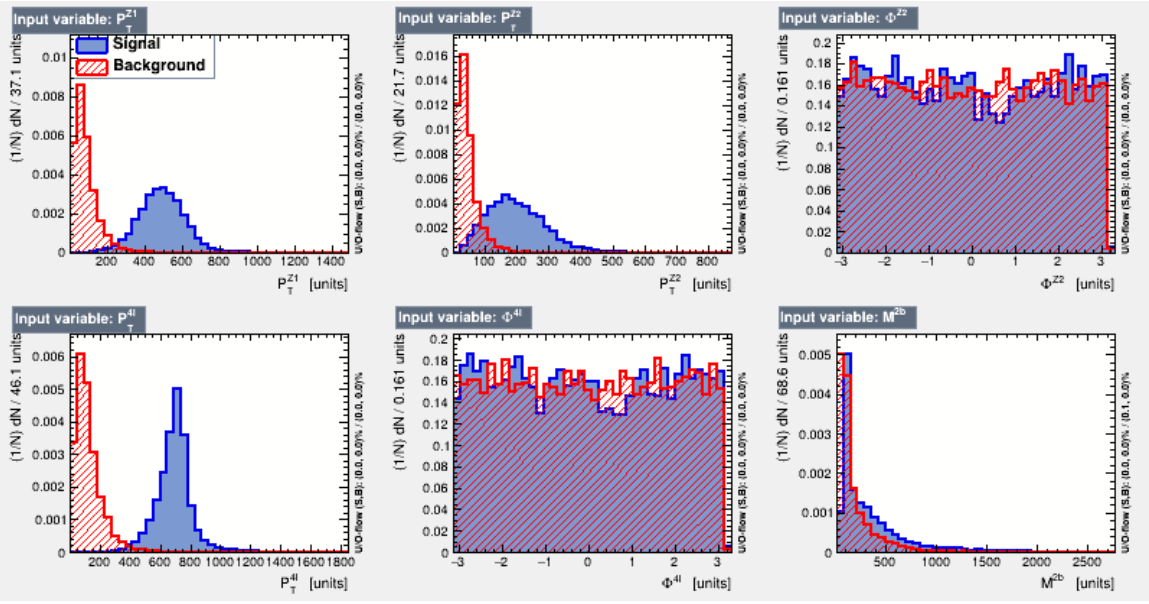


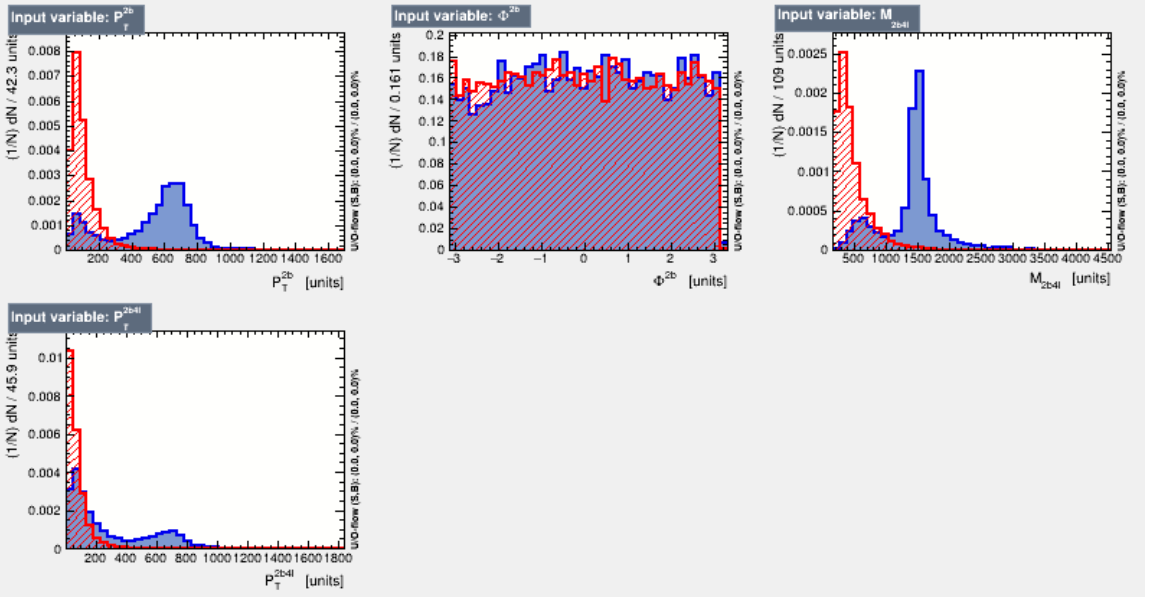


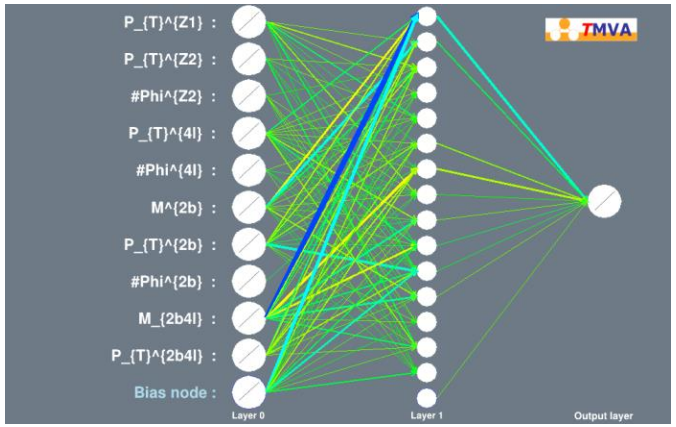
Updates on the MVA Analysis

Radion with M_R = 1.5 TeV

Training and classification