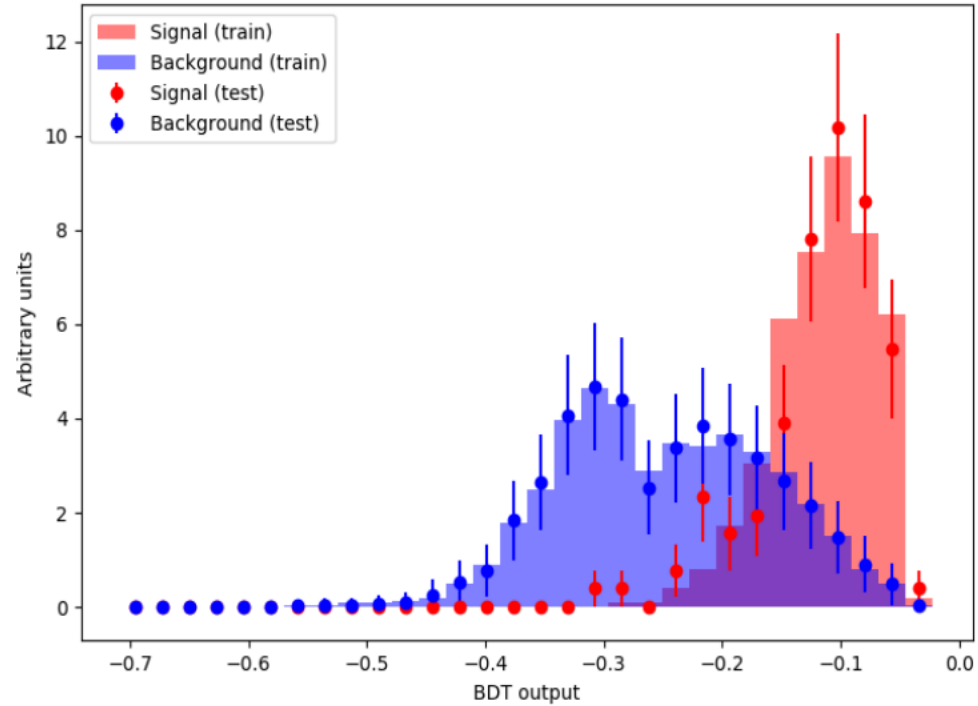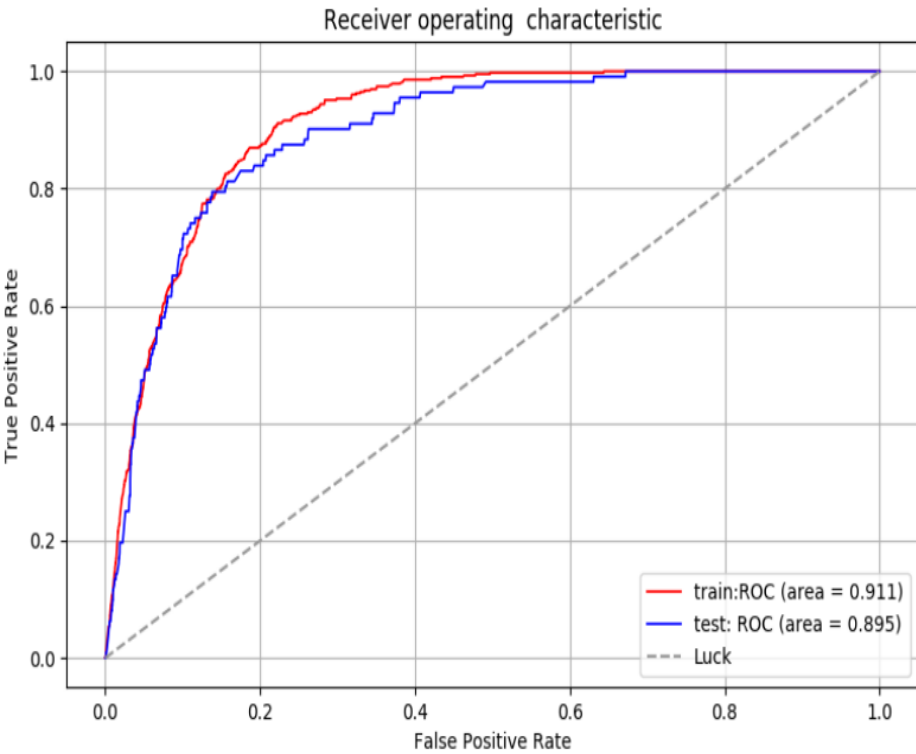# CEPC HZZ Project

Min Zhong, Yanxi Gu

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BDT Study Using Dalitz Variables (qqHZZ)

BDT Study Using Dalitz Variables (qqHZZ)

**Add A Simple cut after all the cuts**

cut	qqhzz	zh	2f	4f
Raw events	20254	1140511	801811977	107203890
pre-selection	826	30494	480828	515425
2m+2j	203	30271	480828	515425
Npfo	180	18036	14766	298938
Vis_mass	149	4638	3836	30476
cos_theta	120	3594	0	7271
RecM(dimuon)	102	2559	0	2530
vis_all_p	96	2244	0	1897
M(dijet)	88	1587	0	1028
jet_lead_e	85	1467	0	733
jet_sub_e	84	1435	0	628
angle_mj	78	1240	0	475
M(dimuon)	74	1045	0	369
vis_all_cos	71	994	0	289
RecM(vis_all)	62	657	0	249
vis_all_pt	61	651	0	242
not mmhzz	60	418	0	227
not nnhzz	57	406	0	224
Dalitz Cut	52	259	0	120

BDT Results

cut	qqhzz	zh	2f	4f
Expected	20254	1140511	801811977	107203890
Pre-selection	826	30494	480828	515426
Is signal	203	30291	480828	515426
$38 < Npfo < 90$	180	18036	14766	298938
$80 <$ Dijet Mass < 110	161	5452	29	225456
$|Cos\ theta| < 0.95$	130	4238	7	137929
Visible Mass~[115,154]&[164,210]	109	2441	0	2618
BDT Score > -0.016	47	237	0	155

BDT Study on mmHZZ (vvjj)
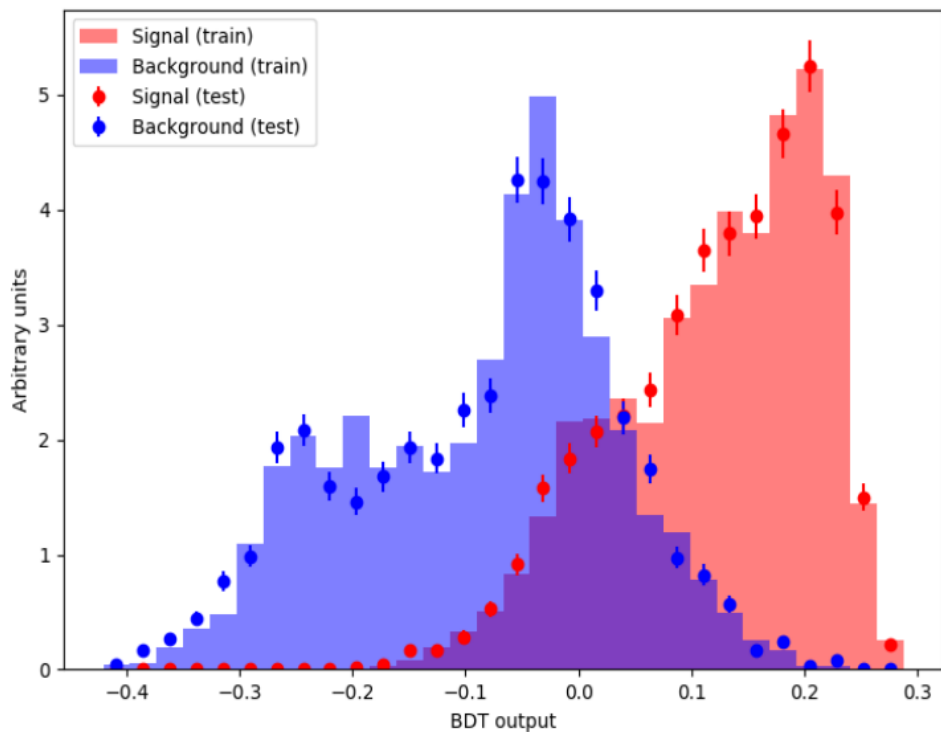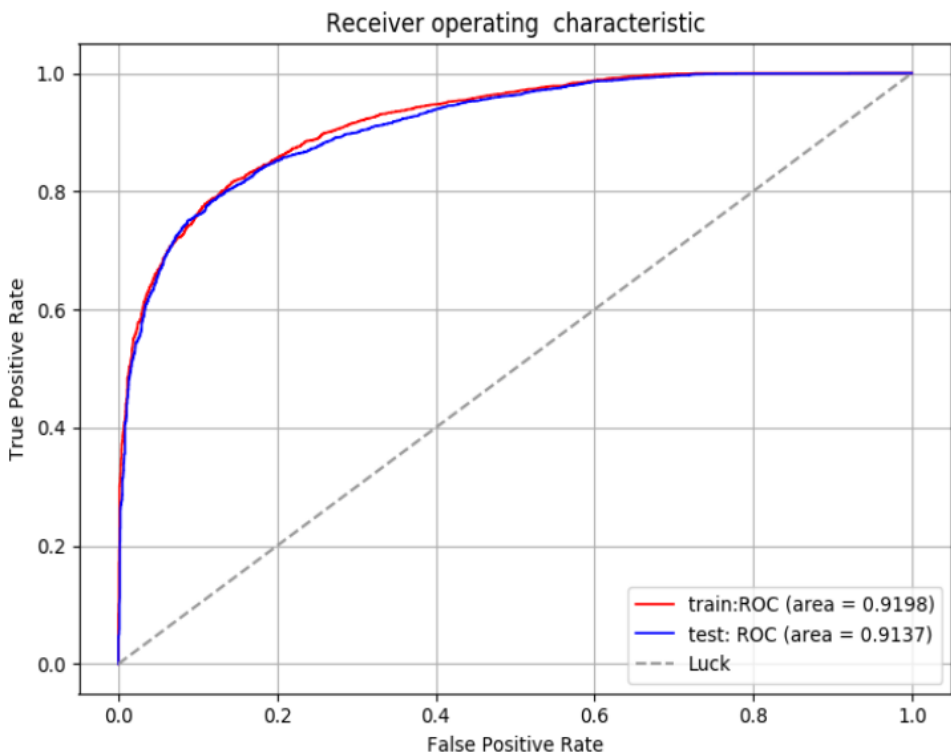
BDT Study on mmHZZ (vvjj)