application are done for different hypothesis

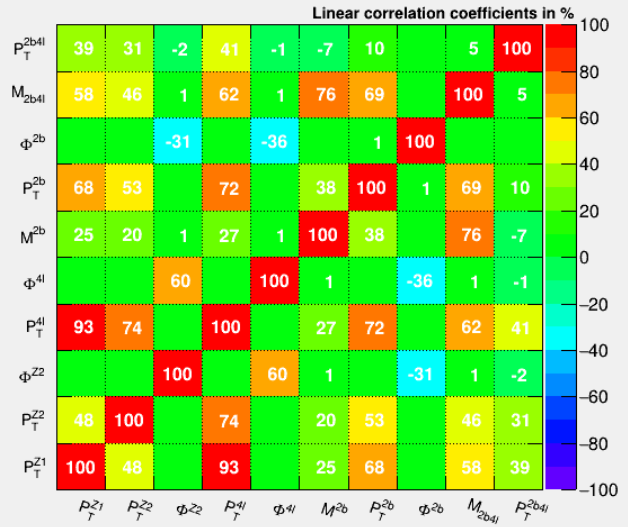




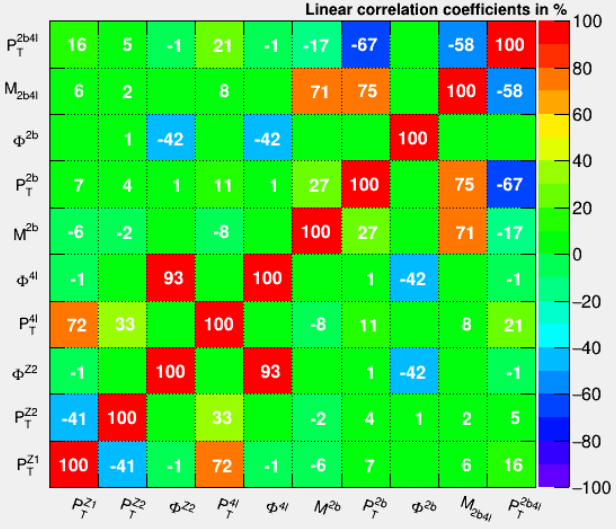


1 hidden layer
15 nodes
Activation type: ReLu
Learning epochs: 300
Learning rate: 0.01

Correlation Matrix (background)



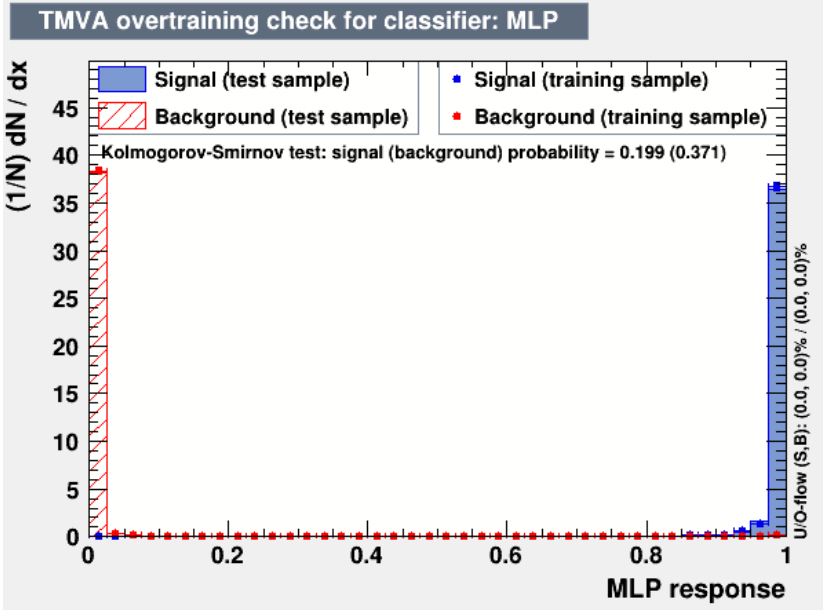
Correlation Matrix (signal)