Cut-based

Cut	Signal	ZH background	2f background	4f background
Expected	1000	1140511	801811977	107203890
$Pre-selection$	616	30524	481301	515955
$Signal\ or\ not$	211	30307	481301	515955
$M_{missing} > M_{dijet}$	107	1605	115175	28838
M_{dimuon}	95	726	73813	6836
M_{dimuon}^{rec}	95	707	7894	1360
$N(pfo)$	94	336	3271	574
$Pt_{visible}$	89	312	342	168
$Angle_{min}$	85	298	283	139
$M_{missing}\ and\ M_{dijet}$	62	80	254	46
$Single\ Jet$	54	67	0	9

BDT

| Cut	Signal	ZH background	2f background	4f background
$Expected$	1000	1140511	801811977	107203890
$Pre-selection$	616	30494	480828	515426
$Signal\ or\ not$	211	30282	480828	515426
$M_{missing} > M_{dijet}$	107	1608	115062	28811
M_{dimuon}	95	725	73741	6833
M_{dimuon}^{rec}	95	706	7886	1359
$N(pfo)$	94	336	3268	574
$Pt_{visible}$	89	312	342	168
$BDT\ score$	62	22	14	6

Main Background of BDT: nnh_zz (11), e2e2 (14)

BDT Study on mmHZZ (vvjj)
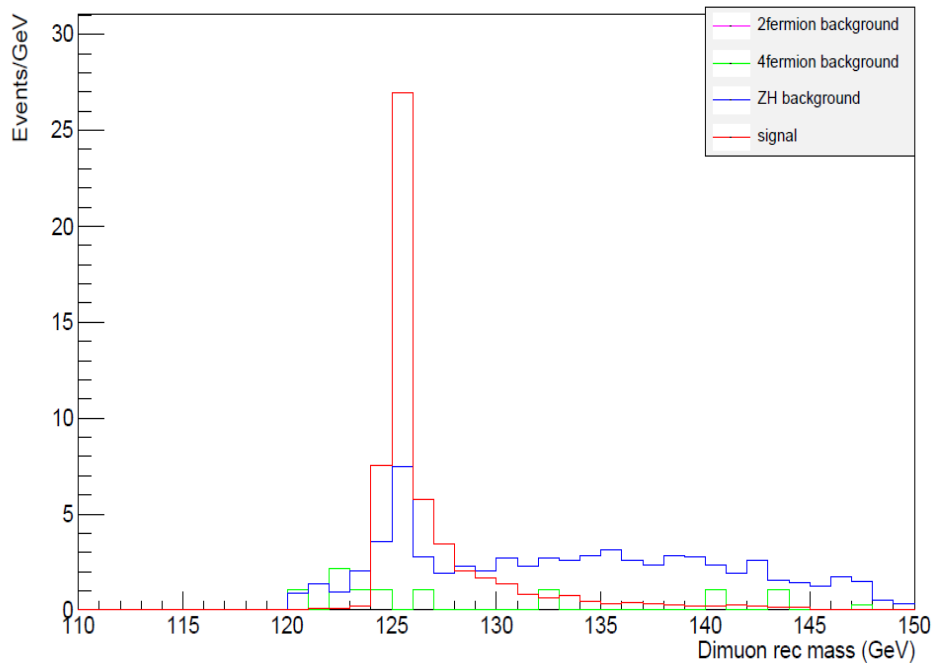
Cut-based