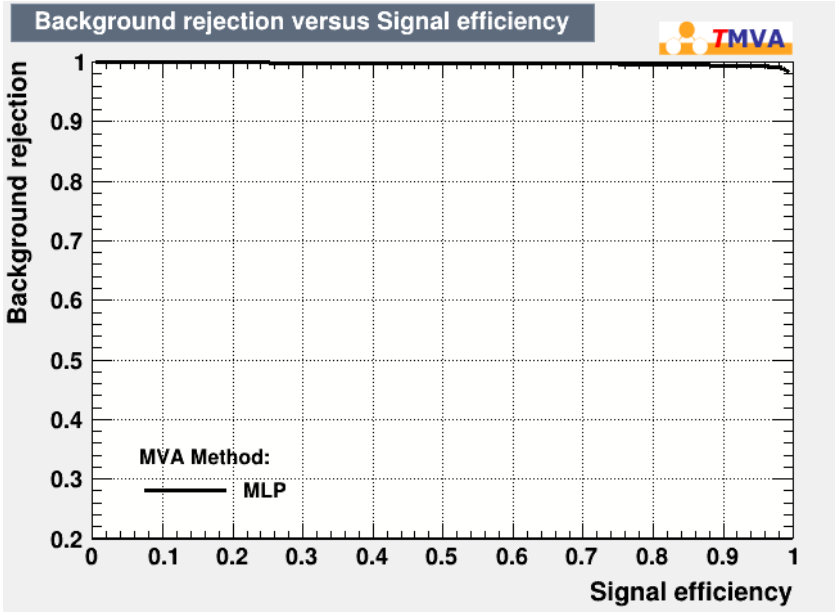


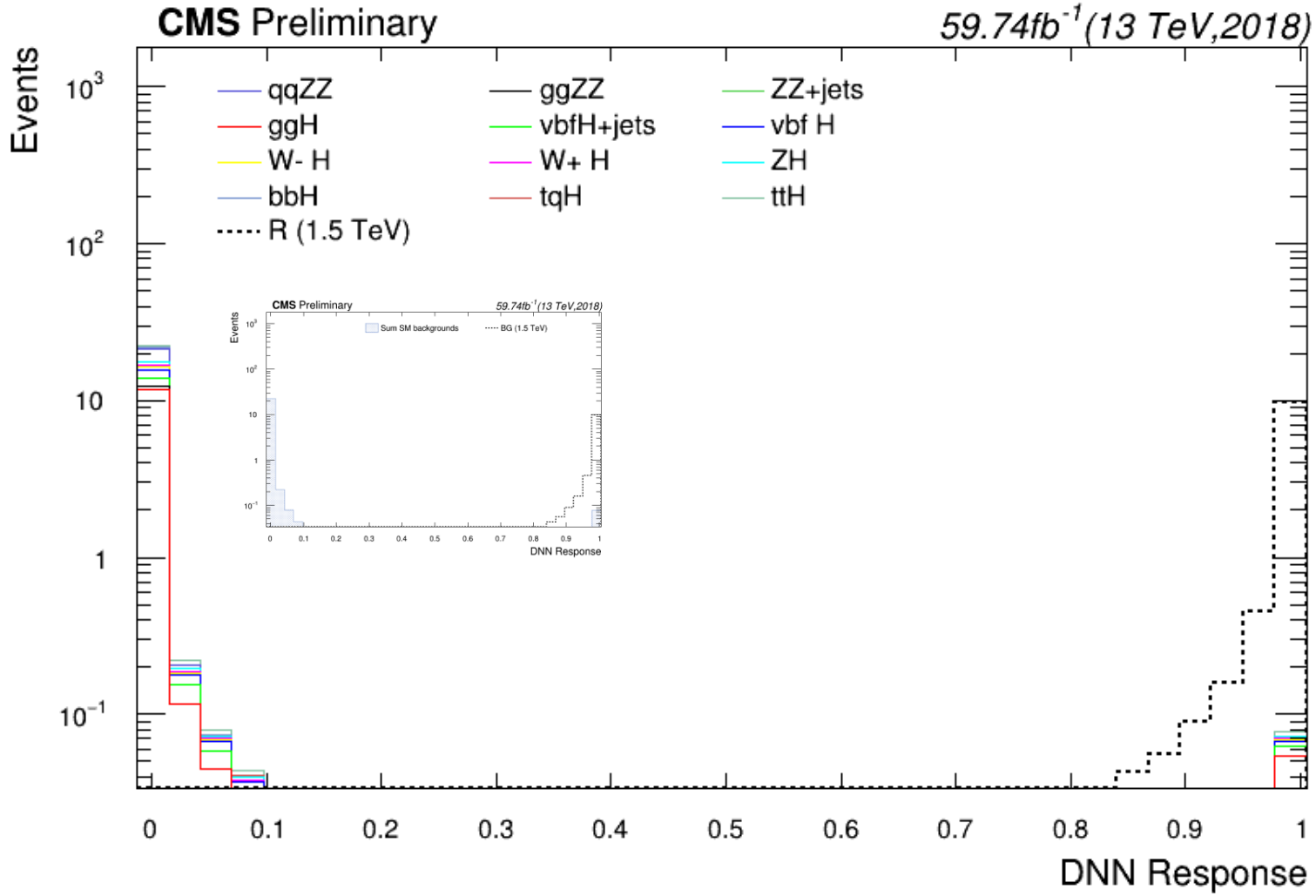
Updates on the MVA Analysis

Radion with M_R = 1.5 TeV

Training and classification application are done for different hypothesis

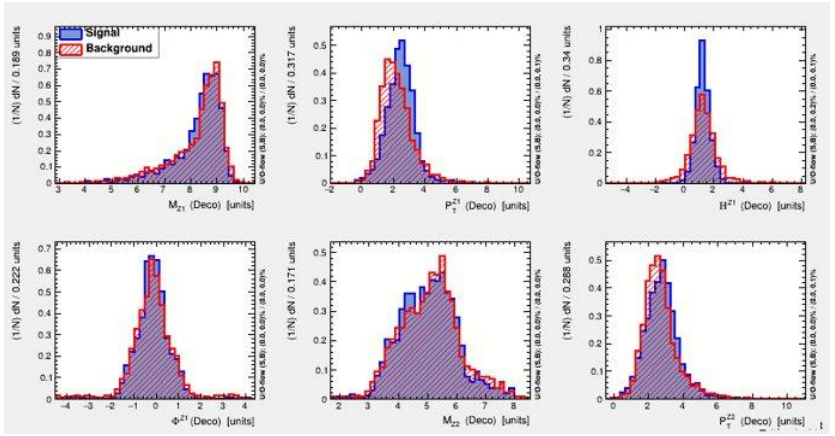


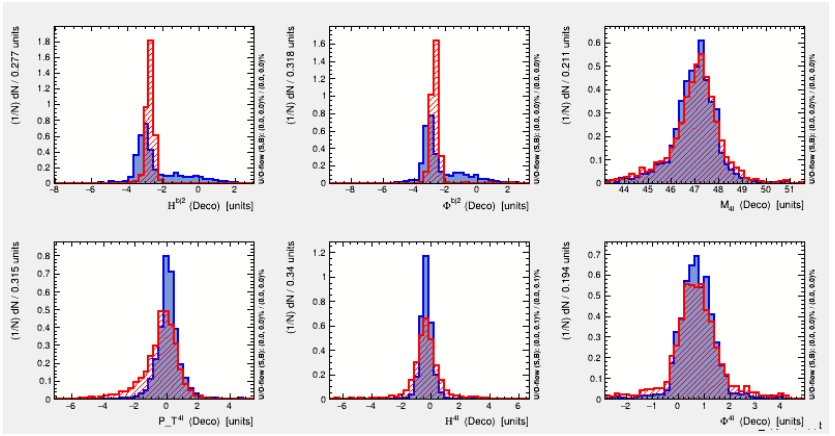


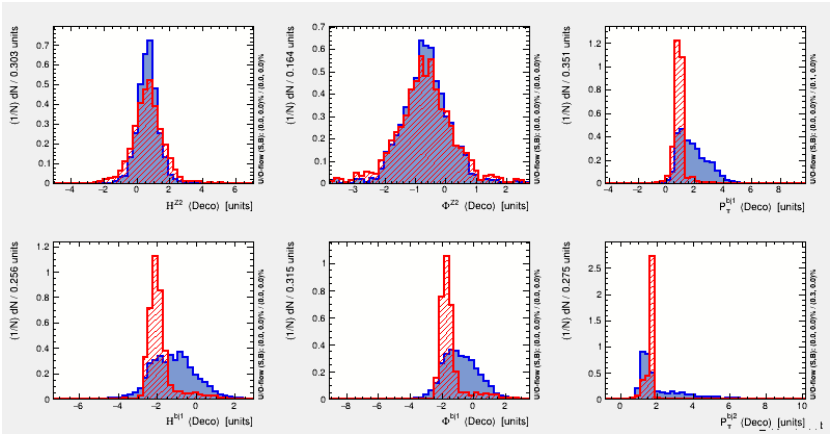


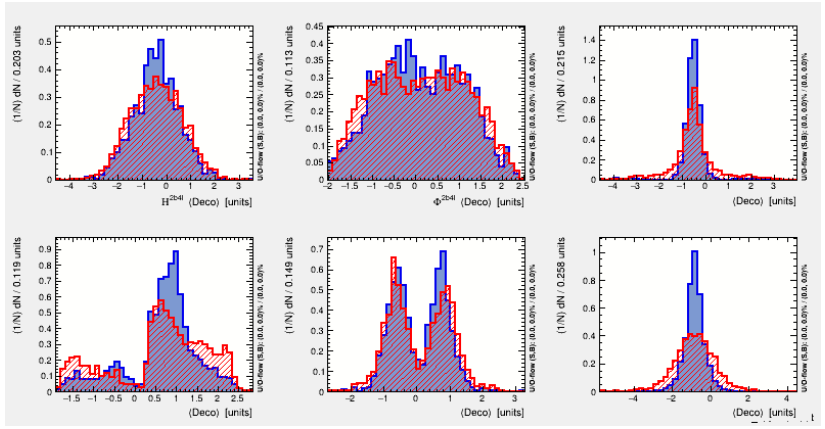
Backup