BDT
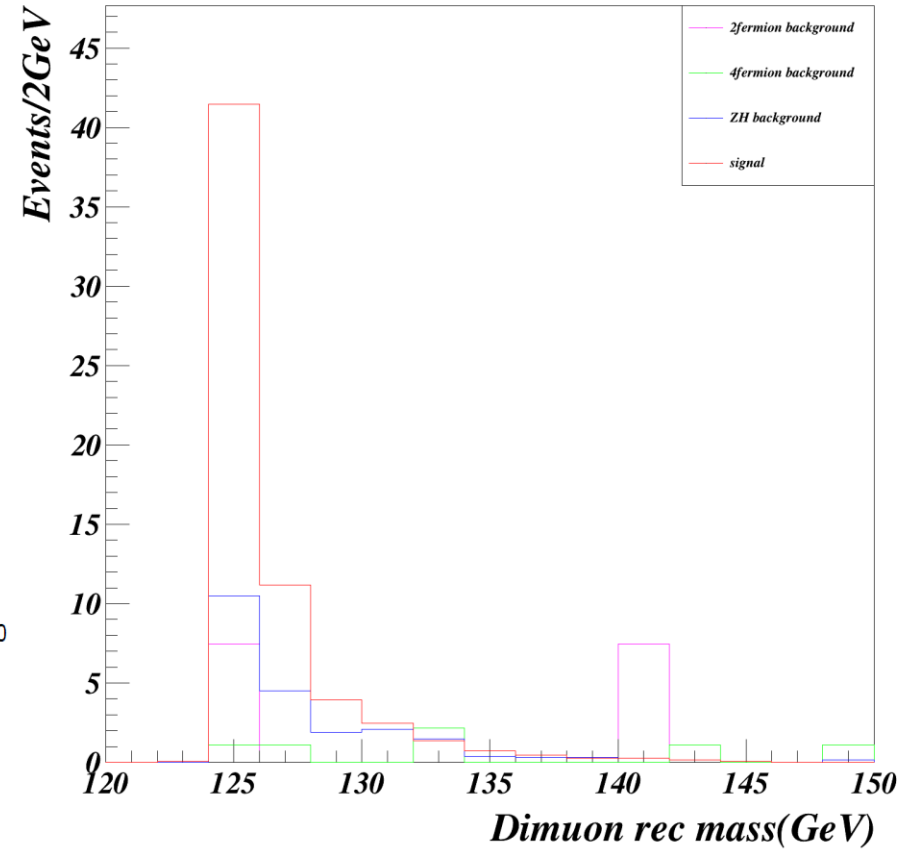
Plotting Style

Previous Style
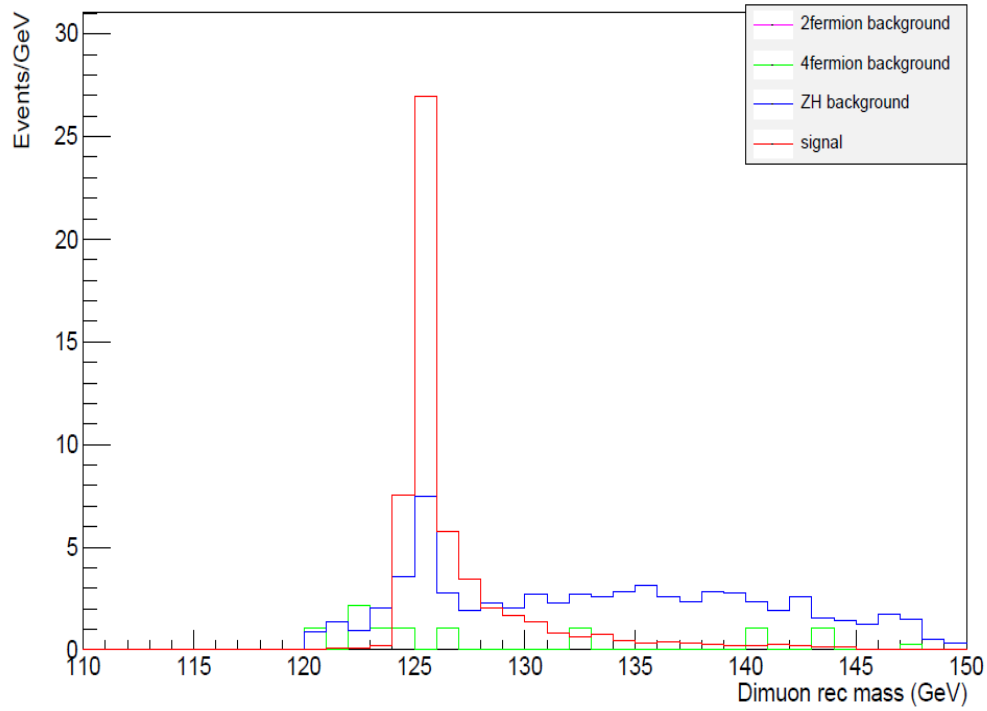
Current Style
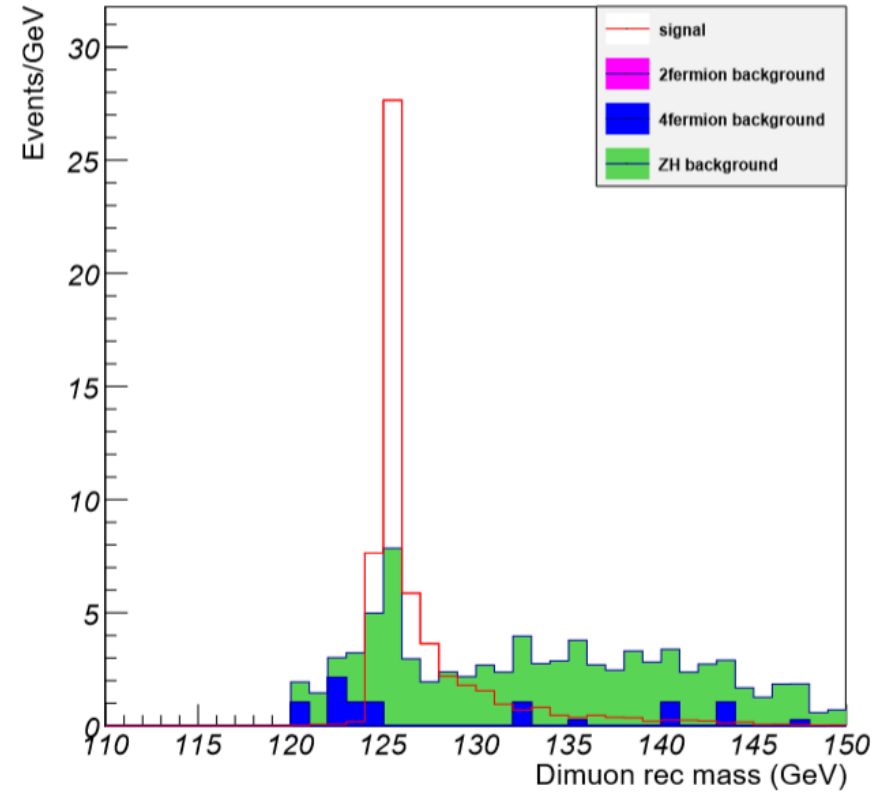
Project Review

	mmHZZ	vvHZZ	qqHZZ
Cut-based	Done	Done	Done
Merge into framework	Done	Done	To do
BDT Study	Preliminary	Done	Done
Put BDT code in package	To do	To do	To do
Higgs width fitting	Done	Done	To do
Dalitz Fitting	To do		

	Status
Table & Plot style	Done
CEPC Memo	To do
EFT	On-going (Ryuta)