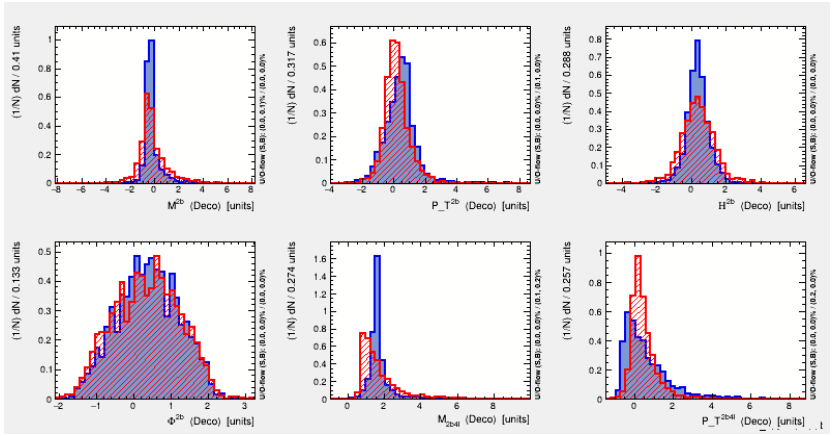
MVA input variables

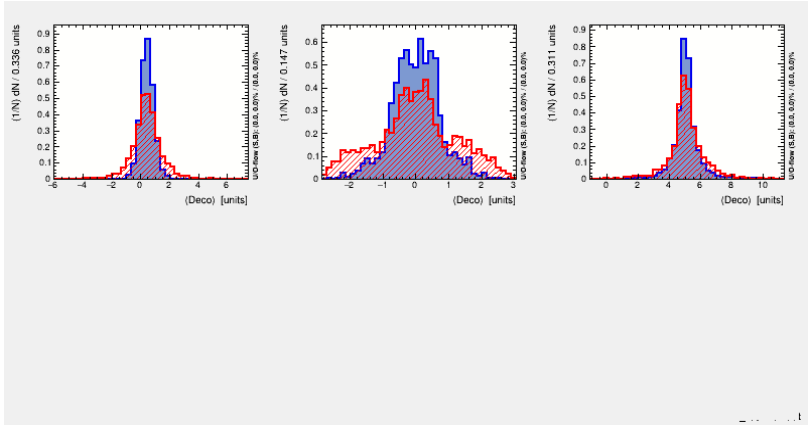












MVA input variables

Rank	Variable	Importance
1	st_H2_mass	7.024e+01
2	st_HH_mass	5.991e+01
3	st_HH_pt	5.761e+01
4	st_H1_pt	4.583e+01
5	st_H2_pt	3.865e+01
6	st_Z2_pt	3.187e+01
7	st_Z2_phi	2.533e+01
8	st_H2_phi	2.227e+01
9	st_Z1_pt	2.217e+01
10	st_Z1_phi	1.752e+01
11	st_H1_phi	1.654e+01
12	st_HH_phi	1.621e+01
13	st_angle_j1j2	1.420e+01
14	st_angle_H1H2	1.056e+01
15	st_Z2_mass	9.353e+00
16	st_deltaEta_j1j2	6.352e+00
17	st_HH_eta	5.297e+00
18	st_deltaR_H1H2	5.201e+00
19	st_Z1_mass	4.859e+00
20	st_H1_mass	4.598e+00
21	st_H1_eta	3.392e+00
22	st_Z2_eta	3.371e+00
23	st_angle_Z1Z2	3.200e+00
24	st_deltaEta_H1H2	3.095e+00
25	st_Z1_eta	2.513e+00
26	st_H2_eta	2.041e+00
27	st_deltaEta_Z1Z2	9.358e-01